PUBLIC DRAFT • FEBRUARY 2013

Integrated Natural Resources Management Plan

Naval Auxiliary Landing Field San Clemente Island

Integrated Natural Resources Management Plan

Naval Auxiliary Landing Field
San Clemente Island, California

Public Draft
February 2013

Prepared for:

Naval Base Coronado
3 Wright Avenue, Building 3
San Diego, CA 92135
Point of Contact: Ms. Melissa Booker, Wildlife Biologist

Under Contract with:

Naval Facilities Engineering Command Southwest
2730 McKean St Bldg 291
San Diego, CA 92136
Point of Contact: Ms. Michelle Cox, Natural Resources Specialist

Contract No. N62473-06-D-2402/0026

Prepared by:

Tierra Data Inc.
10110 W. Lilac Road
Escondido, CA 92026
Point of Contact: Ms. Elizabeth Kellogg, President

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN
Naval Auxiliary Landing Field San Clemente Island, California

APPROVAL

This Integrated Natural Resources Management Plan (INRMP) fulfills the requirements for the INRMP in accordance with the Sikes Act (as amended), DoDINST 4715.3, and OPNAVINST 5090.1C (as amended). This document was prepared and reviewed in coordination with U.S. Fish and Wildlife Service and California Department of Fish and Wildlife Central Region in accordance with the 2006 Memorandum of Understanding for a Cooperative Integrated Natural Resource Management Program on Military Installations.

Approving Official–U.S. Navy, Naval Auxiliary Landing Field San Clemente Island

____ ______________

Captain Gary A. Mayes, U.S. Navy — Date
Commanding Officer
Naval Base Coronado, Coronado, California

Approving Official–U.S. Navy, Naval Facilities Engineering Command Southwest Environmental Department

____ ______________

Melissa Booker, U.S. Navy — Date
Natural Resources Manager
Naval Facilities Engineering Command Southwest
Environmental Department
San Diego, California

Approving Official–U.S. Navy, Naval Facilities Engineering Command Environmental Conservation (Natural & Cultural Resources) (EV5)

____ ______________

Douglas Powers, U.S. Navy — Date
Conservation Manager (EV5)
Naval Facilities Engineering Command Southwest
Environmental Conservation
San Diego, California

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Concurring Agency - U.S. Fish and Wildlife Service

Jim A. Bartel, Field Supervisor
U.S. Fish and Wildlife Service
Carlsbad Fish and Wildlife Office
6010 Hidden Valley Road, Suite 101
Carlsbad, California 92011

Date

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Concurring Agency - California Department of Fish and Game:

Ed Pert
Regional Manager-South Coast Region
California Department of Fish and Wildlife
3883 Ruffin Road
San Diego, CA 92123

Date

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Executive Summary

The U.S. Department of the Navy (Navy) is revising the 2002 Naval Auxiliary Landing Field San Clemente Island (SCI) Integrated Natural Resources Management Plan (INRMP) for Naval Base Coronado. The revision is required due to the following: the SCI INRMP marine management footprint expanded from 300 yards offshore from the Mean Lower Low Water tide line to 3 nautical miles (6 kilometers); changes in military operations on SCI as described in the 2008 Environmental Impact Statement for the Southern California Range Complex (Navy 2008); new natural resources data; new proposed projects; and additional U.S. Department of Defense (DoD) and Navy guidance (DoD Instruction 4715.03, *Natural Resources Conservation Program;* Navy Chief of Naval Operations Guidance of April 2006).

In 2010, the U.S. Coast Guard established permanent safety zones (Federal Register Vol. 75, No. 97) off the shore of SCI in order to conduct training essential to successfully accomplish U.S. Navy missions relating to military operations and national security. The safety zones are intended to protect the public from hazardous, live-fire, and testing operations, and to ensure operations proceed as scheduled. With the establishment of safety zones, the Navy withdrew such areas from unrestricted public use in favor of utilizing these areas for military training. To achieve compliance with Navy INRMP Guidance (2006) regarding INRMP coverage of “lands that are withdrawn from the public domain for military uses,” the SCI INRMP boundary has been extended to align with the safety zone boundaries.

The Navy's mission is to organize, train, equip, and maintain combat-ready naval forces capable of winning wars, deterring aggression, and maintaining freedom of the seas. This mission is mandated by federal law (Title 10 U.S. Code [USC] § 5062), which ensures the readiness of the nation's naval forces. SCI is part of the Southern California Range Complex, the most capable and heavily used military range complex in the eastern Pacific. The mission of the Southern California Range Complex is to serve as the principal Navy training venue in the eastern Pacific to support required current, emerging, and future training (Navy 2008). It is the only remaining contiguous United States range that supports simultaneous live fire ship to shore, air to ground, and ground troop training. It allows for training in all Primary Mission Areas: Anti-Air Warfare, Amphibious Warfare, Anti-Surface Warfare, Anti-Submarine Warfare, Mine Warfare, Strike Warfare, Electronic Combat, and Naval Special Warfare. Forces need to “train the way they fight,” thus, they need to perform all of the above Primary Mission Areas together. SCI is uniquely capable of supporting such integrated training and, as such, is a highly valuable, irreplaceable asset to the Navy. In addition to its direct training support value, its proximity to southern California allows sailors and marines to effectively train in closer proximity to their families and support networks, increasing quality of life and force sustainability.

The Sikes Act, as amended (2012), requires preparation and implementation of INRMPs at all DoD installations in the United States that contain significant natural resources. An INRMP is the primary means by which natural resources compliance and stewardship priorities are set and funding requirements are determined for DoD installations. The main purpose of an INRMP is to help installation commanders more effectively manage natural resources to ensure installation lands remain available and in good condition to support the military mission; conserve and rehabilitate natural resources on military installations; sustain multipurpose use of the resources and public access to military installations to facilitate the use of those resources; participate, as appropriate, in regional ecosystem initiatives; and preclude designation of critical habitat. The Navy is required to ensure ecosystem management is the basis for all management of its lands (Sikes Act, as amended [16 USC 670a]; DoD Instruction 4715.03). While the Sikes Act, as amended, and other instructions, described above, require stewardship for natural resources on military installations, including species not listed under the Endangered Species Act, these projects support the military mission on SCI and do not foreclose current or future training opportunities. Natural resources funding priorities are established by regulatory drivers, such as the Biological Opinion on SCI Military Operations and Fire Management Plan (U.S. Fish and Wildlife Service 2008), allowing projects not driven by regulatory compliance to frequently fall below the funding availability cut-off.

The 2013 SCI INRMP was developed by an integrated working group of stakeholders, including state and federal natural resource agencies, conservation organizations, and the Navy. The 2013 SCI INRMP establishes planning and management strategies; identifies natural resources constraints and opportunities; supports the resolution of land use conflicts; provides baseline descriptions of natural resources necessary for the development of conservation strategies and environmental assessment; serves as the principal information source for the preparation of future environmental documents for proposed SCI actions; and provides guidance for annual natural resources management reviews, internal compliance audits, and annual budget submittals.

The vision of the SCI INRMP is to ensure the continued ability of SCI to support its current and evolving DoD mission requirements while conserving its natural resources, cooperatively working with other agencies to manage those resources, and applying the principles of ecosystem management and adaptive management.

The Goal of the SCI INRMP is to utilize adaptive management to maintain long-term ecosystem health and minimize impacts to natural resources consistent with the operational requirements of the DoD's training and testing mission. The SCI INRMP will identify key components that:

- Facilitate sustainable military readiness and foreclose no options for future requirements of the DoD.
- Conserve, maintain, and restore priority native species and habitats to reach self-sustaining levels through improved conditions of terrestrial, coastal, and nearshore ecosystems.
- Promote ecosystem sustainability.
- Maintain the full suite of native species with appropriate emphasis on endemics.

The National Defense Authorization Act for Fiscal Year 2004 (Public Law 108-136) amended the Endangered Species Act (7 USC § 136, 16 USC § 1531 et seq.) to limit areas eligible for designation as critical habitat. Specifically, Section 4(a)(3)(B)(i) of the Endangered Species Act (16 USC 1533(a)(3)(B)(i)) now provides: “The Secretary shall not designate as critical habitat any lands or other geographical areas owned or controlled by the Department of Defense, or designated for its use, that are subject to an integrated natural resources management plan prepared under section 101 of the Sikes Act (16 USC 670a), if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation.”

The federally threatened and endangered species within the SCI INRMP area are the San Clemente Island indian paintbrush (*Castilleja grisea*), San Clemente Island larkspur (*Delphinium variegatum* subsp. *kinkiense*), San Clemente Island woodland-star (*Lithophragma maximum*), San Clemente Island lotus (*Acmispon dendroideus* var. *traskiae*), San Clemente Island bush-mallow (*Malacothamnus clementinus*), Santa Cruz Island rockcress (*Sibara filifolia*), island night lizard (*Xantusia riversiana*), San Clemente loggerhead shrike (*Lanius ludovicianus mearnsi*), San Clemente sage sparrow (*Amphispiza belli clementeae*), western snowy plover (*Charadrius alexandrinus nivosus*), white abalone (*Haliotis sorenseni*), black abalone (*Haliotis cracherodii*), loggerhead sea turtle (*Caretta caretta*), green sea turtle (*Chelonia mydas*), olive ridley sea turtle (*Lepidochelys olivacea*), leatherback sea turtle (*Dermochelys coriacea*), Guadalupe fur seal (*Arctovephalus townsendi*), Steller sea lion (*umetopias jubatus*), southern sea otter (*Enhydra lutris nereis*), blue whale (*Balaenoptera musculus*), fin whale (*Balaenoptera physalus*), humpback whale (*Megaptera novaeangliae*), North Pacific right whale (*Eubalaena japonica*), sei whale (*Balaenoptera borealis*), and sperm whale (*Physeter macrocephalus*). The SCI INRMP Chapter 3 Natural Resource Condition and Management Strategies and Appendix F INRMP Benefits for Endangered Species discusses how the plan provides for the conservation of the essential physical or biological features, the effectiveness of current management, and the monitoring implemented to ensure the conservation measures are effective and can be adapted in the future in response to new information. Appendix B Implementation Summary Table for the SCI INRMP lists all natural resources projects with the implementation year and frequency.

The effects of implementing the 2013 SCI INRMP are addressed under the National Environmental Policy Act by an Environmental Assessment and Finding of No Significant Impact, appended to this document (Appendix I). The Navy will implement recommendations in the 2013 SCI INRMP within the framework of regulatory compliance, national Navy mission obligations, anti-terrorism and force protection limitations, and funding constraints. All actions contemplated in the 2013 SCI INRMP are subject to the availability of funds properly authorized and appropriated under federal law. Nothing in the 2013 SCI INRMP is intended to be, nor must be, construed to be a violation of the Anti-Deficiency Act (31 USC 1341 et seq).

SCI is achieving no net loss of training land through the implementation of the 2013 SCI INRMP. The 2008 Environmental Impact Statement for the Southern California Range Complex (Navy 2008) covers training conducted on SCI. Execution of threatened and endangered species management projects listed in the INRMP support no net loss of training through species recovery that results in long-term operation flexibility and reduced encumbrances. Furthermore, management of candidate species and sensitive species reduce the potential for future Endangered Species Act listings that could inhibit training. Lastly, in capturing the on-going management of species (as required by the Biological Opinion [USFWS 2008] and/or as new candidate species dictate) the INRMP provides an avenue for exemption from critical habitat, which is pivotal to no net loss of military training.

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Table of Contents

Appendices

List of Figures

List of Maps

List of Photos

List of Tables

1.0 Introduction and Overview

San Clemente Island harbors priceless assets that are inextricably linked. It is an indispensable platform for national defense readiness and home to globally significant natural resources. This Integrated Natural Resources Management Plan sets the course for their management and protection, including a no net loss to the military mission.

1.1 Purpose and Authority

The primary mission of Naval Auxiliary Landing Field San Clemente Island (SCI) is to provide the naval services and other military departments with air, land, and sea space to conduct realistic training events in support of operational readiness requirements in a maritime environment. Integrated Natural Resource Management Plans (INRMPs) ensure military operations and natural resources conservation are integrated and consistent with stewardship and legal requirements with no net loss to military training activities.

The 2002 SCI INRMP was developed by an integrated working group of stakeholders that included state and federal governing bodies, natural resource regulatory agencies, conservation organizations, and the U.S. Department of the Navy (Navy). Revision of the 2002 INRMP was deemed necessary due to the following:

- The expansion of the SCI marine management footprint from 300 yards (0.14 nautical miles [nm]) out to 3 nm (6 kilometers [km]); and
- Changes in military operations on SCI, as described in the 2008 Environmental Impact Statement (EIS) for the Southern California Range Complex (SOCAL) (Navy 2008).

In 2010 (Federal Register Vol. 75, No. 97), the U.S. Coast Guard established permanent safety zones off the shore of SCI to conduct training essential to successfully accomplish U.S. Navy missions relating to military operations and national security. The safety zones were established to protect the public from hazardous, live-fire, and testing operations and ensure operations proceed as scheduled. The limits of the segmented safety zones range from high tide seaward 3 nm (6 km) (See Section 4.1.3 Safety and Other Restricted Access Zones for detailed information on the safety zones). With the establishment of safety zones, the Navy withdrew such areas from unrestricted public use in favor of utilizing these areas for military training. To achieve compliance with Navy INRMP Guidance (Navy 2006) regarding INRMP coverage of “lands that are withdrawn from the public domain for military uses,” the SCI INRMP boundary has been extended to align with the safety zone boundaries.

Impacts and mitigation measures from changes in military training and operations on SCI are discussed in the SCI Wildland Fire Management Plan, the Environmental Assessment to the Wildland Fire Management Plan, and a Biological Opinion issued by the U.S. Fish and Wildlife Service (USFWS) on SCI military operations and fire management (FWS-LA-09B0027-09F0040; USFWS 2008).

This INRMP provides SCI with an implementable framework for managing natural resources on the land and water it owns or controls. Required by the Sikes Act (as amended) an INRMP is the primary means by which natural resources compliance and stewardship priorities are set and funding requirements are determined for U.S. Department of Defense (DoD) installations.

The Sikes Act (as amended, 2012) stipulates that this INRMP provide for:

- Conservation and rehabilitation of natural resources;
- Sustainable, multi-purpose use of resources;
- Public access that is necessary and appropriate for the use described above, subject to safety and military security requirements;
- Specific natural resource goals and objectives, and time frames for acting on them;
- Fish and wildlife management, land management, and forest management;
- Fish and wildlife habitat enhancement or modifications;
- Wetlands protection, enhancement, and restoration where necessary for support of fish, wildlife, and/or plants;
- Integration of and consistency among various activities conducted under the Plan;
- Sustainable use by the public of natural resources to the extent that use is not inconsistent with the needs of fish and wildlife resources;
- Enforcement of natural resource laws and regulations;
- No net loss in the capability of the military installation lands to support the military mission of the installation; and
- Such other activities as the Secretary of the Navy determines appropriate.

The Sikes Act (as amended) directs the DoD to take appropriate management actions necessary to conserve and enhance the land and water resources on all installations under its control. The DoD Directive 4700.4, *Natural Resources Management Program* and DoD Directive 4715.03 (2011), *Environmental Conservation Program* have been implemented to establish fundamental land management policies and procedures for all military lands to preserve the military mission while conserving natural resources. Naval Operations Instruction (OPNAVINST) 5090.1C CH-1, *Environmental Readiness Program Manual, 18 July 2011 Chapter 24 Natural Resources Management* further establishes program responsibilities and standards for complying with resource protection laws, regulations, and Executive Orders to conserve and manage natural resources on Navy installations in the United States and its territories and possessions. The Chief of Naval Operations (CNO) INRMP Guidance for Navy Installations, *How to Prepare, Implement, and Revise INRMPs, April 2006* supplies guidelines on the process and procedures for developing an INRMP. Finally, Naval Facilities Engineering Command (NAVFAC) Natural Resources Land Management Manual (NAVFAC MO-100.1) provides basic technical guidance for land management practices of all DoD land and water resources. The NAVFAC Natural Resources Management Procedure Manual (NAVFAC P-73 Vol II) gives further instruction on how to develop an INRMP and its content.

By direction of the Office of the Undersecretary of Defense Memorandum of 08 August 1994, *Implementation of Ecosystem Management in the Department of Defense,* INRMPs are required to ensure that ecosystem management is the basis for all future management of DoD lands and waters. Based on an ecosystem approach, this INRMP takes a whole-island view to ensure the overriding purpose of protecting the properties and functions of natural ecosystems (DoD Instruction [DoDINST] 4715.03, *Natural Resources Conservation Program*). Since ecosystem boundaries are rarely synonymous with property ownership, installations such as SCI are encouraged to form cooperative partnerships with nearby communities, as appropriate, and take part in public awareness initiatives in an effort to manage ecosystems more successfully. The Office of the Undersecretary of Defense Memorandum provides principles and guidelines for implementing ecosystem management on DoD lands and includes participation in regional ecosystem initiatives.

The Sikes Act (as amended) requires preparation and implementation of INRMPs at all DoD installations in the United States that contain significant natural resources. A successfully implemented INRMP will:

- Ensure the sustainability of all native ecosystems encompassed by an installation, and
- Ensure no net loss of the capability of installation lands to support the DoD mission.

The National Defense Authorization Act for Fiscal Year 2004 (Public Law 108-136) amended the Endangered Species Act (ESA) (7 U.S. Code [USC] § 136, 16 USC § 1531 et seq.) to limit areas eligible for designation as critical habitat. Specifically, section 4(a)(3)(B)(i) of the ESA (16 USC 1533(a)(3)(B)(i)) now provides: "The Secretary shall not designate as critical habitat any lands or other geographical areas owned or controlled by the Department of Defense, or designated for its use, that are subject to an integrated natural resources management plan prepared under section 101 of the Sikes Act (16 USC 670a), if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation." The USFWS use a three-point criteria test to determine if an INRMP provides a benefit to the species. These include:

- The plan provides a conservation benefit to the species.
- The plan provides certainty that the management plan will be implemented.
- The plan provides certainty that the conservation effort will be effective.

For more details on the criteria, see the Integrated Natural Resources Management Plan Guidance for Navy Installations (Navy 2006).

Designed to facilitate both stewardship and compliance with natural resources laws within the context of military mission requirements, this INRMP integrates natural resources components of existing SCI plans; environmental documents; and the requirements of all applicable DoD, Navy, and installation regulations and guidelines.

Consistent with all of the above, this INRMP provides goals and objectives for the use and conservation of natural resources at SCI that integrate regional ecosystem, military, social (community), and economic concerns. It establishes planning and management strategies; identifies natural resources constraints and opportunities; supports the resolution of land use conflicts; provides baseline descriptions of natural resources necessary for the development of conservation strategies and environmental assessment; serves as the principal information source for the preparation of future environmental documents for proposed SCI actions; and provides guidance for annual natural resources management reviews, internal compliance audits, and annual budget submittals.

The effects of implementing this INRMP are addressed under the National Environmental Policy Act (NEPA) by an Environmental Assessment and Finding of No Significant Impact, appended to this document (Appendix I). Other federal legal requirements that are the primary drivers for natural resources management at SCI are listed in Appendix D.

The Navy and SCI will implement recommendations in this INRMP within the framework of regulatory compliance, national Navy mission obligations, anti-terrorism and force protection limitations, and funding constraints. All actions contemplated in this INRMP are subject to the availability of funds properly authorized and appropriated under federal law. Nothing in this INRMP is intended to be, nor must be, construed to be a violation of the Anti-Deficiency Act (31 USC 1341 *et seq*).

Organization of this INRMP is consistent with the 2006 DoD Template for INRMPs (DoD 2006) (See Appendix J for a crosswalk between this INRMP and the DoD Template). Since Navy guidelines for INRMPs (Navy CNO Guidance of April 2006; DoD guidance March 2011; OPNAVINST 5090.1C CH-1) are more comprehensive than those identified in the DoD Template, the outline of this INRMP has been revised to include additional material that will ensure compliance with all guidelines (Navy 2006, 2007; DoD 2011).

1.2 Location and Planning Footprint

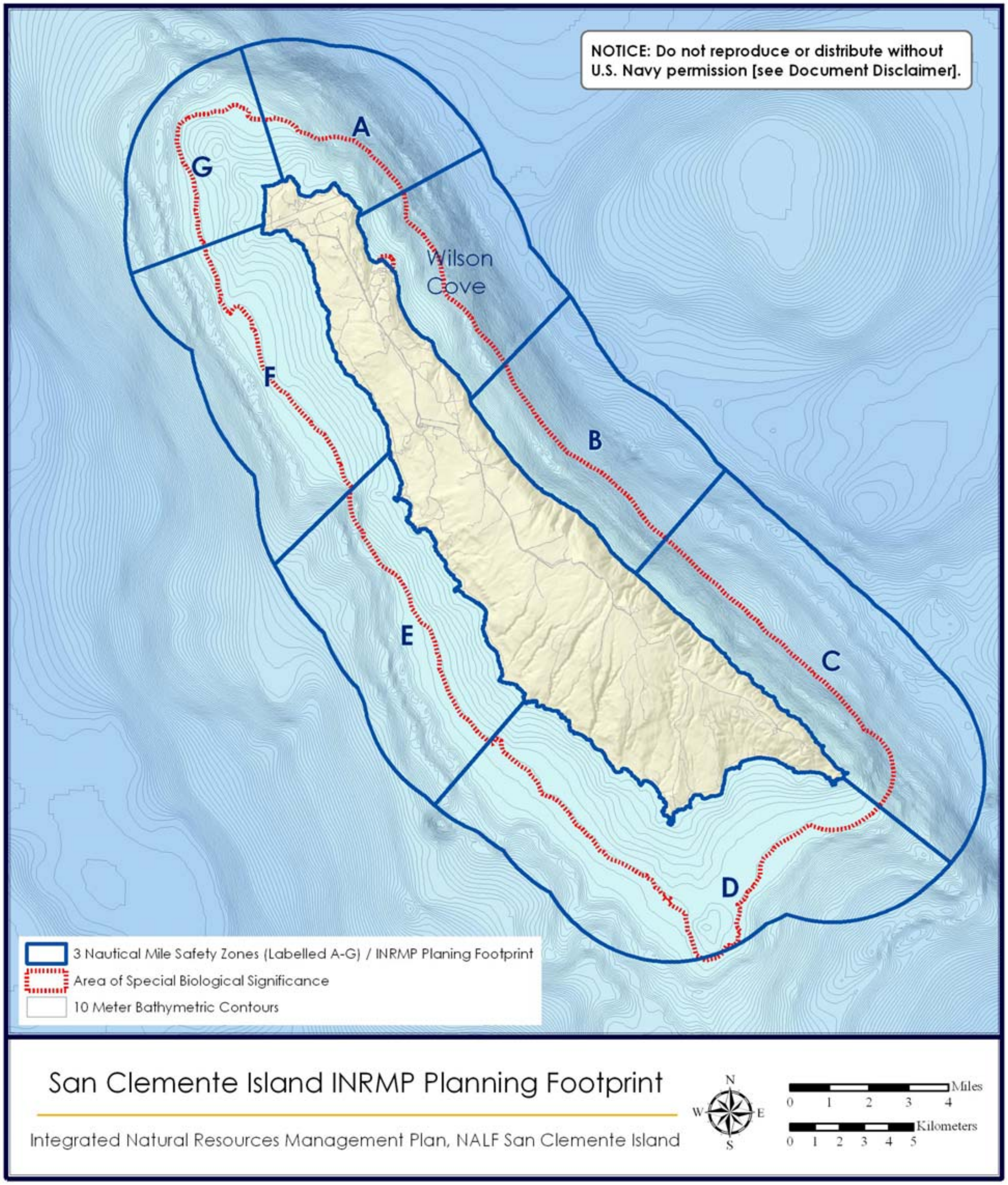
The SOCAL Range Complex encompasses surface and subsurface ocean operating areas, over-ocean military airspace, and SCI (Map 1-1). SCI is the southernmost island of an archipelago of eight major Channel Islands located in the Southern California Bight (SCB). The SCB is a recessed curve in the southwestern California coastline from Point Conception in Santa Barbara County to just south of the Mexican border. The island is located 68 nm (125 km) west of San Diego and 55 nm (101 km) south of Long Beach, California.

The island is oriented northwest to southeast. Its size is approximately 21 miles (34 km) long and 4 miles (11 km) at its widest point and is approximately 56 square miles (145 square kilometers) total. The island has a relatively broad open plateau on top and slopes gently to the west. Marine terraces are conspicuous features, especially along the western slope of the island. To the east of the plateau, steep escarpments drop precipitously to the rocky coastline along the southern half. The southern part of the island is deeply dissected by many canyons up to 500 feet (152 meters) deep. The highest point is Mount Thirst, which is approximately 1,965 feet (599 meters) (Yatsko 2000).

The INRMP will be used to manage all SCI lands and adjacent waters in the nearshore environment under the Navy command. The previous INRMP (Navy 2002) specifically addressed the nearshore environment from –1.61 feet (-0.5 meters) Mean Lower Low Water to the approximate maximum depth of submerged vegetation. The INRMP planning footprint is larger and coincides with a 3-nm Naval Safety Zone designation (Map 1-2). All species and habitats documented on the island and within the waters of the 3-nm planning footprint will be considered in this plan.

Map 1-1. Regional location of San Clemente Island.[1]

1. All maps in this INRMP were compiled by Tierra Data Inc., except if noted, using data believed to be accurate at the time of publication. However, a degree of error is inherent in all maps. The maps are distributed "AS-IS," without warranties of any kind, either expressed or implied, including, but not limited to, warranties of suitability to a particular purpose or use. No attempt has been made in either the design or production of the maps to define the limits or jurisdiction of any federal, state, or local government. The maps are intended for use only at the published scale. Detailed on-the-ground surveys and historical analyses of sites may differ from the maps.



Map 1-2. Integrated Natural Resources Management Plan planning footprint and Naval Safety Zones.

1.3 Real Estate Summary

In 1934, Executive Order 6897 mandated that control of SCI be transferred to the Navy. SCI consists of 36,073 acres (14,598 hectares) and 54 acres (22 hectares) of offshore rocks. The island has been owned and operated by various naval commands since its transfer to Navy control. The Commander, Naval Forces Pacific is the major claimant for the island, and Naval Base Coronado (NBC) is responsible for the administration of SCI.

1.4 Achieving Success and No Net Loss to the Military Mission

In keeping with the principal use of military installations to ensure the preparedness of the U.S. Armed Forces, the Sikes Act (as amended) mandates that the INRMP shall provide for no net loss of the capability of the installation's lands to support the military mission.

> *Each INRMP shall ensure no net loss to the training and testing capability and capacity of the installation and range and enhance those capabilities to the maximum extent practicable (DoDINST 4715.03).*

The Navy's mission is to organize, train, equip, and maintain combat-ready naval forces capable of winning wars, deterring aggression, and maintaining freedom of the seas. This mission is mandated by Federal law (Title 10 USC 5062), which ensures the readiness of the nation's naval forces.

The mission of SCI is to support Tactical Training and Research, Development, Test and Evaluation efforts in the SCI Range Complex by maintaining and operating facilities and providing services, arms, and material support to the U.S. Pacific Fleet and other operating forces.

The mission of the SOCAL Range Complex is to serve as the principal Navy training venue in the eastern Pacific to support required current, emerging, and future training (Navy 2008).

SCI is the only remaining contiguous United States range that supports live fire ship to shore, air to ground, and ground troop training. It allows for training in all Primary Mission Areas: Anti-Air Warfare, Amphibious Warfare, Anti-Surface Warfare, Anti-Submarine Warfare, Mine Warfare, Strike Warfare, Electronic Combat, and Naval Special Warfare. Forces need to "train the way they fight," thus, they need to perform all the able Primary Mission Areas together. SCI is uniquely capable of supporting such integrated training and, as such, is a highly valuable, irreplaceable asset to the U.S. Navy. In addition to its direct training support value, its proximity to southern California allows sailors and soldiers to effectively train in closer proximity to their families and support networks, increasing quality of life and force sustainability.

SCI currently supports seven general categories of training and testing. These include: 1) offshore training, 2) Shore Bombardment Area training, 3) U.S. Marine Corps amphibious training outside the Shore Bombardment Area, 4) Naval Special Warfare training, 5) other island operations, 6) Research, Development, Test and Evaluation of new systems, and 7) airfield operations. These are discussed in detail in Chapter 2.

The link between land use and the Navy, SCI, SOCAL Range Complex, and tenant missions needs to be identified to ensure there is no net loss to the military mission from the implementation of this INRMP. This is achieved through the description of military uses in Chapter 2, objectives and strategies to achieve no net loss are discussed in Chapter 3, and a strategy to sustain them in Chapter 4 (Section 4.1 Supporting Sustainability of the Military Mission and the Natural Environment).

The installation is achieving no net loss of training land through the implementation of this INRMP. Range capacity (in terms of area, uses, and frequency) has expanded since 2008 (Navy 2008; USFWS 2008); however, due to the high density of threatened and endangered species and ranges at SCI, significant work-arounds persist for both operations (training) and facilities.

1.5 INRMP Vision, Goals, and Objectives

The vision for this INRMP is to ensure the continued ability of SCI to support its current and evolving DoD mission requirements while conserving its natural resources, cooperatively working with other agencies to manage those resources, and applying the principles of ecosystem management and adaptive management in an integrated approach. This INRMP will help to guide the improvement of conditions for long-term certainty and permanence for the Navy mission at SCI. This will be completed by defining appropriate natural resources management actions and conservation measures that comply with regulatory requirements and reduce impacts to military training activities. The INRMP will lead SCI to integrating a Navy conservation ethic while outlining opportunities to conserve and maintain natural resources and fully comply with regulatory requirements. The standards of success for achieving this vision are:

- Navy mission accomplishment that is unimpeded
- A net gain in ecological productivity, natural biodiversity, and sensitive species recovery
- Ecosystems and habitats that are resilient and require minimal human intervention to remain intact and functional
- Navy projects that are not delayed and contribute no net loss to conservation goals
- Interagency partnerships that result in mutual benefits and improved cost-effectiveness of the work undertaken
- Full integration with SCI programs for cost-efficiency and mutual benefit towards Environmental Programs and Services Office vision and goals
- A growing internal (SCI) and/or external (public) conservation ethic as measured by volunteerism, public interest, and participation
- Implementation of management strategies that allow progressive implementation of programs that contribute to ecosystem health while maintaining military operational flexibility

All INRMPs have specific goals that are shaped by DoD guidelines and directives, pertinent laws and regulations, public needs, public values, ecological theory, and practice and management experience. A goal statement is necessary for setting the course towards a successful plan (See Table 1-1 for definition of a goal). The planning terms used in this document such as goal, objective, strategy, and guideline cover a gradient of specificity and durability ranging from a very broad, enduring goal to specific guidelines. Strategies are developed and presented using a step-down approach, using the planning definitions in Table 1-1 (See Chapters 4 and 5 for examples).

Table 1-1. Planning definitions.

Hierarchy	Definition
Objective	Specific statement that describes a desired future condition or successful outcome. Can be quantitative. Should be followed by a "standard," which is an observable indicator by which successful attainment of a condition stated in the objective is measured. "How do we know we are making progress or have attained the desired condition or successful outcome?" Should be good for at least five years.
Goal	Broad statement of intent, direction and purpose. An enduring, visionary description of where you want to go. An outcome. A goal is not necessarily completely attainable. It does, however, describe a desired outcome related to the mission, rather than an activity or process.
Strategy	Explicit description of ways and means chosen to achieve objectives or standards. "What are we going to do about it?"
Project	Specific step, practice or method to get the job done, usually organized sequentially with timelines and duty assignments. These go out of date quickly and should be updated annually.

The goal of the SCI INRMP is to utilize adaptive management to maintain long-term ecosystem health and minimize impacts to natural resources consistent with the operational requirements of the DoD's training and testing mission.

The SCI INRMP will identify key components that:

- Facilitate sustainable military readiness and foreclose no options for future requirements of the DoD
- Conserve, maintain, and restore priority native species and habitats to reach self-sustaining levels through improved conditions of terrestrial, coastal, and nearshore ecosystems
- Promote ecosystem sustainability against testing and training impacts
- Maintain the full suite of native species with appropriate emphasis on endemics

1.6 INRMP Responsibilities

This section discusses the internal and external stakeholders for this INRMP and describes their responsibilities and participation in the development of this document. Stakeholders initially met prior to INRMP preparation to discuss the INRMP process and key issues on SCI; this meeting was followed by a site visit of the island. During the preparation process, many stakeholders were interviewed to properly address issues and capture important information in the INRMP. After completion of the Draft INRMP, stakeholders had the opportunity to provide input on content and management strategies.

Department of the Navy

Successfully implementing an INRMP requires the support of natural resources personnel, other installation, command personnel and installation tenants. The following discusses the responsibilities for INRMP implementation within the Navy. Policy leadership and liaison with non-Navy partners is provided by the Commander Navy Region Southwest (CNRSW) N40, NAVFAC Southwest, and NBC.

Chief of Naval Operations. The CNO serves as the principal leader and overall Navy program manager for the implementation of this INRMP. The CNO provides policy, guidance, and resources for the development, revision, and implementation of the INRMP and associated NEPA documentation. The CNO approves all INRMP projects prior to submittal to regulatory agencies for signature (Navy 2006).

Commander, Navy Installations Command. The Commander, Navy Installations Command reviews the entire INRMP. Their role is to ensure that installations comply with DoD, Navy, and CNO policy on INRMPs and their associated NEPA documentation. They also ensure the programming of resources necessary to maintain and implement INRMPs, participate in the development and revision of INRMPs, and provide overall program management oversight for all natural resources program elements. The Commander, Navy Installations Command reviews and endorses projects recommended for INRMP implementation prior to submittal for signature, and evaluates and validates Environmental Program Requirements Web-based project proposals (Navy 2006).

Commander, U.S. Pacific Fleet. The mission of the Commander, U.S. Pacific Fleet is to support the U.S. Pacific Command's theater strategy and to provide inter-operable, trained, and combat-ready Naval forces to Commander, U.S. Pacific Fleet and other United States unified commanders. As such, the U.S. Pacific Fleet is a force provider to unified commanders in various regions around the world. In addition to its Operational and Type Commanders, the Commander, U.S. Pacific Fleet also coordinates Navy support activities ashore through Regional Coordinators. Overseas, these Regional Coordinators serve as the U.S. Pacific Fleet's military liaison with host governments to facilitate combined exercises and enhance mutual force coordination. There are six regional coordinators; one of them is San Diego CNRSW, which has responsibility over all facilities within the SOCAL Operational Area. Commander U.S. Fleet Forces Command is ultimately responsible for SCI operations, maintenance, training, and support; however, regional command is provided by CNRSW. In practice, Commander U.S. Fleet Forces Command defers operational oversight to Commander, U.S. Pacific Fleet. The Primary Host Command, CNRSW, and NBC have the principal interest and responsibility for oversight and management of SCI Class I and II property.

Commander, Navy Region Southwest. Regional Commanders ensure that installations comply with DoD, Navy, and CNO policy on INRMPs and their associated NEPA documentation. They ensure that installations under their control undergo annual reviews and formal five-year evaluations. They ensure the programming of resources necessary to maintain and implement INRMPs, which involves the evaluation and validation of Environmental Program Requirements Web-based project proposals and the funding of installation natural resources management staff. Navy Region Southwest maintains close liaison with the INRMP signatory partners (USFWS, National Oceanic and Atmospheric Administration, and California Department of Fish and Wildlife [CDFW], formally known as California Department of Fish and Game) and other INRMP stakeholders. They provide endorsement of the INRMP through the Regional Commander signature (Navy 2006).

Office of Counsel. The Office of the General Counsel, CNRSW, provides legal services to NBC on a variety of environmental matters. Particularly pertinent to natural resources management, is their review of NEPA documentation and legal interpretations involving compliance with natural resources laws as they pertain to base operations.

Installation Commanding Officers. Installation Commanding Officers (COs) ensure the preparation, completion, and implementation of INRMPs and associated NEPA documentation. Their role is: to act as stewards of natural resources under their jurisdiction and integrate natural resources requirements into the day-to-day decision-making process; ensure natural resources management and INRMPs comply with all natural resources related federal regulations, directives, instructions, and policies; involve appropriate tenant, operational, training, or research and development commands in the INRMP review process to ensure no net loss of military mission; designate a Natural Resources

Manager/Coordinator responsible for the management efforts related to the preparation, revision, implementation, and funding for INRMPs, as well as coordination with subordinate commands and installations; involve appropriate Navy Judge Advocate General or Office of the General Counsel legal counsel to provide advice and counsel with respect to legal matters related to natural resources management and INRMPs; and endorse INRMPs via CO signature. The CO of NBC is responsible for management of natural resources as summarized in the bullets below.

- Acting as a trustee for natural resources;
- Integrating natural resources requirements into decision-making process;
- Requesting funding;
- Ensuring preparation and implementation of this INRMP;
- Appointing an installation Natural Resources Manager;
- Implementing programs to reduce collisions between aircrafts and wildlife;
- Ensuring that all documentation related to impacts of wetlands are forwarded to the CNO;
- Ensuring incorporation of soil and water conservation into design of new projects;
- Coordinating with federal, state, and local resource agencies;
- Documenting the presence of threatened and endangered species;
- Identifying listed species habitat and determining potential critical habitat;
- Requesting Engineering Field Division support for consultations under the ESA, as required;
- Taking action to avoid impacts to wetlands and waters of the U.S.;
- Ensuring actions affecting natural resources are considered under the NEPA process;
- Maintaining and sharing records of natural resources; and
- Ensuring that principles of natural resources management are integrated into conservation programs.

Public Affairs Office. The Public Affairs Office is involved in aspects of the environmental program at NBC. This includes being informed of the public notice process required in various NEPA analysis processes.

Naval Facilities Engineering Command Southwest

Public Works Department. The NBC Facilities Planning Office, Public Works Department, is responsible for the comprehensive oversight and planning of all land use issues relating to NBC. Their role in development of this INRMP is to provide document review confirming the INRMP description of compatible land uses.

The **NBC Environmental Division**, under the Public Works Department, is responsible for the preparation and implementation of this INRMP. Acting through the Natural Resources Manager, the NBC Environmental Division is responsible for the management of natural resources as part of the overall NBC environmental program. NBC natural resources staff provides technical support. This INRMP is the direct vehicle for accomplishment of many CO responsibilities. The Installation Environmental Program Manager communicates directly to the CO.

Business Line Team (N45). Natural resources business line team specialists (N45) provide technical support and contractual oversight in the development, revision, and implementation of this INRMP. In addition, NAVFAC Southwest is responsible for providing support for natural resources management at NBC when requested. NAVFAC Southwest personnel, such as the NEPA and INRMP coordinators, have natural resources programming and/or technical support roles in developing this INRMP.

Tripartite Agreement Partners

The Sikes Act (as amended) provides a mechanism whereby the DoD, U.S. Department of the Interior, and host states cooperate to plan, maintain, and manage fish and wildlife on military installations. Cooperative management of terrestrial and marine flora and fauna is required under the Sikes Act (as amended) and the Fish and Wildlife Coordination Act. Therefore, the USFWS and CDFW have a statutory obligation to review and coordinate on INRMPs. National Oceanic and Atmospheric Administration also reviews and coordinated INRMPs that touch their jurisdiction, as appropriate (DoDINST 4715.03). Recognizing the core, three-way partnership in preparing, reviewing, and implementing INRMPs among the DoD, USFWS, and state fish and wildlife agencies, a Tripartite Agreement was signed in January 2006 (DoD et al. 2006). The CDFW and other state fish and wildlife agencies were represented by the International Association of Fish and Wildlife Agencies. The desire is for "synchronization of INRMPs with existing fish and wildlife service and state natural resources management plans" and "mutually agreed-upon fish and wildlife service conservation objectives to satisfy the goals of the Sikes Act" (DoD et al. 2006). The Sikes Act (as amended) no longer requires a Cooperative Agreement with the USFWS or CDFW as a separate document; however, DoD guidance (17 May 2005) states that joint review should be reflected in a memo or letters.

1.6.1 INRMP Working Group

A mission statement was developed by the working group at the initial INRMP stakeholder meeting. The mission statement for the INRMP is: to develop an implementable plan to maintain long-term ecosystem health and minimize adverse impacts to existing habitats consistent with the operational requirements of the DoD's training and testing mission.

The preparation and/or revision of an INRMP draws from many disciplines and sources. It is imperative that a cross-section of land users and land managers take part in INRMP preparation and/or revision in order to meet legal requirements. Navy guidance (2006) states that a small group of individuals representing the critical interests at the installation to serve as the core of the Working Group should be identified. The Group should include representatives from the military operators and trainers and major tenants who use natural resource areas, as well as natural resources managers, facility planners, and environmental counsel. Initially, the Working Group identifies mission and supporting land uses, legal and guidance drivers, and natural resources management goals and develops natural resource management courses of action and monitoring. The Group should agree on the purpose of the planning process, underlying assumptions, a protocol for meetings, legal review, the role of stakeholders, and command support for conservation priorities and strategies. Effective leadership is important and should therefore be the responsibility of the CO or Officer-in-Charge of the installation.

The Working Group should comprise, but not be limited to, the following:

- Managers of military operations/training activities
- Environmental managers
- Facility Planning staff
- Regional Environmental staff
- Federal and state agencies (at a minimum the USFWS and/or National Marine Fisheries Service, state fish and game departments)
- Local government planning groups

The Working Group should be tailored to the installation's situation. The installation should identify the key stakeholders and determine the level of interest of each.

The Working Group was formed consisting of both internal (Navy) and external stakeholders. Navy stakeholders included representatives from: NAVFAC; Commander, Navy Installations Command; Pacific Fleet; USFWS; CDFW; U.S. Bureau of Land Management; Southern California Offshore Range; CNRSW; and NBC Public Works Department.

The following stakeholders are key operators and tenants at SCI:

- U.S. Navy, Commander Naval Air Forces
  - Mission Statement: To man, train, equip, and maintain a Naval Air Force that is immediately employable, forward deployed and engaged. We support the Fleet and Unified Commanders by delivering the right force with the right readiness at the right time with a reduced cost…today and in the future (http://www.cnaf.navy.mil/).
- U.S. Navy, Commander, Naval Surface Force, U.S. Pacific Fleet
  - Mission Statement: Naval Surface Force, U.S. Pacific Fleet is comprised of surface ships, and support and maintenance commands, provides operational commanders with well-trained, highly effective, and technologically superior surface ships and Sailors.
- U.S. Navy, Commander U.S. Third Fleet
- U.S. Navy, Naval Auxiliary Landing Field San Clemente Island
  - Mission Statement: The mission statement of NBC is to arm, repair, provision, service, and support the U.S. Pacific Fleet and other operating forces.
- U.S. Navy, Naval Special Warfare Command, Special Operations Command
  - Mission Statement: Man, Train, Equip, Deploy, and Sustain Naval Special Warfare Forces for operations and activities abroad, in support of Combatant Commanders and U.S. National Interests (http://www.public.navy.mil/nsw/Pages/Mission.aspx).
- U.S. Navy, Expeditionary Warfare Training Group, Pacific
  - Mission Statement: To conduct and support Navy and Marine Corps training and instruction in doctrine, tactics and techniques of Naval expeditionary warfare with a focus on amphibious operations to support operational commanders' ready forces that can project military power from the sea (http://ewtgpac.ahf.nmci.navy.mil/about/index.html).
- Southern California Offshore Range
  - Mission Statement: 1) Improve the combat readiness of Pacific Fleet Air, Surface, and Submarine units and Expeditionary forces in all warfare areas; 2) Provide instrumented operating areas, targets, and associated facilities which support Fleet training

exercises and tactical development; and 3) Schedule and coordinate Operational Areas and ranges within the SCI Range Complex (R. Tahimic, pers. com. 2012).

- The Officer-In-Charge of SCI supervises non-range day-to-day operations and activities on and around the island.
- The SCI Range Complex Fleet Support Officer serves as the liaison and coordinates between range operations (managed by Southern California Offshore Range) and island support activities. This includes facilitating operational events, logistics support and coordination with the CNRSW, Natural Resources Team Lead in reviewing operations for compliance with all applicable statutes, laws, and environmental regulations.

The external stakeholders participating in this INRMP include:

- USFWS Ecological Services
- National Oceanic and Atmospheric Administration
  - National Marine Fisheries Service Habitat Conservation
  - National Marine Fisheries Service Protected Resources
- CDFW
  - Habitat Conservation, Marine and Terrestrial
- Marine Protected Areas Monitoring Enterprise
- Bureau of Land Management California Coastal National Monument
- National Parks Service – Channel Islands National Park
- Water Quality State Water Resources Control Board Ocean Unit
- Catalina Conservancy

Members of the Working Group meet in the beginning planning stages of an INRMP to discuss what has changed since the previous INRMP, the expected INRMP structure, key issues and concerns from Working Group member agencies, project schedule, and Working Group member expectations. In addition, many stakeholder were interviewed at later dates to obtain input and expertise on resource areas. All stakeholders were provided ten weeks to review and submit comments on the Draft INRMP before public review.

1.7 Stewardship and Compliance

For the purposes of this INRMP, the terms stewardship and compliance have specific meanings as criteria for implementing project lists (Navy 2006). Project rankings are assigned based on whether an activity is mandatory to comply with a legal requirement such as under the ESA, Clean Water Act, or Migratory Bird Treaty Act. Alternatively, a project may be considered good land stewardship but is not considered an obligation for SCI to be found in compliance with environmental laws. Projects considered necessary to comply with the law are generally funded within budget constraints whereas stewardship projects are ranked lower for funding consideration when projects are competed among multiple installations.

The budgeting for the INRMP is based on programming and budgeting programs described in DoDINST 4715.03. This Instruction defined four classes of conservation programs—the first three falling into the class of conservation and the fourth falling under stewardship activities. Funds are routinely programmed three years in advance of project implementation, and project tasks within the INRMP will be requested based on priority under this guidance. Projects are also prioritized through the Navy Environmental Readiness Level system (Environmental Readiness Levels 1-4). The highest Environmental Readiness Level (4) is considered the absolute minimum level of compliance. It supports all actions specifically required by law, regulation, or Executive Order. Accordingly, the projects recommended in this INRMP have been prioritized based on compliance and stewardship criteria, and the four programming and budgeting priority levels are described in Chapter 5.

1.8 Ecosystem Management, Adaptive Management, and the Environmental Management System

Beyond funding classifications, the DoD and the Navy have adopted a policy of ecosystem management for INRMPs and DoD and Navy Instructions mandate an ecosystem framework and approach for the INRMP (DoDINST 4715.03; OPNAVINST 5090.1C CH-1). Ecosystem management in the DoD draws on a long-term vision of integrating ecological, economic, and social factors. This approach takes a long-term view of human activities, including military uses, and biological resources as part of the same environment. The goal is to preserve and enhance ecosystem integrity as well as to sustain biological diversity and continued availability of those resources for military readiness and sustainability and other human uses (as defined in OPNAVINST 5090.C CH-1). Managing for sustainability and ecosystem management are approaches that attempt to integrate long-term goals with short-term project lists.

The ecosystem mandate is accomplished by applying principles of sustainable use at several scales with emphases on partnerships, public outreach, long-term monitoring, and adaptive management. Consistent with Navy policy, ecosystem-based management shall include (OPNAVINST 5090.1C CH-1):

- A shift from single species to multiple species conservation;
- Formation of partnerships necessary to consider and manage ecosystems that cross boundaries; and
- Use of the best available scientific information and adaptive management techniques.

An adaptive management approach is also a separate requirement for INRMPs. The DoD Directive 4715.DD-R 1996 states: “Incorporate a dynamic, continuous process for decision-making, including future changes or additions to the INRMP.”

Adaptive management is partly implemented through the Navy’s Environmental Management System (EMS), used to integrate environmental considerations into day-to-day activities across all levels and functions of Navy enterprise. It is a formal management framework that provides a systematic way to review and improve operations, create awareness, and improve environmental performance. Systematic environmental management as an integral part of day-to-day decision making and long-term planning processes is an important step in supporting mission readiness and effective use of resources. The most significant resource for every organization is their senior leadership’s commitment and visibility in EMS implementation and sustainability. A robust EMS is essential to sustaining compliance, reducing pollution and minimizing risk to the mission. The Navy EMS conforms to the International Organization for Standardization 14001:2004 EMS standard.

Adaptive management is also part of the INRMP review and revision process as described in Section 1.9 Revision and Annual Review and in Figure 1-1.

1.9 Revision and Annual Review

DoD policy requires installations to review INRMPs annually in cooperation with the two primary parties to the INRMP (USFWS and the state fish and wildlife agency). Annual reviews facilitate “adaptive management” by providing an opportunity for the parties to review the goals and objectives of the plan as well as establish a realistic schedule for undertaking proposed actions.

Section 101(b)(2) of the Sikes Act (as amended)[16 USC 670a(b)(2)] specifically directs that INRMPs be reviewed “as to operation and effect” by the primary parties “on a regular basis, but not less often than every five years,” emphasizing that the review is intended to determine whether existing INRMPs are being implemented to meet the requirements of the Sikes Act (as amended) and contribute to the conservation and rehabilitation of natural resources on military installations. The Office of the Secretary of Defense (17 May 2005) guidance states that joint review should be reflected in a memorandum or letter.

Recent guidance on INRMP implementation mandated “external INRMP reviews for operation and effect no less than every five years.” The Annual Review process is broadly guided by the DoD Natural Resources Conservation Program (DoDINST 4715.03 18 March 2011) and by OPNAVINST 5090.1C CH-1.

The INRMP Implementation Guidance (10 October 2002 Memorandum) improved coordination external (USFWS, state agencies, and the public) and internal to DoD (military operators and trainers, cultural resources managers, pest managers). It also added new tracking procedures, called metrics, to ensure proper INRMP coordination occurred and that projects were implemented. See Chapter 5 for more detail.

According to *Public Comment on INRMP Reviews Legislative Language Section 2905 of the Sikes Act* [16 USC 670a note], the Secretary of each military department is required to provide the public a meaningful opportunity for the submission of comments on the initial INRMPs prepared pursuant to new Section 101(a)(2) of the Sikes Act (as amended). Because an INRMP is a public document that requires the mutual agreement of public agencies, it is crucial that a common understanding is reached regarding which projects contained in a Draft INRMP are most likely to receive funding under existing policy.

There is no legal obligation to invite the public either to review or to comment upon the parties’ mutually agreed upon decision to continue implementation of an existing INRMP without revision (10 October 2002 Memorandum). If the parties determine that substantial revisions to an INRMP are necessary, public comment shall be invited in conjunction with any required NEPA analysis.

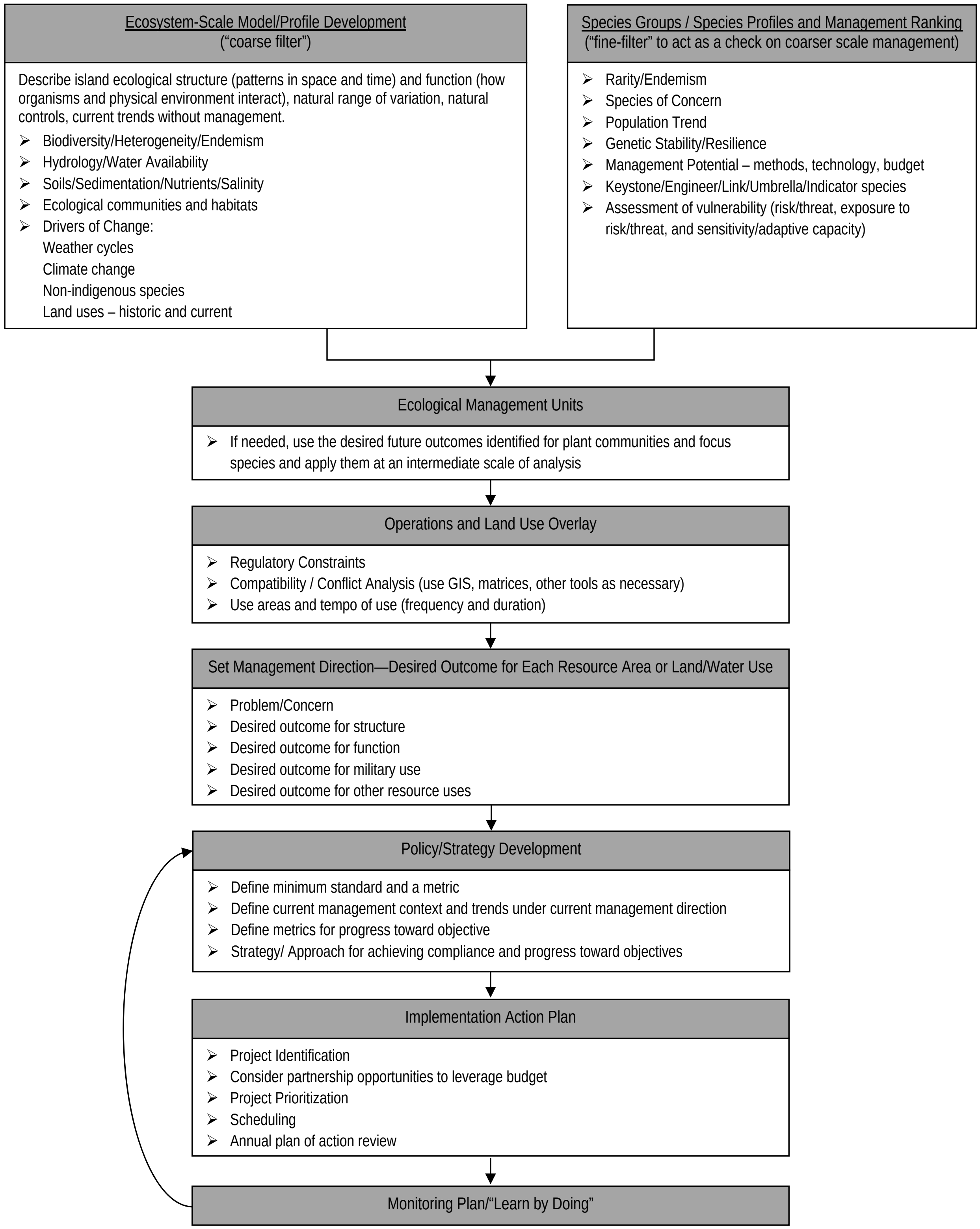


Figure 1-1. Ecosystem management-based decision process.

1.10 Regional Area Use and Planning Processes

1.10.1 Planning Processes

Designed to facilitate both stewardship and compliance with natural resources laws in the context of military mission requirements, this INRMP integrates natural resources components of existing SCI plans, environmental documents, and the requirements of all applicable DoD, Navy, and installation regulations and guidelines.

Certain related or neighboring planning processes may affect this INRMP and the Working Group assessed this Plan's consistency with these plans:

- NBC Public Works Department SCI Master Plan
- NBC Activity Overview Plan
- Naval Special Warfare Master Plan
- NBC Pest Management Plan
- SCI Stormwater Pollution and Prevention Plan
- SOCAL EIS (2008)
- USFWS Five-Year Review for all threatened and endangered species
- NBC Oil Spill and Response Action Plan
- 1997 Feral Cat Management Plan
- Draft Erosion Control Plan for SCI 2012

Other plans in the region that could affect the decisions made in this INRMP or set the stage for future partnership include:

- Point Mugu Sea Range EIS (2002)
- SOCAL EIS/Overseas Environmental Impact Statement (2008)
- Hawaii-Southern California Training and Testing EIS/Overseas Environmental Impact Statement (2012)
- CNRSW Regional Shore Infrastructure Plan
- Naval Base Ventura County San Nicolas Island INRMP
- Regional Water Quality Control Board's Los Angeles Basin Plan
- Channel Island National Park General Management Plan
- Channel Islands Recovery Plans
- Catalina Island Management
- Channel Islands National Marine Sanctuary Management Plan
- Marine Protected Area Planning
- Recovery Plan for the Endangered and Threatened Species of the California Channel Islands
- USFWS Channel Island Fox Recovery Plan
- Northern Channel Islands Plan 2001
- Western Snowy Plover Recovery Plan 2007
- California Coastal National Monument Resource Management Plan 2005

See Section 4.5 Integrating Other Plans and Programs for a brief summary on the key interrelationships with these plans. Key interrelationships with these plans are discussed in the applicable sections in Chapter 3.

1.10.2 Regional Area Uses

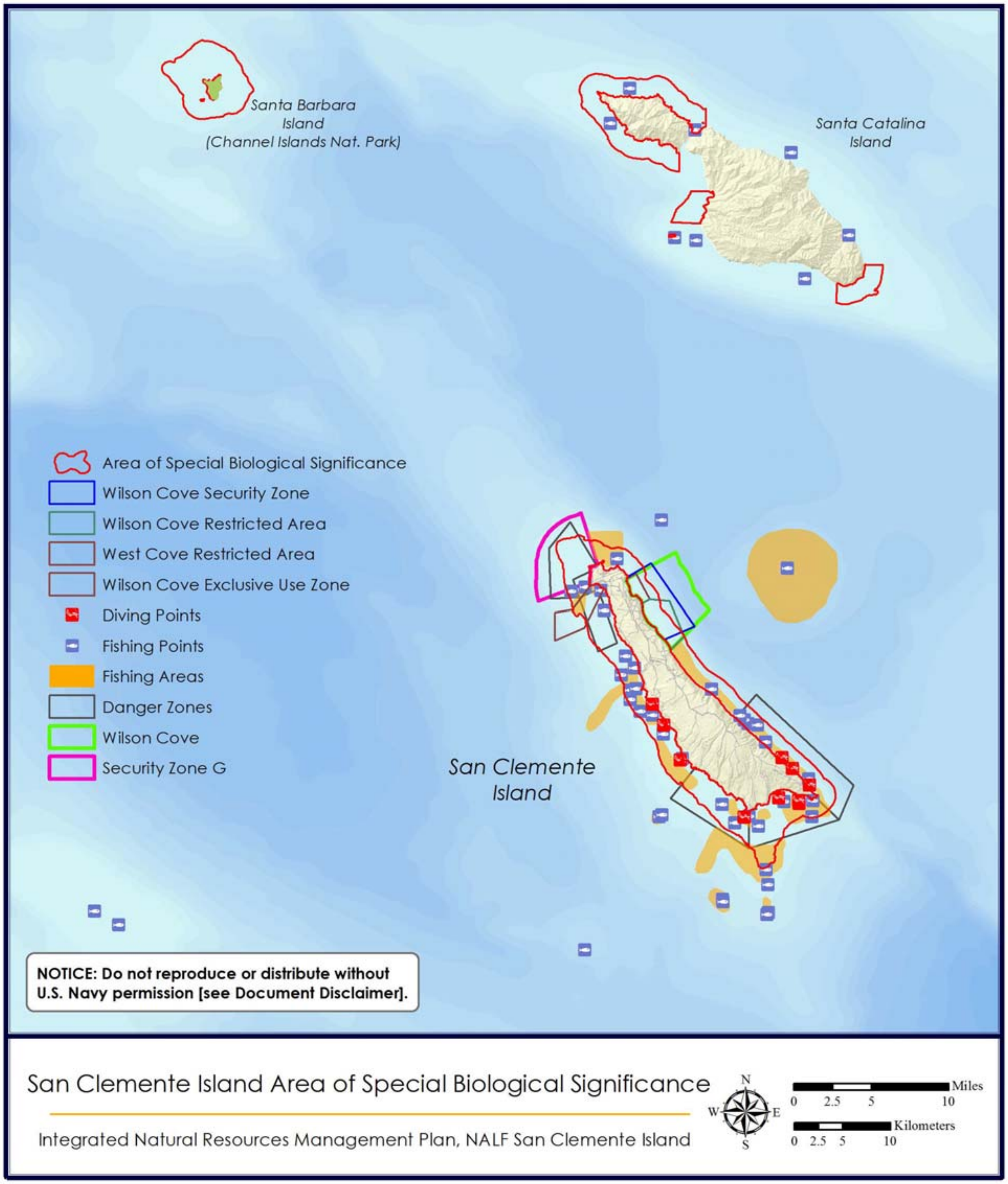
SCI is located in the SCB and is part of an eight island archipelago called the Channel Islands. The SCB lines two major metropolitan areas and is in close proximity to several military installations. The Channel Islands are a unique ecological environment differing dramatically from the heavily developed adjacent mainland. Five of the Channel Islands are part of the Channel Islands National Park (Anacapa, Santa Cruz, Santa Barbara, San Miguel and Santa Rosa), yet only three of those are entirely owned and managed by the National Park Service. San Miguel Island is owned by the Navy, and the western 76% of Santa Cruz Island is owned by The Nature Conservancy, an international non-governmental organization. San Nicolas Island is another Navy-owned island. A majority of Santa Catalina Island is owned by the Catalina Island Conservancy, a nonprofit conservation organization, while the remainder is owned by the Santa Catalina Island Company as well as smaller, private owners.

The islands are relatively unpopulated and used almost exclusively for commercial and recreational purposes. Various entities use the Channel Islands for sailing, diving, sightseeing, hiking, camping, and wildlife observation. Certain uses can be extractive. These include drilling for petroleum and natural gas, shipping, commercial fishing, and spearfishing.

The islands experience natural resources protection through the Channel Islands National Marine Sanctuary, Area of Special Biological Significance designation, and the newly implemented Marine Life Protection Act Marine Protected Areas. Map 1-3 shows the boundary of the state designated Area of Special Biological Significance surrounding SCI. The Area of Special Biological Significance regulates discharge from adjacent land “to assure maintenance of natural water quality conditions in these areas.”

San Diego County contains a majority of military personnel stationed in the area. San Diego contains the largest Navy port, Naval Base San Diego, on the west coast of the United States, as well as many other smaller installations. The county also contains the major west coast base of the Marine Corps, Camp Pendleton, and serves as it prime amphibious training base. The city of San Diego is the eighth largest city in the United States and borders Mexico. San Diego’s economy relies heavily on the military and defense-related activities, tourism, international trade, and manufacturing.

1



2 *Map 1-3. San Clemente Island Area of Special Biological Significance.*

2.0 Military Use and Natural Resources Management

This chapter provides a summary of historic land use, the military mission, current operations, and predicted future operations. It also describes the regulatory framework around which the military mission and natural resources conservation must be integrated.

2.1 Abbreviated History and Pre-Military Land Use

This section describes the history of human occupation and use of the environment on and around San Clemente Island (SCI) prior to military activity. Knowledge of such past use patterns is important to understand current conditions and processes. There are currently no populations of indigenous people living on SCI. Archaeological research has documented the effects of prehistoric populations on nearshore marine ecosystems. These populations regularly introduced the intentional or unintentional burning of the island's terrestrial ecosystem. The historic period also introduced dramatic change to native vegetation populations as a result of livestock grazing. As such, human use of the island profoundly influenced the condition of the natural landscape, prior to U.S. Department of the Navy (Navy) occupation.

2.1.1 Native Americans

When Euro-American explorers reached the coastlines of North America, they found native maritime societies fringing on the continent. During the last century, archaeological thinking generally consigned these coastal groups to the last stages of cultural development in prehistoric North America. Researchers theorized that distinct maritime cultural adaptations, including seafaring and primary dependence on marine foods, took shape only after Ice Age big-game hunters of the continental interior were able to retool their cultural ways for life on the oceans. However, new archaeological investigations within the Channel Islands, including SCI, are fracturing the traditional foundation of maritime cultural origins and the peopling of the new world (Raab et al. 2009).

Evidence of early maritime adaptations has led to renewed interest in the possibility suggested by Fladmark (1979) that a migration route along the Pacific Coast may have played a substantial role in the initial peopling of North America as full glacial conditions ameliorated at the end of the Pleistocene (Raab and Yaksko 2001; Erlandson 2002; Byrd and Raab 2007; Erlandson et al. 2007). Alternatively, early coastal populations may have been derived from earlier immigrant groups that had followed an inland corridor (Moratto 1984).

Native American settlement of the southern California coastal region began in the terminal Pleistocene or earliest Holocene, and established a coastal subsistence economy that included abalone, mussels, mollusks, sea urchins, fish, sea otters, sea lions, harbor seals, and cetaceans (dolphins or whales). Approximately 2,600 years ago, fish and marine mammals became more important, perhaps due to over-harvesting of abalone in response to human population increases (Schoenherr et al. 1999). Tools and clothing were also fashioned from marine organisms, especially abalone shells (Noah 1987).

The island inhabitants sailed on the ocean in unique boats made of redwood planks lashed together with sinew and waterproofed with natural asphaltum, and that could carry 20 men (Hume 1959). Kelp forest, shallow rocky reef, and deep rocky reef nearshore habitats of SCI provided a major fishery for the island inhabitants. Initially, shore-based fishing accounted for most of the fish species present. Then, there was an expansion into different nearshore marine habitats that corresponded to the appearance of the single-piece shell fishhook and the exploitation of deeper water environments for rockfish (*Sebastes* sp.). Fossil records for SCI indicate that inhabitants specialized in fishing for California sheephead (*Semicossyphus pulcher*) (Salls 2000). The presence of white sea bass (*Atractoscion nobilis*), ocean whitefish (*Caulolatilus princeps*), leopard shark (*Triakis semifasciata*), and barracuda (*Sphyraena barracuda*) indicates considerable fishing off the north end of SCI, where numerous schools of most species were observed. Eventually marine resources declined in availability through constant exploitation (Salls 2000).

Some terrestrial resources were also exploited. Acorns of the island oak (*Quercus tomentella*) and fruit from the Catalina Island cherry (*Prunus ilicifolia* subsp. *lyonii*), big berry toyon (*Heteromeles arbutifolia* subsp. *macrocarpa*), laurel sumac (*Malosma laurina*), elderberry (*Sambucus* spp.), California boxthorn (*Lycium brevipes* var. *brevipes*), and cactus (Family Cactaceae) were used. A few land animals were also taken, including land snails, sea birds, and lizards. Grasses, including needlegrass (*Stipa pulchra*), were used for constructing huts and baskets, and grain was ground with rock mortars. SCI Native American inhabitants traded with people of the other islands and the mainland (Noah 1987). Fresh water was probably the most limiting resource, and Native Americans likely relied on perennial tenajas (Noah 1987). The density of humans that the island supported at any one time is difficult to estimate, but was probably less than 100 people (A. Yatsko, pers. com. 2002).

It is generally accepted that the last aboriginal people to inhabit SCI were the Island Gabrielino (Johnson 1988; Walker et al. 1993). The ethnohistoric record also suggests patterns of economic and social interactions among the region's protohistoric and Mission period populations. The decline of the Native American population on SCI is thought to have occurred in the late 18th or early 19th centuries. A date for final abandonment is not known, but archaeological material suggests it may have occurred by the early to mid-19th century.

2.1.2 Spanish and Mexican Periods

The Spanish first arrived at SCI in 1769 when the first missions were established on the mainland in San Diego. Juan Perez, a captain of a Spanish Manila galleon, led the initial historic land exploration of SCI (Bruce 1994). Previous explorers, while noting the island and its inhabitants, had not landed.

During the Spanish (1769–1822) and later Mexican (1822–1848) occupation of California and its islands, use and exploration of SCI was sporadic. During these early periods, the island was largely a base for otter hunting and smuggling. Chinese ports were the primary destination for otter furs. After 1803, the slaughter of these animals became systematic, mostly as the result of the Russian importation of Aleut hunters. Russian fur traders focused their efforts on the island to avoid conflicts with the Spanish, who were mostly concerned with the mainland.

In 1846, near the end of the Mexican period, SCI was given as a land grant. However, the grant was never fully legally recognized (Bruce 1994). Signed in 1848, after the Mexican-American War, the Treaty of Guadalupe-Hildalgo gave California and its islands to the United States. The U.S. Department of Commerce administered SCI and leased it out for sheep ranching throughout the late 19th and early 20th centuries (Daily 1987). Prior to this official leasing, small numbers of sheep appeared on the island as early as 1862.

2.1.3 Early Marine Resource Use (1850s)

The Channel Islands were also an occasional stopping point for Chinese laborers returning to China, entering illegally into the United States. During their time on the island, the Chinese were employed to procure abalone. Abalone was considered a delicacy in China and the Chinese started exploiting the resources in America in the early 1850s. Abalone fishing by the Chinese was restricted by the Exclusion Act of 1892 (Bruce 1994), which increased previously intermittent smuggling of such from SCI.

2.1.4 Ranching (1850–1934)

When considering historical archaeological resources from the ranching period on SCI, it is necessary to examine them from the perspective of 19th and early 20th century industrial capitalism. The ranching landscape on SCI evolved in distinct phases as capital was imported and ultimately removed from production of the land. Historical archaeological resources recorded on SCI have provided insight into the transition from early speculation to industrial capitalism through the lens of an isolated maritime operation. Similar to the industry's counterparts on the mainland, it is necessary to consider the data at both the site specific level and as components of an island-wide feature system.

The speculative phase on SCI is represented by squatting and a documented history of competition for island resources. Although it is likely that little remains from this period due to ephemeral investment, future archaeological studies may uncover earlier remnants of this phase in the landscape (Storey 2002). Bruce (1994) notes an 1896 article in the *San Diego Union* that stated sheep grazing had been in operation on SCI since 1866. In that year a trio of ranchers, Macy, Goodwin, and Crawford, began to use the island as pasture for some 8,000 to 10,000 sheep. Another early sheep rancher, Tom Gallagher, was reported living on the island in 1868. He operated out of the area known as Middle Ranch and had as many as 20,000 sheep (Bruce 1994). During several years in the late 19th century, leasing rights to the island were under dispute.

The industrialized period on SCI is defined by the San Clemente Wool Company and the San Clemente Sheep Company from 1901–1935. As per lease agreements, tenant companies were required to incorporate annual improvements throughout the landscape that totaled a defined dollar amount. These improvements, years of drought, and a scabies epidemic resulted in a substantial complex that included at least three large concrete water tanks, small earth berm reservoirs, roads, a wharf at Wilson Cove, the main ranching complex known as Middle Ranch, fences, corral, pens, a barn, water tanks, troughs, and concrete and cobble dams (Storey 2002). The company's operations brought the year-round residence to about six or seven men, with the number swelling to 65 for the six-week period when sheep were sheared. Goats were also present on the island, although rarely herded. The historic presence of sheep and goats heavily impacted the island's vegetation.

The period of de-industrialization occurred with the transition to Navy ownership in 1934. Although the ranching infrastructure was not relocated from the island, the notion of investment of capital, labor, and technology were invested into events other than production of the land. However, many goats, which had been used to herd the sheep and provide food for the ranchers, were abandoned and eventually caused much disturbance on the island. The goats were originally used for herding because of a California law which prohibited the use of dogs for herding sheep (Andrew 1998). Goats were sometimes hunted for sport by visitors in the early 1900s (Holder 1910). Because of their negative impact on the island's ecosystem, goats were eventually removed by the Navy in the early 1990s.

2.1.5 Early Military Use (1934–1984)

Early on, SCI was found to be ideally suited for Naval missions because: 1) its remoteness permits classified projects to be developed with adequate security; 2) its clear water, variety of depths, and bottom conditions around the island are perfect for testing sonar equipment, new weapons, and safety devices; and 3) there is adequate land area for separation of test ranges for different types of use (Naval Undersea Center San Diego 1974). Soon after SCI came under Navy control in 1960, many new facilities were developed, especially in Wilson Cove. Throughout the next four decades, the number of personnel on SCI would fluctuate, but the importance of the island for training exercises and the development of new weapons systems would gradually increase (Table 2-1).

2.2 Current Operations and Activities

The following information on the military uses of SCI land and water is derived from the Southern California Range Complex (SOCAL) Environmental Impact Statement (EIS) (Navy 2008). The Navy completed Section 7 (Endangered Species Act) consultation with the U.S. Fish and Wildlife Service in 2008 on the training activities described in the SOCAL EIS 2008 (U.S. Fish and Wildlife Service 2008).

2.2.1 Ranges and Air Space

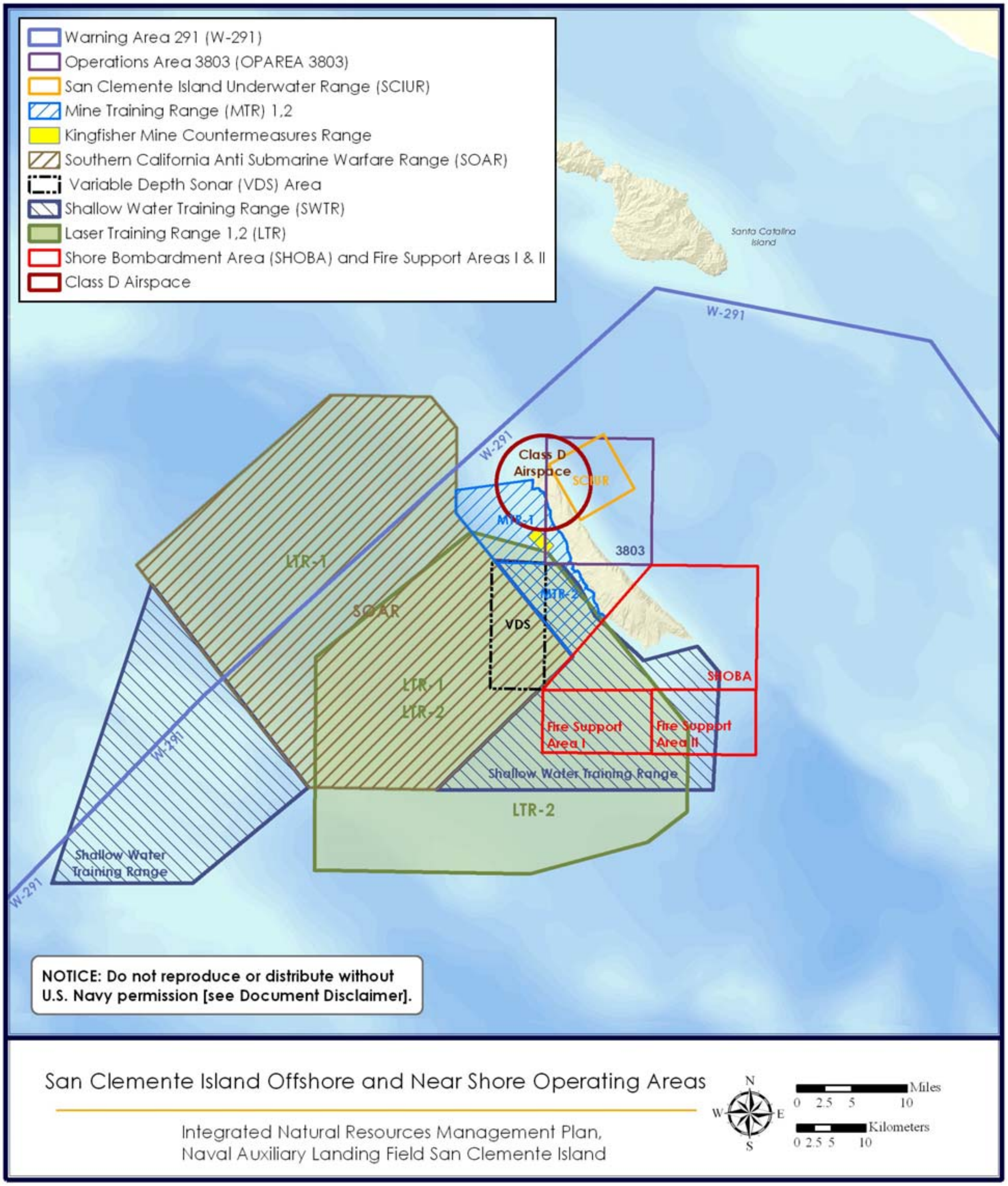
Military activities at and surrounding SCI occur within the SOCAL Range Complex 1) on the ocean surface, 2) under the ocean surface, 3) in the air, and 4) on land. For purposes of scheduling and managing these activities and the ranges, the SOCAL Range Complex is divided into multiple components.

2.2.1.1 SCI Offshore and Nearshore Operating Areas and Ranges

The SCI Offshore and Nearshore operating areas and ranges are illustrated in Map 2-1.

Table 2-1. Chronological summary of early military use on San Clemente from 1934–1984 (Sturgeon 2000; Linder 2001) .

Year	***Activity***
1934	SCI transferred to the Navy on 07 November 1934 by an Executive Order of the President.
1935–1936	22 new facilities were constructed, including the pier, fire station, and administrative buildings. Naval gunfire and bombing was first performed and a target range was developed on the west coast, south of West Cove, and at the sand dunes area.
1937	The first large-scale landing exercise was undertaken, which included about 4,700 Army and Marine personnel and numerous aircraft and landing vehicles. The first permanent Marine Corps unit was also assigned to the island.
1942–1945	In response to the beginning of World War II, the use of the island for bombing exercises, especially in Shore Bombardment Area, was greatly accelerated. A small airfield with support facilities was constructed 4 miles (6 kilometers) south of Wilson Cove.
1949	The island was in caretaker status with only four maintenance personnel on site, although it was still used as a testing range.
1950–1951	The first underwater test ranges were developed. The Air Force established a radar station with about 225 personnel at Wilson Cove and was temporarily responsible for maintenance of the island.
1958	The Polaris missile launch program, which included the construction of new housing facilities at Wilson Cove, began.
1959	Approximately 265 personnel (mostly Air Force) were stationed at SCI.
1950–1969	Numerous surface and sub-surface testing ranges were used along the west shore of the island.
1960s	The underwater range was enlarged into the Southern California Offshore Range for underwater tests and anti-submarine training. SEALAB and America's Man-in-the-Sea Program was based off the east coast. Deep submergence rescue vehicle prototypes were hosted by SCI.
1960	The Air Force radar unit left SCI, leaving it completely in Navy hands.
1961	A new 9,300-foot (2,800-meter) airstrip with support facilities was completed at the north end of the island and the old World War II airstrip was deactivated. An underwater tower, the Pop-up Variable Depth Launch Facility was completed 2.5 miles (4 kilometers) south of Wilson Cove. The structure has a base 170 feet (52 meters) below the surface and is used for testing Polaris missiles. Administrative command of the island was transferred to the Naval Ordnance Test Station China Lake.
1962	A permanent complex for Navy SEAL training was constructed at Northwest Harbor.
1963	The QH-50C Destroyer Anti-Submarine Helicopter was tested and deployed.
1965	Fleet Operational Readiness Accuracy Check Site became fully operational for testing shipboard sonar, radar, navigation, and electronic systems.
1967	Administrative duties were transferred to the Naval Undersea Center San Diego. The Deep Submergence Rescue Vehicle project was implemented and Poseidon missile testing began at the Polaris Pop-Up Range.
1968	The Poseidon test program was completed.
1970s	Test site developed for over-the-horizon radar that could detect environmental conditions and aircraft at thousands of miles. *Bogle* antennas were operating from the northwest shore aimed at the Gulf of Alaska in Project Sea Echo.
1984	Flight testing and development of Tomahawk cruise missiles begins.
1985	Installation of the Southern California Anti-Submarine Warfare Range, a 670-square nautical mile (360 square kilometer) area of three-dimensional underwater tracking and communication capability. First exercise on the Undersea Warfare range pitted an SH-3 helicopter against a Los Angeles class submarine.
1995	Naval Special Warfare Group ONE Maritime Operations training and support facility was commissioned.
1996	Electronic Warfare and Command and Control Warfare training was conducted from five island sites: Range Electronic Warfare Simulator, Threat Avoidance Systems at "Little Rock" and "Tombstone", VC-3 area, and Southern California Anti-Submarine Warfare Range.
1997	Installation of Kingfisher Range, a tethered underwater mine avoidance training area for Commander Naval Surface Forces.
1998	Construction of facilities and equipment for Fleet Area Control and Surveillance Air Route Surveillance Radar-4 complex at Mount Thirst. Island was re-designated "San Clemente Island Range Complex."
2009	Formal designation of 22 Naval Special Warfare Training Area and Ranges and six Special Warfare Training Areas (Navy 2008).



Map 2-1. San Clemente Island offshore and nearshore operating areas and ranges.

Warning Area 291

Warning Area 291 (W-291) encompasses 113,000 square nautical miles (nm^2) (387,500 square kilometers [km^2]) located off the southern California coastline, extending from the ocean surface to 15 miles (24 kilometers [km]) above mean sea level (Navy 2008). W-291 supports training and research, development, test, and evaluation (RDT&E) conducted by all aircraft in the Navy and Marine Corps inventories. Ordnance use is permitted.

Operational Area 3803

Operational Area 3803 is an area overlying and adjacent to the northern portion of SCI. The vertical dimensions are from the sea floor to an indefinite altitude above sea level. The altitude required is activity dependent.

San Clemente Island Underwater Range

The San Clemente Island Underwater Range (SCIUR) is a 5 by 5 nautical mile (nm) (9 by 9 km) area off the northeast shore of the island. Airspace above SCIUR is controlled from the surface to an altitude of 5,000 feet (1,520 meters [m]). The underwater tracking range contains six bottom-mounted three-dimensional hydrophones that can automatically track up to 12 underwater objects (Navy 2005). The primary purpose is to provide high accuracy three-dimensional tracking for surface and subsurface platforms.

Mine Training Range

The Mine Training Range (MTR) and two mining areas are in the SCI Range Complex. MTR-1 is the Castle Rock Mining Range off the northwest coast of the island. MTR-2 is the Eel Point Mining Range at the midpoint on the southwest side. In addition, mining training takes place in the China Point area, off the southwestern-most part of island, and in the Pyramid Cove, off the island's southeast tip. These ranges are used for training of aircrews in offensive mine laying by delivery of inert mine shapes (no explosives) from aircraft.

Kingfisher Mine Countermeasures Range

The Kingfisher Mine Countermeasures Range is a 1 by 2 nm (2 by 4 km) area northwest of Eel Point, and is approximately 1 nm (2 km) off shore (Navy 2005). There are more than a dozen mine-like shapes moored to the ocean bottom by cables and come within 50 feet (15 m) of the surface (Navy 2005). The Kingfisher Mine Countermeasures Range provides training to surface warfare units in mine detection and avoidance.

Southern California Anti-Submarine Warfare Range

The Southern California Anti-Submarine Warfare Range (SOAR) is located to the west of SCI. The underwater tracking range covers over 670 square miles (1,735 km^2) and consists of seven subareas (Navy 2005). The range has the capability of providing three-dimensional underwater tracking of submarines, practice weapons, and targets with a set of 84 acoustic sensors (hydrophones) located on the seafloor (Navy 2005). Communication with submarines is possible through use of an underwater telephone capability.

Southern California Anti-Submarine Warfare Range Variable Depth SONAR Area

The Variable Depth SONAR Area is used as an unscheduled and no-notice area for training with surface ships' sonar devices. The vertical dimensions are from the surface to a maximum depth of 400 feet (122 m) (Navy 2005).

Shallow Water Training Range

The planned Shallow Water Training Range (SWTR) would provide underwater instrumentation for two additional areas of the current SOAR: one 226.2 nm^2 (776.8 km^2) area to the west of the already instrumented (deep water) section in the area of Tanner Bank, and one 129.7 nm^2 (445.4 km^2) area between the deep water section and the southern section of SCI in the Pyramid Cove area (Navy 2008). The SWTR is planned for installation after Fleet Forces Command SWTR is fully funded and installed. This SWTR is discussed in greater detail in Section 2.4 Future Land Use Patterns and Plans. Two Mine Countermeasure ranges were installed at Pyramid Cove and Tanner Banks. Pyramid Cove will be seeded on an as needed basis. The Tanner Banks minefield is located 55 miles (89 km) west of SCI, occurring outside the INRMP Area of Responsibility.

Laser Training Range

Laser Training Ranges 1 and 2 are offshore water ranges, northwest and southwest of SCI, respectively. The Laser Training Ranges were established to conduct over-the-water laser training and training in the use of the laser-guided Hellfire missile. Designated for use from the surface to a ceiling of 5,000 feet (1,524 m), lasers are employed inside the Laser Training Ranges against targets that are towed or remotely controlled (Navy 2005).

Fire Support Areas I and II

The Fire Support Areas are designated locations offshore of SCI for the maneuvering of naval surface ships firing guns into Impact Areas located on SCI.

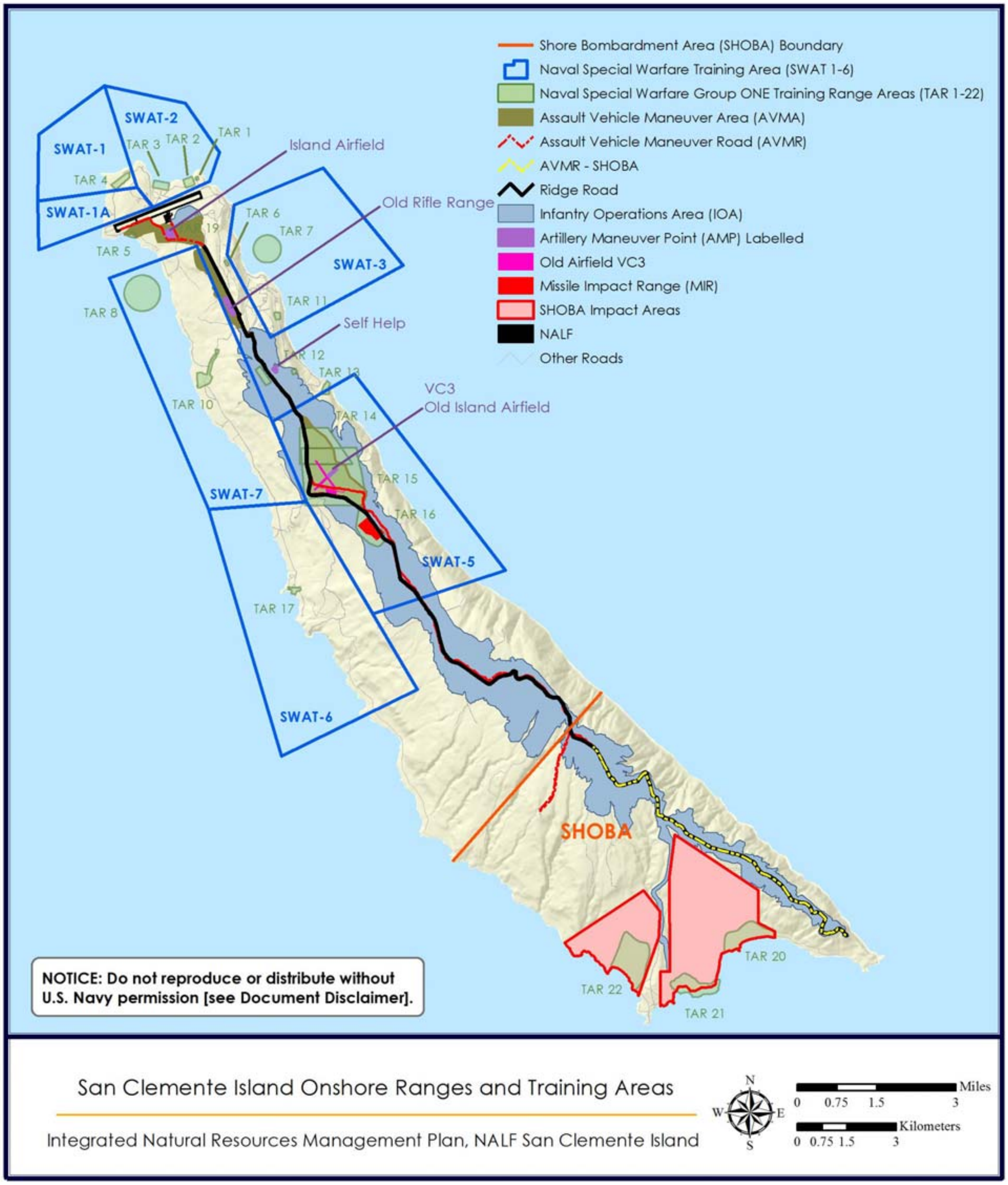
2.2.1.2 San Clemente Island Onshore Ranges

The SCI Range Complex supports the largest concentration of naval forces in the world. The SCI Range Complex land, air, surface, and sub-surface ranges provide the U.S. Navy, U.S. Marine Corps, U.S. Air Force, Naval Special Warfare (NSW), U.S. Army, U.S. Coast Guard, Homeland Security, and allied Navies with space and facilities that are used for conducting unit level, integrated, and sustainment readiness training. SCI provides instrumented ranges, operating areas, and associated facilities to conduct and evaluate a wide range of exercises within the scope of naval warfare. SCI also provides range areas and services to RDT&E activities. Over 20 Navy and Marine Corps commands conduct training and testing activities at SCI. Due to its unique capabilities, SCI supports multiple training activities from every Navy Primary Mission Area and provides critical training resources for Expeditionary Strike Group (ESG), Carrier Strike Group (CSG), and Marine Expeditionary Unit (MEU) certification exercises. These SCI onshore ranges are depicted in Map 2-2.

Shore Bombardment Area

The Shore Bombardment Area (SHOBA) covers offshore, nearshore, and onshore areas of SCI. The southern third of the island is the onshore portion of SHOBA with its offshore part extending to the south and southeast (Navy 2005). The main training activities that occur in SHOBA are naval gun firing, ship-to-shore small arms firing, air-to-ground gunnery, rocket, and missile firing, aerial bombing, and limited ground maneuver with small arms firing. A variety of munitions, both live and inert, are expended in SHOBA. NSW operations also occur in this area. Areas onshore (where ordnance is expended) are designated Impact Areas I and II. Training Areas and Ranges (TARs) 20 through 22 are located within the boundaries of SHOBA.

1



2 *Map 2-2. San Clemente Island Onshore Ranges and Training Areas.*

Naval Special Warfare Training Areas 1–6

A Special Warfare Training Area (SWAT) is a specially designed and designated training area for NSW training operations. These large areas encompass land, water, and associated airspace, and well as infrastructure required to support NSW training operations. SWATs support all levels of NSW training continuum: Basic Underwater Demolition/SEAL (BUD/S), SEAL Qualification Training, Professional Development/Schools, Troop unit level training, and Squadron Interoperability Training. NSW Command users have primacy in scheduling these areas (Navy 2008; U.S. Fish and Wildlife Service 2008). The SWATs provide scheduling, safety, and assured access to training areas that offer the required air, land, and sea interoperable areas, as well as infrastructure, required to support NSW training operations. Six near-shore SWATs have been designated at SCI (Navy 2005). Both basic and advanced NSW operations may be conducted within these areas, as well as special operations training by MEUs and other special operations forces. Specific details, scheduling procedures, and management assignments are provided in Fleet Area Control and Surveillance (FACSFAC) San Diego Instruction 3550.1 series.

Naval Special Warfare Group ONE Training Areas and Ranges 1–22

A TAR is a geographically bounded area used for planning and scheduling purposes for specific types of training operations and range activities. All TARs contain land area with the exception of two (TAR 7 and 8), which are water drop zones. TARs support live fire activities, including small arms, land demolitions, and underwater detonations. TARs are generally small (1–800 acres [0.5–324 hectares (ha)]) and are designed to support NSW training for “actions at the objective” (Navy 2005). TARs were developed from an analysis conducted by Naval Special Warfare Group ONE in 1997–1998, in which the command developed an urgent, compelling need for the expansion of quality tactical training ranges and Over-the-Beach training at SCI.

Each TAR is designed to support a typical training exercise based on tactics and safety requirements. These design requirements include items such as live-fire elements, demolitions, firing lines and positions, maneuver areas, firing lanes, test pads, detonation pads, Surface Danger Zones, and restricted access and exclusionary areas. TARs have minimal facilities, to preserve their realism as tactical targets. Each TAR is intended for live-fire and designed with appropriate Surface Danger Zones, but the TAR area does not include the Surface Danger Zone (Navy 2005). There are 22 TARs, described in Table 2-2.

Assault Vehicle Maneuver Corridor

The Assault Vehicle Maneuver Corridor (AVMC) is the overall term for three linked areas on the island, including the Assault Vehicle Maneuver Areas and Assault Vehicle Maneuver Road (AVMR).

The AVMC is depicted in Map 2-3. The Assault Vehicle Maneuver Area accounts for areas of authorized off-road vehicle use, including: a) the heavily disturbed area immediately south of the Naval Auxiliary Landing Field (NALF) airfield; b) areas west of San Clemente Ridge Road between the NALF airfield and West Cove, associated with the derelict WWII rifle range and contiguous terrain to the north; c) Self Help between San Clemente Ridge Road and TAR 12; and d) the area south of the island dump and encompassing VC-3 as generally contained within San Clemente Ridge Road to the west and Reservoir Road to the east. Areas in provisional planning for use as additional 1st Marine Expeditionary Force-requested Artillery Firing Points (AFPs) would concurrently be cleared for heavy artillery vehicle off-road use and would be expected to tacitly become part of the overall Assault Vehicle Maneuver Areas.

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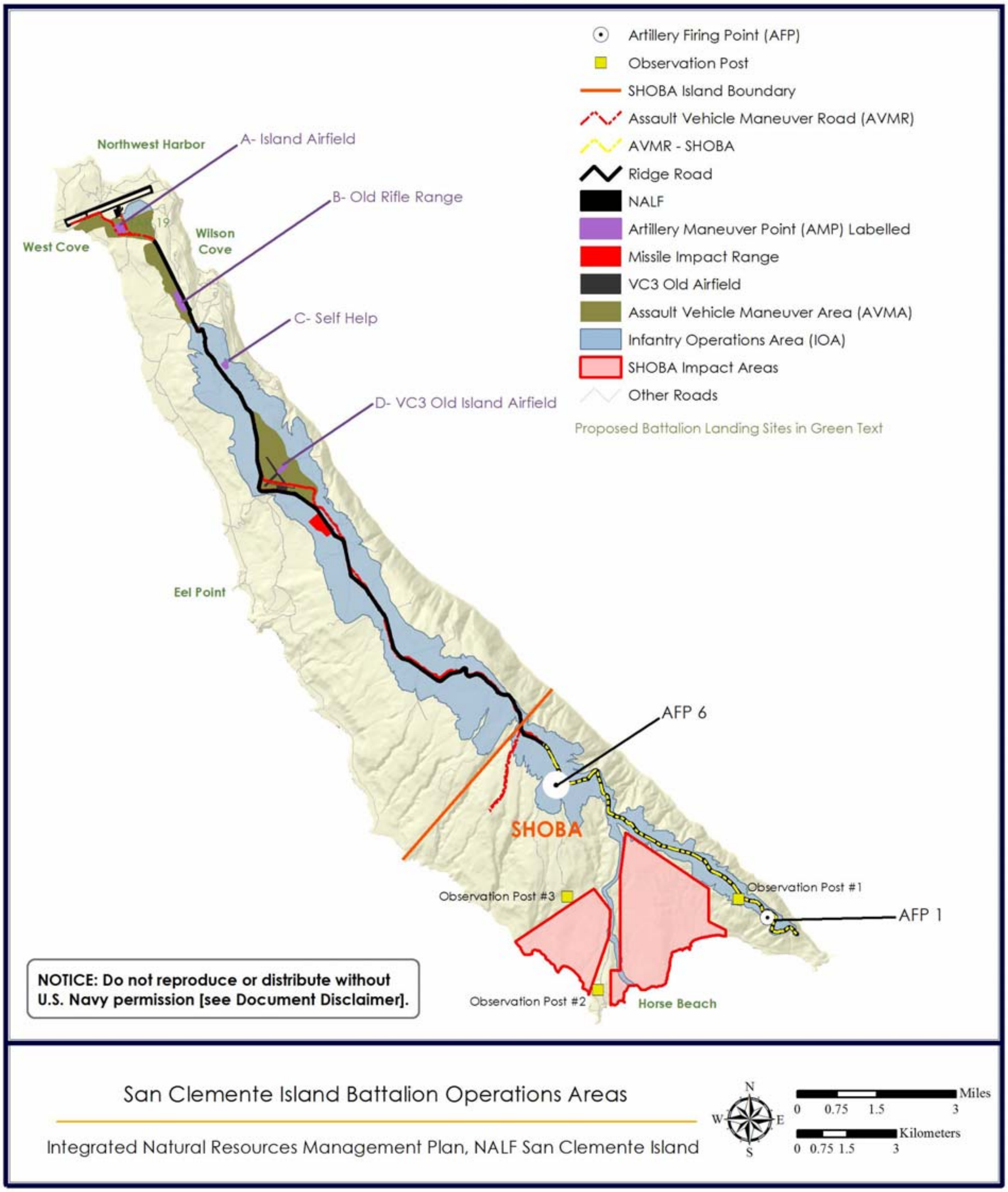

2 *Map 2-3. San Clemente Island Battalion Operations Areas.*

Table 2-2. San Clemente Island onshore Naval Special Warfare training areas and ranges (Navy 2008).

Name	Description
TAR 1: Demolition Range Northeast Point	This 1.8-acre (0.7-ha) site includes a state-of-the-art demolition area with Over-the-Beach capabilities. This TAR includes a safety bunker near the beach and a designated demolition area. No live-fire of small arms is used in TAR 1. All explosives would be non-shrapnel-producing up to 100 pounds (lbs) (45 kilograms [kg]) net explosive weight (NEW). Flares, illumination rounds, and pyrotechnics would also be used.
TAR 2: Graduation Beach Underwater Demolition Range	TAR 2 provides a state-of-the-art underwater and land demolition area with across the beach capabilities. This 13.8-acre (5.6-ha) area is currently in use as a land demolition and an underwater demolition range and has been for over 20 years. The site currently includes 10 feet x 20 feet (3 m x 6 m) temporary structures on existing slabs, and mock mobile missile launch platforms and vehicles. The following site improvements will be made for safety and environmental purposes: erosion control on the access road and in the demolition area, adding a telephone communications line, developing a demolition staging area, and making a demolition preparation area. Live fire use includes blank fire, small arms, simunitions (blanks), short range training rounds, and crew-served weapons. All types of underwater demolitions up to 500 lbs (227 kg) NEW and land demolitions up to 100 lbs (45 kg) NEW.
TAR 3: BUD/S Underwater Demolition Range	TAR 3 is an underwater demolition range with across the beach capabilities. Blank fire for small arms and crew-served weapons. Up to NEW of non-fragmentation producing land demolitions. All types of underwater demolitions up to 500 lbs (227 kg) NEW. TAR 3 is 4.1 acres (1.7 ha) in size.
TAR 4: Whale Point / Castle Rock	Previously used as a demolition range and situated within the old antenna array, TAR 4 constitutes an area of 27.1 acres (11 ha) on the northern tip of SCI. Live-fire and demolition tactical training is used here. A wide range of explosives are also used in this area, including those up to a maximum of 300 lbs (136 kg) NEW, blanks, smoke and grenade simulators, flares and pyrotechnics, and small arms fire up to .50 caliber (cal). Contains Special Operations Urban Complex.
TAR 5: West Cove Amphibious Assault Training Area	This area is adjacent to the Southern California Offshore Range Cable Termination Facility. The beach is used for insertion/extraction and routine amphibious landings and assaults. Potential uses include: nearshore reconnaissance, shallow water mine countermeasure range, and insertion/extraction en route to other TARs on SCI. The size of TAR 5 is 2.1 acres (0.8 ha). Only blanks are permitted on TAR 5; no live fire or demolitions.
TAR 6: White House Training Area	This site is on a bluff overlooking Wilson Cove. It contains a concrete pad with a 10 feet x 20 feet (3 m x 6 m) temporary structure and mock mobile missile launch platforms and vehicles. It has road access. The size of TAR 6 is 3.3 acres (1.3 ha). This TAR is used as a controlled target area and communications base station. No live fire or demolitions. Blanks, simunitions, and pyrotechnics only.
TAR 7: Saint Offshore Parachute Drop Zone (DZ)	This DZ is in the offshore waters opposite Wilson Cove on the leeward side of SCI. The purpose is to provide a DZ in offshore area for the parachute insertion of SEAL platoons and equipment. The transit to the beach is less than 3 nm (6 km). No live fire or demolitions.
TAR 8: Westside Nearshore Parachute Drop Zone	This DZ is located on the west side of SCI in the nearshore area. It is used for day and night insertions including parachute drops. No live fire or demolitions.
TAR 9: Photo Lab Training Area	TAR 9 is for training use only. Four buildings currently exist and are adequate to provide realistic simulated targets. Some of these buildings are periodically in use by non-NSW units. The size of TAR 9 is 26.3 acres (10.6 ha). No live-fire outside; blanks and live-fire are allowed in close quarter combat facility with portable bullet traps. Small arms up to 5.56 millimeter (mm). Breaching charges (< 1 lb [0.5 kg] NEW) in designated areas.
TAR 10: Demolition Range West	TAR 10 provides a land-based location for safe, operationally realistic live-fire and high explosive demolition training en route from a landing area, on patrol to other land-based TAR objectives with a minimum of environmental constraints. The site must support live-fire training for Immediate Action Drills with a minimum of 180 degrees of live-fire, optimum 360 degrees. TAR 10 has a secondary mission of supporting Over-the-Beach operations. TAR 10 has an area of approximately 54.9 acres (22.2 ha) and contains 10 feet x 20 feet (3 m x 6 m) temporary structures on existing slabs, and mock mobile missile launch platforms and vehicles.
TAR 11: Surveillance Training Area	This 8.8 acres (3.5 ha) site is used as an objective, a target area for insertion, reconnaissance, and attack. No live-fire or demolitions are allowed. Smoke, flares, pyrotechnics, and all types of blanks are authorized.
TAR 12: Radar Site Training Area	This small target area high is located on the bluff overlooking NOTS Pier, on the site of an abandoned RDT&E radar facility. TAR 12 provides an objective close to the shore in close proximity to RDT&E facilities to simulate a realistic adversary target. The size of TAR 12 is 5.1 acres (2 ha). No demolitions, flares, or pyrotechnics. Smoke and blanks only.
TAR 13: Randall Radar Site Training Area	This site is on the Eastern Escarpment. The area contains an abandoned bunker with attendant facilities. The bunker was previously used for weapons system development. The size of TAR 13 is 17.1 acres (7 ha). TAR 13 provides a bunker area to conduct tactical land demolitions training and Close Quarters Combat training. No external firing of live weapons. Small arms to include 5.56mm, 7.62mm, and .45 cal with bullet traps. Land demolitions under 5 lbs (2.3 kg) NEW.
TAR 14: VC-3 Onshore Parachute DZ Twinky	The DZ, named Twinky, is off the north end of the VC-3 northwest/southeast abandoned runway. Its use coincides with the use of VC-3, which includes parachute drops, patrolling, and related tactical operations. TAR 14 activities include land-based parachute drops, static line, and free-fall, both day and night. All types of weapons up to 7.62mm fired in an easterly direction are allowed. Also, land demolitions up to 100 lbs (45 kg) NEW, Flares, illumination, and pyrotechnics are used here.

Table 2-2. San Clemente Island onshore Naval Special Warfare training areas and ranges (Navy 2008).

Name	Description
TAR 15: VC-3 Airfield Training Area	TAR 15 is an abandoned airfield, now used for SEAL platoon land raids, airfield attack training, and a Center of Excellence for unmanned aerial vehicle training and testing. The size of TAR 15 is 770.8 acres (312 ha). All types of weapons up to 7.62mm fired in an easterly direction are allowed. Also, land demolitions up to 45 kg (100 lbs) NEW, Flares, illumination, and pyrotechnics are used here.
TAR 16: South VC-3	TAR 16 is currently used for testing Joint Standoff Weapons and Tomahawk Missiles and can be used by special ops forces as a parachute DZ and tactical air assault area. At the target, special operations forces would place explosive charges, demolish the target, and extract from the area via beach, airlift, or existing roads. TAR 16 is 54.2 acres (22 ha). Small arms including 5.56mm and 7.62mm rifles, machine guns, and .50 cal sniper and crew served weapons mounted on vehicles. Flares, pyrotechnics, and tracers. Demolitions up to 1,000 lbs (454 kg) NEW.
TAR 17: Eel Point Tactical Training Range	TAR 17 provides a shore-based location for safe, operationally realistic live-fire and high explosive demolition training for *actions at the objective* and support amphibious landings, Over-the-Beach operations and patrol to other land-based TARs. Existing facilities within the area include a gate and a target building. All types of explosives (25 lbs [11 kg] maximum), 5.56mm and 7.62mm rifles and machine guns, .50 cal sniper/standoff, flares and pyrotechnics are used and all explosives are non-shrapnel-producing explosives.
TAR 18: Close Quarter Battle Training Complex	TAR 18 provides a set of moveable target buildings that realistically simulate a terrorist camp (hostage location) for SEAL training. The proposed design would support four different types of Close Quarters Combat scenarios at one time. TAR 18 is a 0.6-acre (0.2-ha) site. 5.56mm, 9mm, and small demolition charges under 5 lbs (2.3 kg) NEW. All weapons firing is inside non-ballistic walls with berms surrounding the complex.
TAR 19: Simulated Prisoner of War Camp and Surface-to-Air Missile Site	TAR 19 provides a site that realistically simulates a Prisoner of War holding camp (hostage location) in the immediate vicinity of a Surface-to-Air Missile site for SEAL training. The size of TAR 19 is 2.4 acres (1 ha). No live-fire. Blank 5.56mm, 7.62mm, 9mm, simunitions, smoke grenades, booby traps, and small demolition charges under 1 lb (0.5 kg) NEW. Only blanks are used here.
TAR 20: Pyramid Cove Training Area	This site is located in SHOBA and has been used extensively over the past decade for NSW training. TAR 20 provides a tactical firing area close to the shoreline for water and land use. Live-fire and inert training munitions; small arms, .50 cal rifle, .50 cal machine gun on boats, 40mm, 25mm, 60mm, 81mm, 105mm, 127mm (5-inch naval gunfire mounted on destroyer), 155mm, AT-4, and MK-19; land demolitions 100 lbs (45 kg) NEW onshore; no underwater demolitions. Firing in 360 degrees. Flares, illumination, tracers and pyrotechnics.
TAR 21: Horse Beach Cove Training Area	TAR 21 is a 88.1-acre (36.7-ha) site that provides an area close to the shoreline for day and night raids, insertion and extraction in close proximity to a Close Quarters Combat target. Live-fire and inert training munitions; small arms, 9mm, 5.56, 7.62, .50 cal, and training practice (not dud producing) 40mm; land demolitions up to 100 lbs (45 kg) NEW and underwater demolitions up to 20 lbs (9 kg) NEW. Flares, illumination, tracers, and pyrotechnics. Weapons firing in 360 degrees.
TAR 22: China Cove Training Area	TAR 22 provides a 289-acre (117-ha) area close to the shoreline for day and night raids and stand-off weapons employment in Impact Area II. Live-fire and inert training munitions; small arms, .50 cal, 30mm, 40mm, AT-4, 105mm, 127mm (naval gunfire), 155mm, Stinger Missile, and Light Anti-tank Weapon; land demolitions up to 500 lb (225 kg) NEW onshore in an extension of Impact Area IIA (designated for heavy ordnance use) to the shoreline; no underwater demolitions. Also, flares, illumination, tracers and pyrotechnics.

The AVMR is a dirt road that runs from West Cove to Pyramid Cove. The improved AVMR extends from West Cove to the SHOBA gate.

The road runs inside SHOBA from the gate past Observation Post 1 to the cul-de-sac near Pyramid Head. The newest AVMR extension refers to the newly constructed segment between VC-3 and SHOBA Gate. This new route was reviewed through the National Environmental Policy Act process under an Environmental Assessment.

Infantry Operations Area

The Infantry Operations Area, generally located on both sides of the AVMC, is a section of the upland plateau designated as available for foot traffic by military units. The Infantry Operations Area is illustrated in Map 2-3. No vehicles are authorized. Specifically, this area is for use by Marine Corps platoons and companies during the proposed Battalion Landing and other Marine Corps amphibious operations. The quantitative requirement supporting the size of the Infantry Operations Area is the Marine Corps Range Required Capabilities Document. This requirement cannot be met on SCI, but it is large enough to allow company maneuver and attack, and meets the objective of the 1st Marine Expeditionary Force message.

Artillery Firing Points and Artillery Maneuvering Points

An AFP is a location from which towed Howitzers such as the M777 (Lightweight 155mm Howitzer) or Expeditionary Fire Support System (120mm towed mortar) are positioned and used in live-fire employment of munitions. Howitzers are towed with seven-ton trucks and the Expeditionary Fire Support System is towed with the Internally Transportable Vehicle along primary roads, often in convoy with munitions vehicles and High-Mobility Multi-Purpose Wheeled Vehicles. Artillery Maneuvering Points are similar to AFPs; however, no live-fire employment of the weapon is conducted. The location of the Artillery Maneuvering Points and the AFPs are illustrated in Map 2-3.

Old Airfield

The Old Airfield (VC-3), located within TAR 15, is approximately 6 nm (11 km) from the northern end of the island. Access to the area is afforded by Ridge Road for ground vehicles (Navy 2005). Virtually all types of military trainings ashore have occurred on VC-3. It is ideally suited for company-sized units. It is used for air assault training for insertion of troops by helicopter and for use by NSW as an Unmanned Aerial Vehicle Center of Excellence. The presence of a number of buildings allows for training forces in a semi-urban environment. Combat Search and Rescue and airlift extraction of forces are also conducted on a routine basis at the Old Airfield.

Missile Impact Range

The Missile Impact Range (MIR) is in the north central portion of the island, just south of VC-3. It is situated at the ridge crest of the island's central plateau. The MIR is 3,200 by 1,000 feet (975 by 305 m) at an elevation of approximately 1,000 feet (305 m) above sea level (Navy 2005). The MIR is equipped by Space and Naval Warfare Systems Center (SPAWAR) with multiple camera stations for recording the flight, impacts, and detonations of weapons. There are fixed targets on the ground within the range boundary that consist of both simulated structures and actual aircraft in bermed revetments. Typical weapons tested on the MIR include the Joint Standoff Weapon and the Tomahawk Cruise Missile. The Navy published an Environmental Assessment for the testing of the Joint Standoff Weapons system on SCI at the MIR (April 1996). The Finding of No Significant Impact was published in June 1996.

2.2.2 Facilities

2.2.2.1 Naval Auxiliary Landing Field Facilities

The NALF is located at the northern end of the island. It has a single runway oriented northeast and southwest. There is a single parallel taxiway south of the runway with a midfield parking area for aircraft adjacent to the control tower. The runway is 9,300 feet (2,835 m) long and 200 feet (61 m) wide; it is equipped with two bi-directional aircraft arresting gear, 2,000 feet (610 m) from the approach ends of the runway. The users of the airfield include the Navy and Marine Corps, other military branches, contract air carriers, and a few non-military federal aviation aircraft (Navy 2005). Airfield operations are supported by surveillance radar.

NALF is the host organization for all SCI activities. It is the responsibility of NALF to maintain and repair the installation infrastructure. The facilities used by NALF are in support of the airfield, waterfront operations, military and civilian support personnel berthing, general messing, and administrative/supply buildings.

Currently, there are more than 350 buildings and structures on SCI (Navy 2002), the majority of which are more than 60 years old and reflect that age in habitability, maintainability, and functionality. However, many of the berthing structures are less than ten years old, and the mess hall is less than seven years old.

NALF is also responsible for the explosives storage or bunker area down-island and all ready service lockers for munitions storage at several remote sites. At most times there are approximately 350 personnel housed on the island, including Navy personnel, civil service employees, and civilian contractors (Navy 2002) but this can exceed 1,000 for short periods. Twenty-three berthing buildings accommodate all NALF personnel. Major facility locations are identified in Map 2-4.

2.2.2.2 Fleet Area Control and Surveillance/Southern California Offshore Range Facilities

The main FACSFAC facilities are located down-island at Mount Thirst and Mount Vista. Mount Thirst is the location of the southern California area air control and surveillance radar. This facility is comprised of five structures housing the radar antenna, electronics equipment, and utilities support equipment.

Mount Vista Communications, located just south of Mount Thirst, is comprised of five structures that house the FACSFAC Point Loma-San Clemente Island microwave link. A surface search radar, SPS-10, is also located here.

The majority of SCI range related facilities are occupied by the Southern California Offshore Range (SCORE). Range facility site locations extend from the Cable Termination Shelter site in West Cove at the north end of the island to Observation Post 1, located in SHOBA at the south end. There are 20 range operations/equipment sites that comprise the SCORE facilities on the island. At these sites there are a total of 22 permanent buildings and 18 operational/equipment support shelters.

Personnel assigned to the FACSFAC facilities use two separate berthing facilities at Wilson Cove. Several sites are operated remotely from the SCORE Range Operations Center, located at Naval Air Station North Island Naval Base Coronado. Microwave links are presently used for this purpose. Future planning includes complete control of all Under Sea Warfare and Electronic Warfare systems from the Range Operations Center via fiber-optic communications. The majority of SCORE's contract personnel are housed in the SCI trailer complex in the Wilson Cove area.

2.2.2.3 Basic Underwater Demolition/SEAL Complex

The BUD/S Complex is located at Northwest Harbor at the extreme north end of SCI. It is comprised of 36 buildings accommodating 53,246 square feet (4,497 square meters) of berthing, messing facilities, classrooms, and training range support structures. Berthing facilities can accommodate 64 students and 48 staff personnel. This facility was rebuilt in 1990. The BUD/S Complex also has a vehicle support structure in Wilson Cove.

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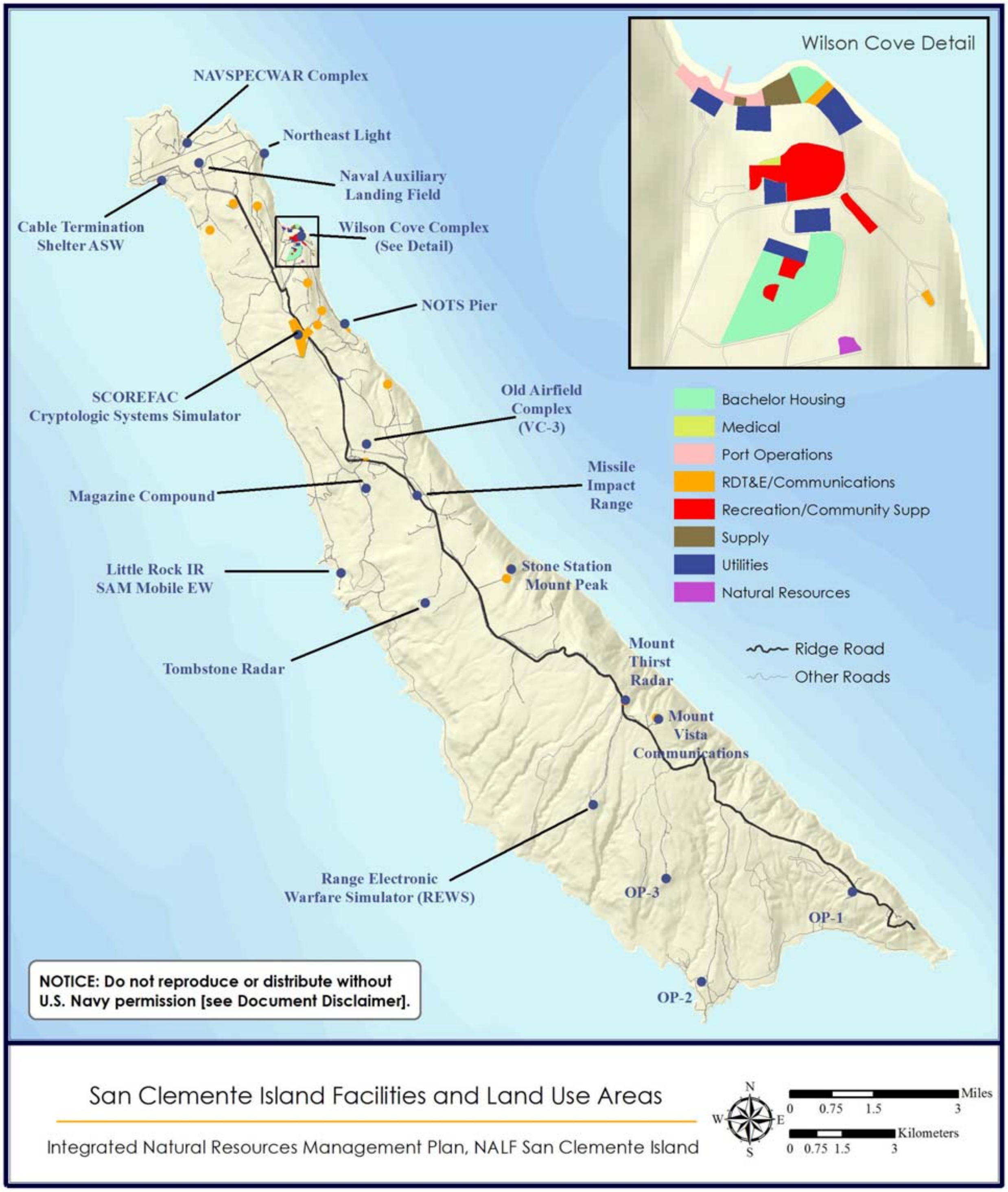


2 *Map 2-4. San Clemente Island facilities and land use areas.*

2.2.2.4 Maritime Operations Complex

The Maritime Operations Complex is comprised of three NSW buildings at Northwest Harbor that provide 26,130 square feet (2,429 square meters) of training rooms, personnel accommodations, and vehicle and boat support. Berthing facilities can accommodate 60 personnel. Commander, Naval Surface Warfare Center is developing a SCI Master Plan addressing facility modernization of BUD/S and maritime operations. The new facilities include expanded berthing capability, administrative office space, dive lockers, classrooms, armory, road improvements, medical facility, and waterside Naval Special Warfare Group-4 infrastructure.

2.2.2.5 Space and Naval Warfare Systems Center Pacific

SPAWAR Pacific presently has 33 buildings assigned. However, 20 of these are simple camera/tracking pad sites. Day-to-day staffing levels for SPAWAR Pacific are approximately five personnel; however, during a major test this level increases to approximately 40–50 persons. Berthing for SPAWAR Pacific personnel is in a six-trailer complex in Wilson Cove. Future facility construction plans are to build a berthing complex for approximately 60 persons in the same location as a replacement for the trailers. Planning for future Unmanned Aerial Vehicle test and evaluation support calls for major construction in the Old Airfield complex area. Two hangars and two office facilities are also planned for this site (P. McKay, pers. com. 2012).

2.2.2.6 Public Works Center Facilities

The Public Works Center is assigned 29 structures on the island, which include maintenance, warehousing, power plant, and other utility facilities. The majority are located in Wilson Cove. The Public Works Center is responsible for the operation and maintenance of all island utilities and motor pool vehicles. In addition, Public Works is responsible for delivering fuel and potable water to all outlying sites south of the Photo Lab complex. There are currently 44 Public Works Center personnel. All personnel, with the exception of four supervisors, are billeted in one berthing facility.

2.2.2.7 Naval Undersea Warfare Center

The Naval Undersea Warfare Center (NUWC) provides test and evaluation support for forces afloat by operating underwater test ranges. The main support facility, Range Control, is located on the waterfront in Wilson Cove.

2.2.2.8 Transient Activity Facilities

Transient personnel are those present for temporary purposes, such as aviation detachments, military construction units, and combat operations training detachments, among others. Certain berthing facilities are specifically assigned to accommodate transient personnel. Transient personnel numbers frequently exceed 150 people.

2.2.3 Transportation, Circulation and Utilities

2.2.3.1 Transportation and Circulation

The main circulation artery of SCI is Ridge Road (Map 2-5), which extends from NALF south for approximately 20 miles (32 km). Other secondary roads to sites along Ridge Road are generally unpaved or partially paved. Conditions of SCI circulation roads are poor, are generally non-maintainable, and lack pavement.

2.2.3.2 Utilities

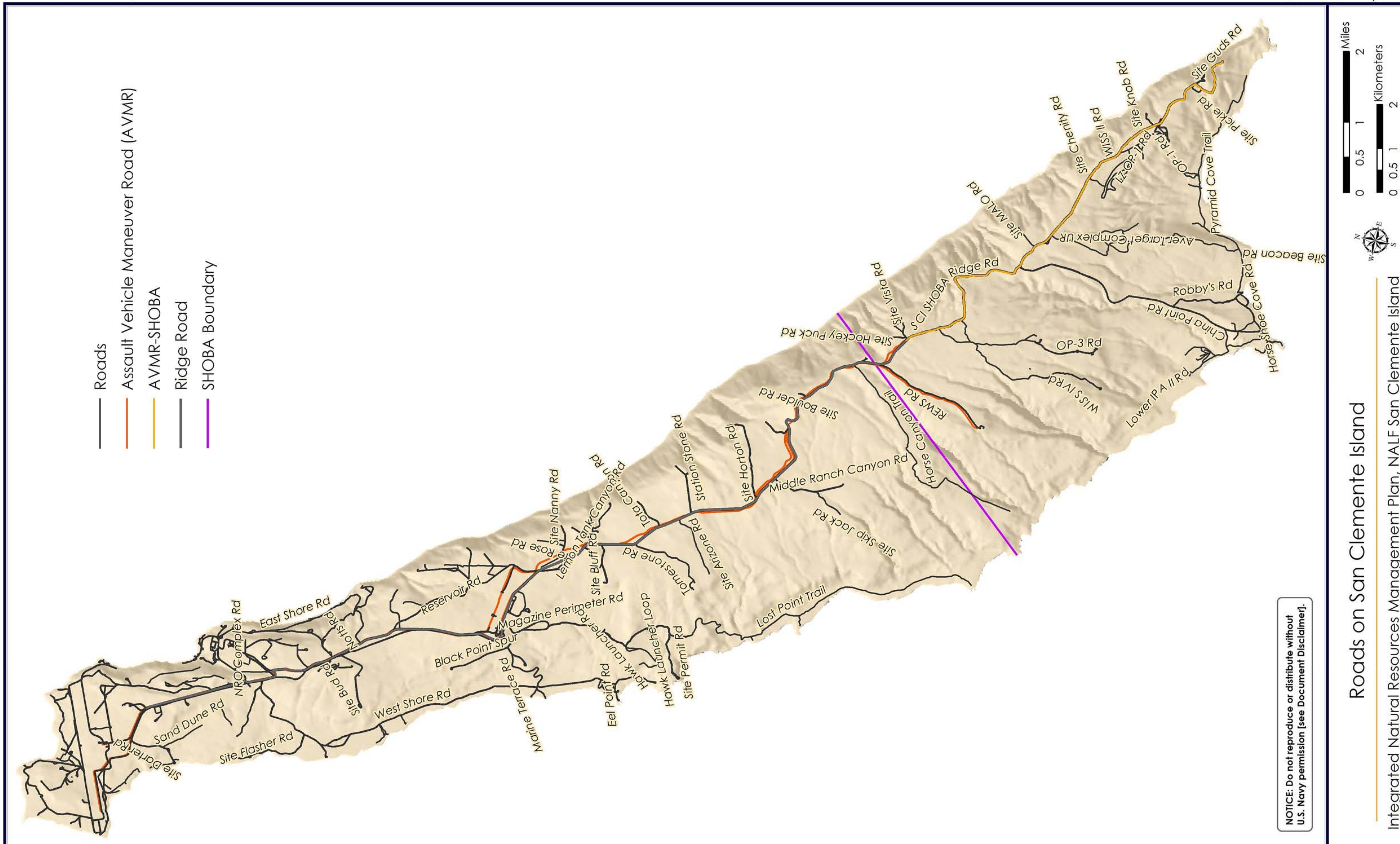
Power Plant. The power plant at Wilson Cove is comprised of 2–500 kilowatts (kW), 1–1,200 kW, and 1–750 kW diesel generators with a total capacity of 2,950 kW per hour. This plant is presently loaded to a nominal capacity average of 35%. The plant is operated and maintained 24 hours each day, seven days per week. A Strategic Environmental Research and Development Program wind farm constructed in 1997–1998 augments the existing power system, providing approximately 20% of the island's power, or approximately 150 kW per month. The monthly load is about one megawatt.

Power Distribution. The system consists of approximately 925 poles, spanning a distance of 45 miles (72 km). Several sites on the island were connected to the power grid in 1997, which significantly increased the efficiency of power production.

Sewage. Sewage generated at SCI is treated in individual septic systems or at the wastewater treatment plant, located approximately 1,500 feet (457 m) east of Wilson Cove, to secondary levels before being discharged into the ocean water nearby (under National Pollutant Discharge Elimination System Permit #CA 0110175 CI 6432, 31 July 2000).

The treatment plant is a dual unit, extended aeration system, presently at state-licensed capacity of 25,000 gallons (gal)/day (94,635 liters [L]/day). The facility is capable of 60,000 gal/day (22,227,125 L/day) but is restricted by the state to its present processing level. The plant is operated by Navy Public Works. Monthly monitoring reports are sent to the Los Angeles Regional Water Quality Control Board. There are approximately 25 active septic tank/leach field systems at SCI, located at the northern portion of the island. The septic systems are maintained by Navy Public Works and serviced through a Navy contract that performs preventive maintenance, pump out, and transportation of waste by pumper truck and barge for proper disposal at a San Diego Metropolitan Waste pump station.

Potable Water. There is no on-island source of water. Approximately 245,200 gal (931,700 L) of drinking water are barged to SCI weekly at a cost of approximately $50,000 a week or about $2.6 million a year. Potable water is initially supplied and tested by the Sweetwater Authority, prior to loading on the barge at the Naval Station in San Diego Bay. Once test results indicate that the water meets all standards, it is transported to the island and pumped ashore into distribution tanks. The Navy performs downstream testing (lead/copper, trihalomethanes, and chlorine) to comply with drinking water regulations and tracks degradation in water quality related to long-term storage. The present capacity of the system is 2.3 million gal (8.7 million L).



Map 2-5. Roads on San Clemente Island.

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Communications. Telephone service is provided to the island via microwave relay from San Pedro, California. This Consolidated Area Telephone System is a fully digital integrated network that interfaces with the 11 military bases within the system. The on-island network of equipment requires continuous maintenance.

Landfill. The current landfill is approximately 20 acres (8 ha) in size, of which 15 acres (6 ha) are designated to receive municipal solid waste (under Los Angeles Regional Water Quality Control Board Order No. R4-2010-0045, File No. 84-035, Compliance File No. CI 9585, 09 March 2010). Closure of the landfill is anticipated in 2032, at 991 tons-per-year rate of disposal use. It is currently augmented by shipping trash to the mainland, via the weekly barge. Approximately 127 tons of recycled materials are also shipped to the mainland annually. Since 01 October 1997, no burning of trash has been allowed, due to air quality concerns.

2.2.4 Airfield and Operations

SCI is administered by the Commanding Officer of Naval Base Coronado, San Diego, California. As the host for all tenants and users of the island, Naval Base Coronado is responsible for all facilities and day-to-day control and compatibility of land uses.

The airfield itself, NALF, provides fleet aviation training and support. It functions as a primary, secondary, and emergency divert airfield. It hosts a number of major tenants and frequent users, including those listed in Table 2-3.

Table 2-3. Users of San Clemente Island and associated offshore ranges.

Tenants	
■ Fleet Area Control and Surveillance Facility	■ Special Boat Team TWELVE
■ Southern California Offshore Range	■ Naval Facilities Engineering Command
■ Space and Naval Warfare Systems Center Pacific	■ Military Welfare and Recreation
■ Naval Undersea Warfare Center	■ Naval Medical Clinic
■ Naval Special Warfare Center	■ Natural Resources Office
■ Naval Special Warfare Group ONE	■ Federal Fire Department
Frequent Users	
■ Naval Air Force Pacific	■ Expeditionary Warfare Training Group Pacific
■ Naval Surface Forces Pacific	■ Submarine Squadron 11
■ Submarine Forces Pacific	■ Helicopter Combat Support Squadron 85
■ 1st Marine Expeditionary Force	■ Helicopter Advanced Readiness Program
■ THIRD Fleet	■ Airline transport contractor
■ Commander Strike Force Training Pacific	■ 3rd Marine Air Wing
Intermittent Users	
■ Naval Air Warfare Center Weapons Division (Point Mugu)	■ U.S. Army Rangers and Special Forces
■ Explosive Ordnance Demolition Mobile Unit 3	■ Marine Air Wings
■ California, Arizona, and Nevada National Guard Units	■ Immigration and Naturalization Service
■ California Army National Guard	■ University Research Programs
■ Mobile Diving Salvage Units	■ State and Federal Resource Agencies
■ Naval Construction Force Units	■ U.S. Coast Guard
■ U.S. Air Force Units	

2.2.4.1 Overview of SCI Range Complex Operations

Operations performed in the SCI Range Complex are of three types: qualification training, tactical training, and testing (RDT&E). Operations are described in detail in the SOCAL EIS (2008). An operation is defined as:

- A live-training exercise, RDT&E test, or field maneuver conducted for a specific strategic, operational, or tactical military mission or task; a military action; the basic metric of range activity.
- Operations may occur singly, or multiple operations may be accomplished as part of a Major Range Event. Operations consist of a combination of activities accomplished together. Operations can be characterized by their number (Operations Tempo), type, participants, footprint, and ordnance expended. An operation can include air, land, sea, and undersea warfare training or testing and can be identified by Naval Tactical Task. Participants can include a specific number and type of aircraft, ships, submarines, amphibious, or other vehicles and personnel. Ordnance broadly encompasses all weapons, missiles, shells, and expendables (chaff and flares).
- An individual operation occurs over a given geographic footprint for a scheduled period of time, usually less than one day. For example, a SEAL Gunnery Exercise; each Gunnery Exercise is discrete, relatively short-term, but it may be combined with other operations in a major training event, like a Joint Task Force Exercise (JTFEX), which lasts for several days or weeks.
- Similarly, a Major Range Event is defined as: a significant operational employment during which training or testing is accomplished. An event is a Navy approved employment schedule term that can have multiple training operations (sub-events), each with its own mission, objective, and time period. Training may also occur during periods of operational employment that are considered major training events such as Composite Training Unit Exercise (COMPTUEX) and JTFEX (Commander Fleet Forces Command Instruction 3501.3 Fleet Training Continuum, 28 May 2002).

Tactical training operations cover the entire spectrum of tactical training levels-unit-level, integrated, and sustainment, which can be equated to basic, intermediate, and advanced training. Every ship, submarine, and deployable aircraft squadron in the Navy are part of this Fleet Readiness Training Plan. The Fleet Readiness Training Plan, also referred to as the Fleet Response Plan is a modification of the previous operating cycle, the Inter-Deployment Training Cycle. The Fleet Response Plan extends the interval between maintenance periods to attain a substantially larger surge force.

The typical Fleet Response Plan timeline involves a progressive approach of successive training phases that sequentially increases training elements with respect to complexity, intensity, duration, and level of threat. The initial unit-level training phase begins shortly after a unit returns from deployment, lasts one to six days, and involves individual repetitive performance of fundamental procedures by a single unit (aircraft, surface ship, or submarine). Upon completion of the unit-level training phase, a unit is certified as emergency surge ready, or deployable if an urgent need exists.

After the unit-level training phase, the integrated phase combines the elements of unit training into larger, coordinated engagements within a simulated, higher threat, environment. Integrated training differs from unit-level training in complexity, intensity, duration, and level of threat.

The training mission of Commander, U.S. Pacific Fleet is to provide fully-trained Navy and Marine forces to the Combatant Commanders as dictated by the National Command Authority. In furtherance of this mandate, the U.S. Navy's THIRD Fleet conducts COMPTUEXs and JTFEXs. These exercises are large, deployment-level exercises, requiring vast and varied land, sea, and undersea training environments necessary to exercise the full range of capabilities required of deploying naval forces.

CSGs and ESGs conduct COMPTUEX and JTFEX training events. CSGs are formed and disestablished on an as needed basis, and one may be different from another. However, they all are comprised of similar types of ships. The CSG could be employed in a variety of roles, all of which would involve the gaining and maintenance of sea control. The ESG centers on the flexibility and readiness of a combined expeditionary unit and an Amphibious Readiness Group. The total ESG provides operational freedom and expanded warfare capabilities, not only by land with embarked Marines, but at sea as well.

COMPTUEX, which is the intermediate phase of the Fleet Readiness Training Plan, involves CSG or ESG assets engaging in a free play battle scenario against an opposition force. The exercise provides integrated and realistic training on in-theater operations, and provides a means for Commander, THIRD Fleet to evaluate the CSG's/ESG's ability to assess and respond to battle scenarios utilizing previous training skill sets. COMPTUEXs are longer in duration than JTFEXs.

JTFEX is an at-sea Naval Strike Group training exercise for CSGs and ESGs, part of which includes joint operations training for Navy and Marine Corps forces. The JTFEX is a sea control/power projection exercise for purposes of evaluating the readiness and testing the interoperability and proficiency of naval forces in realistic scenarios ranging from Military Operations Other-Than-War to armed conflict. JTFEX is the final phases of a Naval Strike Group's mandatory pre-deployment training program. It is dedicated to preparing Strike Groups and military forces for joint combat operations and to demonstrating the ability of those forces to communicate and operate in simulated hostile environments. The JTFEX is a scenario-driven, free play exercise, designed not only to evaluate the performance of the Strike Group, but also its decision-making processes as a whole. JTFEXs are shorter in duration than COMPTUEXs. Sustainment Phase (advanced training) of the Fleet Readiness Training Plan, includes realistic opposing force and electronic threat replication to support training of integrated and joint forces to maintain Strike Group proficiency.

The role of the SCI is to provide a wide range of training opportunities to support the naval mission areas of: Anti-Submarine Warfare (ASW), Anti-Surface Warfare (ASUW), Mine Warfare, Strike Warfare, Surface Warfare, Anti-Air Warfare Training, NSW, and Amphibious Warfare. The following discussion of SCI airfield and waterfront operations is adapted from the SOCAL EIS 2008.

Offshore Training Operations

Training is focused on preparing for worldwide deployment. Naval forces deploy in specifically organized units called Strike Groups. A Strike Group may be organized around one or more aircraft carriers, together with several surface combatant ships and submarines, collectively known as a CSG. A naval force known as a Surface Strike Group consists of three or more surface combatant ships. A Surface Strike Group may also be organized around a MEU embarked on amphibious ships accompanied by surface combatant ships and submarines, known as an ESG. The Navy and Marine Corps deploy CSGs, ESGs, and Surface Strike Groups on a continuous basis. The number and composition of Strike Groups deployed, and the schedule of deployment, is based on the Combatant Commander's worldwide requirements and commitments. Pre-deployment training is governed by the Fleet Readiness Training Plan. The Fleet Readiness Training Plan establishes a training cycle that includes four phases: 1) maintenance; 2) unit level training; 3) integrated training (COMPTUEX and JTFEX); and 4) sustainment.

The offshore ranges and operational areas include: Fleet Training Area Hot, Missile Ranges 1 East and 1 West, Northern Air Operating Area, Laser Training Range, SOCAL missile range, Fire Support Areas, SOAR, the Variable Depth SONAR no notice area, and SHOBA (previously discussed), which has an offshore component. In addition, closer to the shore of SCI are the MTRs, Kingfisher Mine Countermeasures Range, SCIUR, Operational Area 3803, and danger zones, which extend from offshore to nearshore. For more information on training areas, see the SOCAL EIS (2008).

Airspace W-291 is included in the offshore ranges. It is the special use airspace that overlays SCI. Warning Areas are designated airspace for military activities in international airspace, located over the coastal waters of the United States and its territories. Although military activities conducted in Warning Areas may be hazardous in nature, there are no restrictions to flight for non-participating aircraft, since the airspace is over international waters. W-291, which encompasses 388,075 km^2 (113,000 nm^2), is the Navy's most heavily scheduled and utilized training area. FACSFAC San Diego provides scheduling, surveillance, and control of military aircraft operating in the area.

Anti-Submarine Warfare Training

ASW tracking exercises train aircraft, ship, and submarine crews in tactics, techniques, and procedures for search, detection, localization, and tracking of submarines. ASW involves helicopter and maritime patrol aircraft, ships, and submarines. These units operate alone or in combination to locate, track, and neutralize submarines. Controlling the undersea battlespace is a unique naval capability and a vital aspect of sea control. Undersea battlespace dominance requires proficiency in ASW. Every deploying strike group and individual surface combatant must possess this capability.

Various types of active and passive sonars are used by the Navy to determine water depth, locate mines, and identify, track, and target submarines. Passive sonar *listen* for sound waves by using underwater microphones, called hydrophones, which receive, amplify, and process underwater sounds. No sound is introduced into the water when using passive sonar. Passive sonar can indicate the presence, character, and movement of submarines. However, passive sonar provides only a bearing (direction) to a sound-emitting source; it does not provide an accurate range (distance) to the source. Active sonar is needed to locate objects, due to its ability to provide both bearing and range to the detected contact (as an enemy submarine).

The Navy's ASW training plan, including the use of active sonar in at-sea training scenarios, includes multiple levels of training. Individual-level ASW training addresses basic skills, including detection and classification of contacts; distinguishing discrete acoustic signatures, including those of ships, submarines, and marine life; and identifying the characteristics, functions, and effects of controlled jamming and evasion devices.

More advanced, integrated ASW training exercises, involving active sonar, are conducted in coordinated, at-sea operations during multi-dimensional training events involving submarines, ships, aircrafts, and helicopters. This training integrates the full anti-submarine warfare continuum from detecting and tracking a submarine to attacking a target using either exercise torpedoes or simulated weapons. Training includes detection and tracking exercises against enemy submarine contacts; torpedo employment exercises against the target; and exercising command and control tasks in a multi-dimensional battlespace.

Anti-Surface Warfare Training

ASUW is a type of naval warfare in which aircraft, surface ships, and submarines employ weapons, sensors, and operations against enemy surface ships or boats. Aircraft-to-surface ASUW is conducted by long-range attacks, using air-launched cruise missiles, other precision guided munitions, or aircraft cannons. ASUW is conducted by warships employing torpedoes, naval guns, and surface-to-surface missiles. Submarines attack surface ships using torpedoes or submarine-launched, anti-ship cruise missiles.

Training in ASUW includes surface-to-surface gunnery and missile exercises, air-to-surface gunnery and missile exercises, and submarine missile or torpedo launch events. Training generally involves expenditure of ordnance against a towed target. A sinking exercise is a specialized training event providing an opportunity for ship, submarine, and aircraft crews to use multiple weapons systems to deliver live ordnance on a deactivated vessel that was deliberately sunk.

ASUW also encompasses maritime interdiction; that is, the interception of a suspect surface ship by a Navy ship for the purpose of boarding-party inspection, or the seizure of the suspect ship. Training in these tasks is conducted in Visit, Board, Search, and Seizure exercises.

Offshore Research, Development, Test & Evaluation

SPAWAR Pacific conducts RDT&E, engineering, and Fleet support for command, control, and communications systems and ocean surveillance. SPAWAR's tests on SCI include a wide variety of ocean engineering, missile firings, torpedo testing, manned and unmanned submersibles, unmanned aerial vehicles, electronic combat, and other Navy weapons systems. Specific events include:

- Ship Tracking and Torpedo Tests
- Unmanned Underwater Vehicle Tests
- Sonobuoy Quality Assurance/Quality Control Tests
- Ocean Engineering Tests
- Marine Mammal Mine Shape Location and Research
- Missile Flight Tests

The San Diego Division of the NUWC is a Naval Sea Systems Command organization supporting the U.S. Pacific Fleet. NUWC operates and maintains the SCIUR. The NUWC conducts tests, analysis, and evaluation of submarine Undersea Warfare (USW) exercises and test programs. NUWC also provides engineering and technical support for USW programs and exercises; design cognizance of underwater weapons acoustic and tracking ranges and associated range equipment; and proof testing and evaluation for underwater weapons, weapons systems, and components.

Nearshore/Onshore Training Operations

The following discussion addresses nearshore and onshore training conducted on SCI, which in some cases involves movement from the marine to the terrestrial environment.

Amphibious Warfare Training

Amphibious Warfare is a type of naval warfare involving the utilization of naval sea and air space dominance plus firepower and logistics in concert with Marine Corps landing forces, to project military power ashore. Amphibious Warfare encompasses a broad spectrum of maneuver operations from the sea to objectives ashore, ranging from reconnaissance or raid missions with a small unit, to large-scale amphibious operations involving over one thousand Marines and Sailors. Multiple ships and aircraft embark in a Strike Group.

Amphibious Warfare training includes tasks at increasing levels of complexity, from individual, crew, and small-unit events to large task force exercises. Individual and crew training include the operation of amphibious vehicles and naval gunfire support training. Small-unit training operations include events leading to the certification of a MEU as "Special Operations Capable." Such training includes shore assaults, boat raids, airfield or port seizures, and reconnaissance. Larger-scale amphibious exercises involve ship-to-shore maneuver, shore bombardment and other naval fire support, and air strike and close air support training integrated with a ground force's maneuver and fires ashore.

Naval Special Warfare Training

NSW forces (SEALs and Special Boat Units) train to conduct military operations in five Special Operations mission areas: unconventional warfare, direct action, special reconnaissance, foreign internal defense, and counterterrorism. NSW training involves specialized tactics, techniques, and procedures, employed in training events that include insertion/extraction operations using parachutes rubber boats or helicopters; boat-to-shore and boat-to-boat gunnery; demolition training on land or underwater; reconnaissance; and small arms training.

Strike Warfare

Strike Warfare operations include training of fixed-wing fighter/attack aircraft in the delivery of precision- guided and non-guided munitions, rockets, and other ordnance against land targets in all weather and light conditions. Training events typically involve a simulated strike mission with a flight of four or more aircraft. The strike mission may simulate attacks on "deep targets" (i.e. those geographically distant from friendly ground forces), or may simulate close air support of targets within close range of friendly ground forces. Laser designators from aircraft or ground personnel may be employed for delivery of precision guided munitions. Some strike missions involve no-drop events, in which prosecution of targets is simulated with video footage often obtained by onboard sensors.

Explosive Ordnance Disposal

The Explosive Ordnance Disposal mission area involves employment of skills, tactics, and equipment designed to safely render unexploded ordnance. Explosive Ordnance Disposal personnel are highly trained and operate in both tactical and administrative capacities. Tactical missions include safe disposal of improvised explosive devices. Administrative missions include range clearance and ordnance safety in support of operational forces.

Nearshore and Onshore Research, Development, Test & Evaluation

Space and Naval Warfare Systems Center Pacific conducts RDT&E, engineering, and Fleet support for command, control, and communications systems and ocean surveillance. SPAWAR tests on SCI include a wide variety of ocean engineering, missile firings, torpedo testing, manned and unmanned submersibles, unmanned aerial vehicles, electronic combat training, and other Navy weapons systems. Specific events include:

- Ship Tracking and Torpedo Tests
- Unmanned Underwater Vehicle Tests
- Sonobuoy Quality Assurance/Quality Control Tests
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Major Range Events

The Navy conducts large-scale exercises, called major range events, in the SOCAL Range Complex. These exercises are required for pre-deployment certification of naval formations. The composition of the force to be trained and the nature of its mission upon deployment determine the scope of the exercise. The Navy currently conducts up to eight major range events per year in the SOCAL Range Complex.

Major range events bring together the component elements of a Strike Group or Strike Force (that is, all of the various ships, submarines, aircraft, and Marine Corps forces) to train in complex command, control, operational coordination, and logistics functions.

Major range events require vast areas of sea space and airspace for realistic training, as well as land areas for conducting land attack training. The training space required for these events is a function of naval warfighting doctrine that favors widely-dispersed units capable of projecting forces and firepower at high speeds across distances of up to several hundred miles in a coordinated fashion to concentrate on an objective. The three dimensional space required to conduct a major range event involving a CSG or ESG is a complicated polygon covering an area as large as 50,000 nm^2 (171,715 km^2). The space required to exercise an Expeditionary Strike Force is correspondingly larger.

A major range event is composed of several unit level range operations conducted by several units operating together while commanded and controlled by a single commander. These exercises typically employ an exercise scenario developed to train and evaluate the Strike Group/Force in required naval tactical tasks. In a major range event, most of the operations and activities directed and coordinated by the Strike Group commander are identical in nature to the operations conducted in individual, crew, and smaller-unit training events. In a major range event, however, these disparate training tasks are conducted in concert, rather than in isolation.

For example, within a single exercise scenario a CSG could conduct a coordinated ASW operation in which several ships and aircraft work together to find and destroy an enemy submarine, while Marine forces, surface combatant ships, and/or aircraft conduct a coordinated air and amphibious strike operation against objectives ashore. While exercise scenarios for different major range events would be similar in some or many operational respects, they would not be identical. Operations are chosen to be included in a given major range event based on the anticipated operational missions that would be performed during the Strike Group's deployment, and other factors, such as the commander's assessment of the participating units' state of readiness.

Major range events include the following: Integrated ASW Course Phase II, COMPTUEX, JTFEX, and Surge Exercise (SURGEX).

Integrated Anti-Submarine Warfare Course Phase II

The Integrated ASW Course (formerly Maritime Integrated Tailored Training [MITT]) exercise is directed by the Fleet ASW Command and is performed after completion of Unit Training Phase, prior to COMPTUEX/ESG COMPTUEX. The MITT Exercise is nominally seven days long (five to ten days, depending on specific training requirements) and its purpose is to increase war-fighting proficiency by training CSGs, ESGs, and theater assets in integrated ASW and USW. CSG and ESG participants include the Sea Combat Commander staff, surface ships, submarines, and fixed and rotary anti-submarine warfare aircraft (Sea-Based ASW Helicopter on Aircraft Carrier, Sea-Based ASW Helicopter on Surface Combatant, Fixed Wing Land-Based ASW Patrol Aircraft, and Fixed Wing Sea-Based ASW Aircraft). During MITT, the Sea Combat Commander defends CSG or ESG units against hostile surface and submarine threats. Participants receive feedback after each range event with Navy Mission Essential Task List-based metrics and standards to improve integrated ASW/USW tactics, mission performance, and effectiveness.

Composite Training Unit Exercise

The COMPTUEX is an Integration Phase, at-sea, major range event. For the CSG, this exercise integrates the aircraft carrier and carrier air wing with surface and submarine units in a challenging operational environment. For the ESG, this exercise integrates amphibious ships with their associated air wing, surface ships, submarines, and MEU. Live-fire operations that may take place during COMPTUEX include long-range air strikes; Naval Surface Fire Support; and surface-to-air, surface-to-surface, and air-to-surface missile exercises.

The MEU also conducts realistic training based on anticipated operational requirements and to further develop the required coordination between Navy and Marine Corps forces. Special Operations training may also integrate with the exercise scenario. The COMPTUEX is typically 21 days in length. The exercise is conducted in accordance with a schedule of events, which may include two one-day, scenario-driven, *mini* battle problems, culminating with a scenario-driven three-day final battle problem. COMPTUEX occurs three to four times per year.

Joint Task Force Exercise

The JTFEX is a dynamic and complex major range event, the culminating exercise in the Integrated Phase training for the CSGs and ESGs. For an ESG, the exercise incorporates an Amphibious Ready Group Certification Exercise for the amphibious ships and a Special Operations Capable Certification for the MEU. When schedules align, the JTFEX may be conducted concurrently for an ESG and CSG. JTFEX emphasizes mission planning and effective execution by all primary and support warfare commanders, including command and control, surveillance, intelligence, logistics support, and the integration of tactical fires. JTFEXs are complex scenario-driven exercises that evaluate a Strike Group in all warfare areas. JTFEX is normally ten days long, not including a three-day in-port Force Protection Exercise, and is the final at-sea exercise for the CSG or ESG prior to deployment. JTFEX occurs three to four times per year. Elements of a typical JTFEX are illustrated in Figure 2-1.

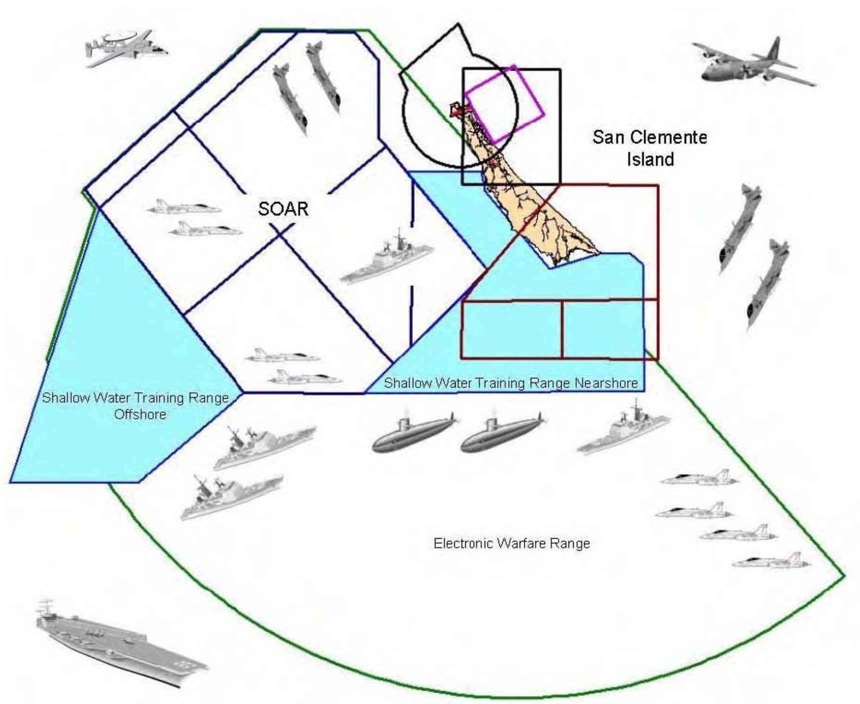


Figure 2-1. Elements of a typical Joint Task Force Exercise (Navy 2005).

Surge Exercise

The SURGEX is a recently developed (late 2003) Fleet Readiness Training Plan exercise that is designed to maintain CSG or ESG readiness and proficiency in situations where groups complete JTFEX and are not immediately deployed. World events or the National Command Authority determines when there is a requirement to deploy the CSG or ESG. If they are not deployed as originally planned, their readiness and proficiency will decay without periodic repetitive training. SURGEX is designed to reset their readiness to levels achieved immediately after JTFEX. SURGEX is normally eight days in length, conducted in the SOCAL Range Complex, and is primarily oriented toward maintaining CSG and ESG readiness and proficiency.

2.2.5 Security, Safety, and Other Restricted Zones

Several coastal areas in and around SCI have been identified in the Code of Federal Regulations as restricted to Navy vessels or as presenting a significant hazard to mariners. These restricted, safety, security, and danger areas are identified in Map 2-6. These areas are described in Title 33 of the Code of Federal Regulations. The descriptions in the regulation provide notice to mariners about hazards to the operation of vessels in the vicinity of SCI.

The security zone, restricted anchorage, safety zone and restricted area in the vicinity of Wilson Cove are continuously restricted. Public access is restricted in Safety Zone Section G off the northwest portion of SCI. The Wilson Cove Exclusive Use Zone is used extensively by Navy ships for anchorage and port facilities. The West Cove Restricted Area precludes anchorage by ships to avoid damage to underwater cables laid on the seafloor supporting the acoustic sensors on the SOAR range.

To protect the public from potentially hazardous training and testing activities, and to ensure the military's sustained use of the waters around SCI, the U.S. Coast Guard established a 3-nm (6-km) Safety Zone around SCI in 2010. In an effort to ensure public safety, while still optimizing the public's access to these waters, the Safety Zone is divided into eight sections. The public is restricted from entering only those sections scheduled for potentially hazardous military activities while still retaining access to unscheduled sections. This approach was developed to prevent having to restrict all offshore areas for a single scheduled training activity anywhere around SCI. The segmented configuration provides the public with access to areas not scheduled for potentially hazardous operations, while ensuring the military's continued use of the waters for critical naval training.

Some of the designated zones are not in effect on a continuous basis, and when not in use by the Navy, are accessible to the public. This is done for protection of vessels from the extensive firing and demolition activities that can occur in these areas. When areas are scheduled to be active, a *Notice to Mariners* is published to inform the public. This information can be obtained at the website www.scisland.org or by telephone (619) 545-6536. A summary of the formal access regulations published in navigation regulations of The U.S. Coast Pilot 7 45th Edition (U.S. Department of Commerce 2012).

2.3 Other Land Uses

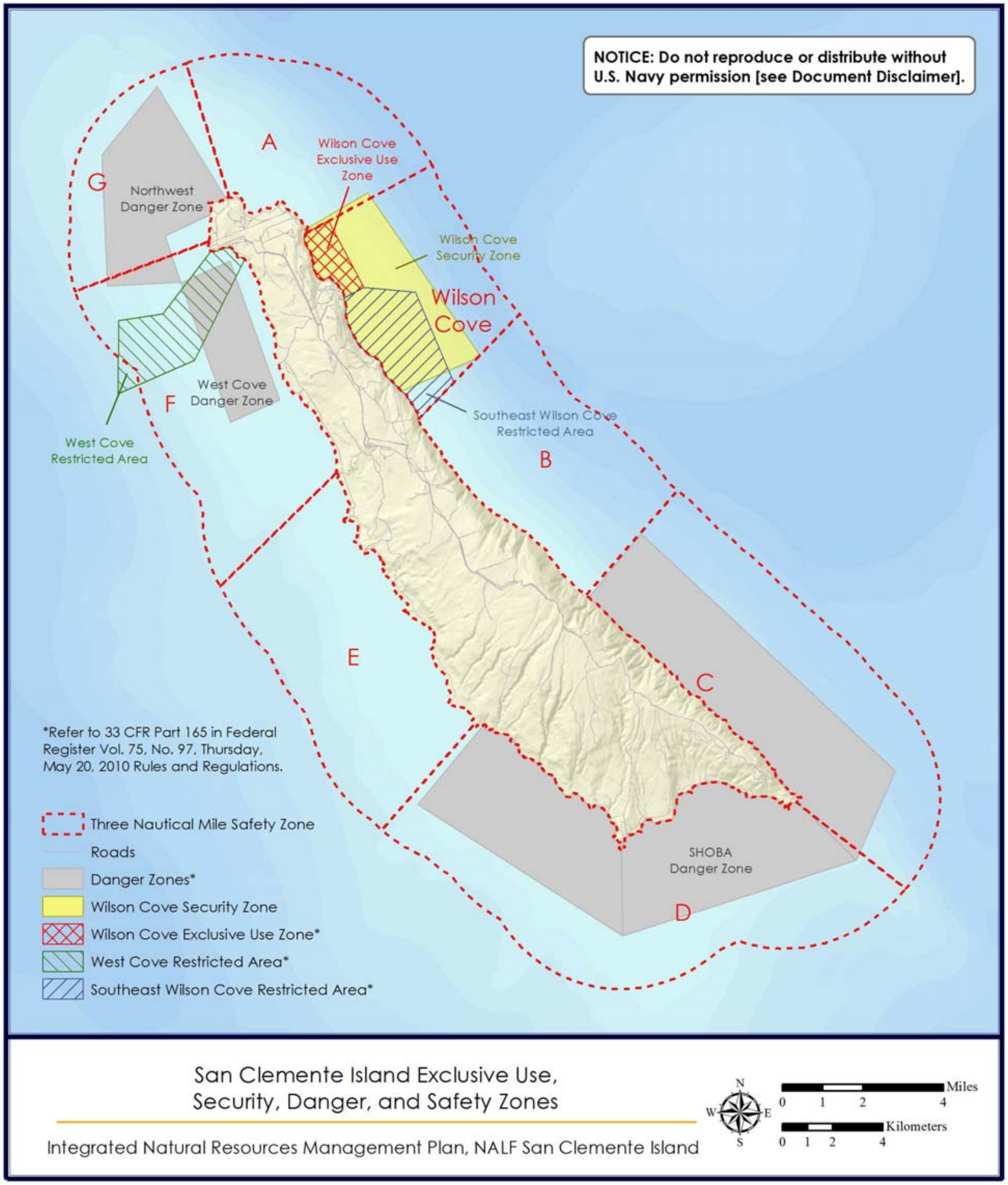
- Landscaping and vegetation exists around several developed facilities on the island (Section 3.10 Landscaping and Grounds Maintenance).
- There are 17 installation restoration sites addressed through the Resource Conservation and Recovery Act as of 2010 (Section 4.5.1 Environmental Restoration Program).
- Outdoor recreational opportunities exist on SCI for military and SCI personnel (Section 4.3.3 Outdoor Recreation and Environmental Education for On-Island Personnel).
- SCI is a popular fishing site for fishermen and aquaculturists given the highly productive waters surrounding the island (Section 4.3.2 Public Access and Outreach).
- Recreational diving by the public in SCI nearshore waters is popular due to its clear waters and diverse marine life (Section 4.3.2 Public Access and Outreach).

2.4 Future Land Use Patterns and Plans

Proposed projects for the island are incorporated into the SCI Master Plan (as funding allows) and include the following:

- Replacement of fuel storage and distribution system
- Construction of wind and solar equipment
- Construction of fire station berthing
- Construction of a new concrete pad and taxiway
- Construction of aircraft and maintenance facility
- Construction of terminal
- Extension of the Wilson Cove Pier
- Installation of a reverse osmosis system

1



2 *Map 2-6. San Clemente Island security and other restricted zones.*

There are additional plans to extend the West Coast SWTR. The purpose of the extension is to support Fleet readiness through training and tactical development of submarine, surface ship, and aircraft ASW and mine warfare. The extended SWTR (Map 2-7) would provide underwater instrumentation for two additional areas: one 226.2 nm^2 [776.8 km^2] and west of the current SOAR and the other 129.7 nm^2 [445.4 km^2] and east of the current SOAR. If installed in these areas, use of the SWTR would increase the use of ASW training involving mid-frequency active sonar.

2.5 Regional Planning Jurisdictions

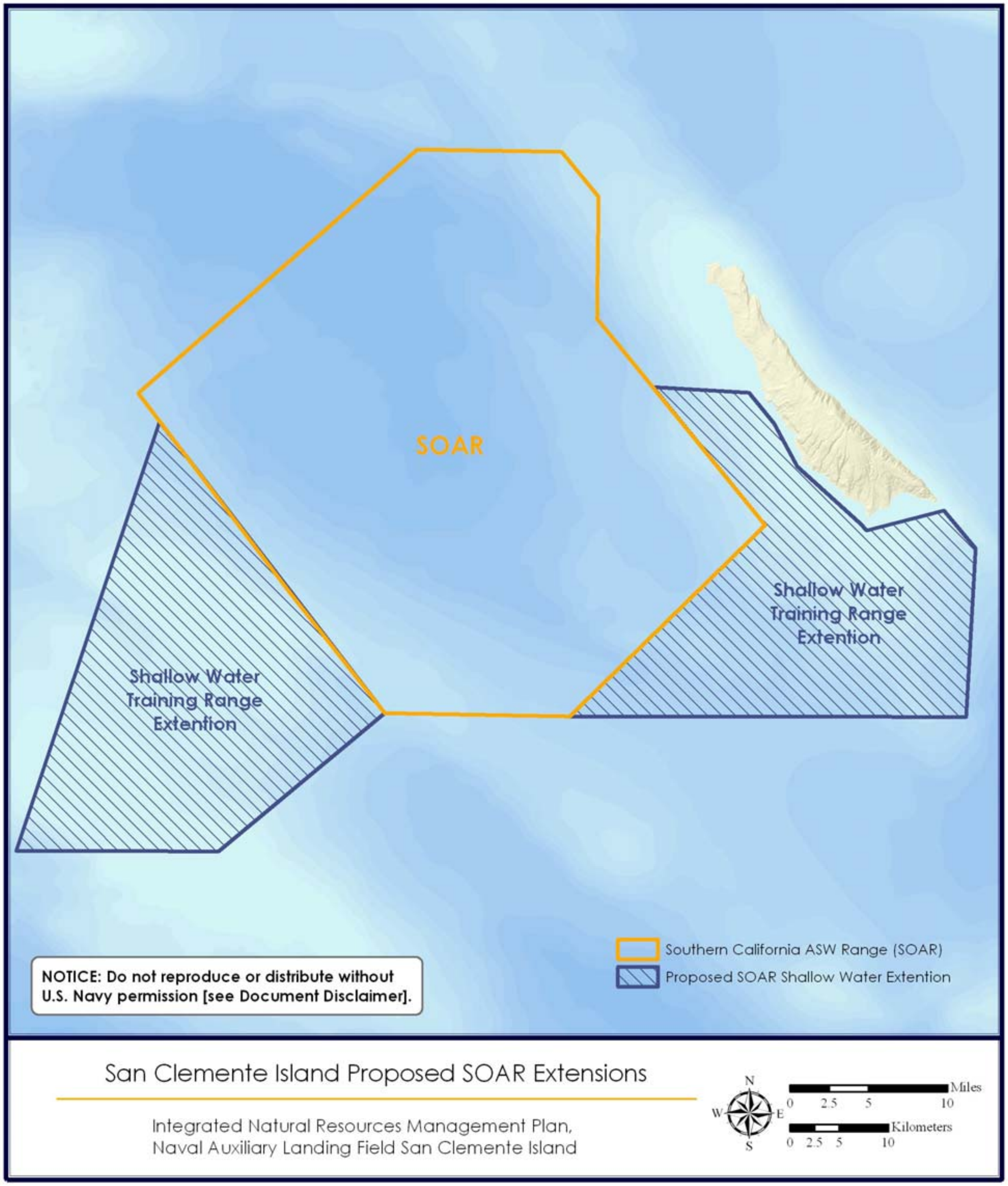
2.5.1 Ownership and Control

The U.S. Department of Commerce acquired control and jurisdiction of SCI for lighthouse purposes through Executive Orders (EOs) dated 11 September 1854 and 26 January 1867. In the 1930s, President Franklin D. Roosevelt transferred control and jurisdiction of SCI from the Secretary of Commerce to the Secretary of the Navy on 07 November 1934, by EO 6897. This EO formalized the Navy's control and jurisdiction of the island to the mean high tide line. In 1937, President Roosevelt established a “Defensive Sea Area” from the low water mark extending out for a distance of 300 yards (275 m) for purposes of national defense through EO 7747. This EO gave the Secretary of the Navy the authority to revoke access by vessels or other craft within this boundary.

Ten years after its establishment, President Harry Truman discontinued the “San Clemente Island Naval Defensive Sea Area” through EO 9894 dated 23 September 1947. In the following decade, the island became embedded within a patchwork of underwater test ranges encompassing the nearshore and offshore waters of SCI. The underwater ranges were enlarged in the 1960s into SCORE for underwater tests and anti-submarine training. In subsequent years and decades, additional safety and security restrictions to vessel or craft access were added, due to Naval exercises in the SOCAL Range Complex, available to mariners on the National Oceanic and Atmospheric Administration chart for the island and in Chapter 2 of the U.S. Coast Pilot.

Below the Mean Lower Low Water mark and seaward to 3 nm (6 km), waters and submerged lands are owned by the State of California. Although owned by the state, the federal government has what amounts to an easement on submerged lands and navigable waters (below ordinary high-water mark), including for dredging or construction of facilities, based on an authority called navigational servitude. This authority originates from the constitutional power over interstate and foreign commerce, and the control and improvement of navigation.

All offshore rocks (See Section 3.8.4 Offshore Rocks and Islets for a description of offshore rocks) within the SCI management footprint are management by the Bureau of Land Management under the California Coastal National Monument. A Memorandum of Understanding was signed in 2007 between the Navy and the Bureau of Land Management regarding the California Coastal National Monument. Under the Memorandum of Understanding, the Navy agreed to serve as a steward for the portion of the California Coastal National Monument off the shoreline of SCI.



Map 2-7. Proposed location of Shallow Water Training Range extensions of the Southern California Anti-Submarine Warfare Range.

For in-water construction, bulkhead lines are usually within federal property boundaries and are not at issue. However, pierhead boundary limits are defined for construction and fill planning purposes so as to avoid impacts to navigation, the protection of which is enforced by the U.S. Coast Guard. Federal code refers to them as “federal control lines,” and the U.S. Army Corps of Engineers refers to them as “Navigational Impact Lines.” There is no precise distance from shore defined, but the U.S. Coast Guard must concur that any construction will not affect navigation.

2.5.2 Jurisdictional Boundaries

A summary of jurisdiction and ownership is depicted in Figure 2-2.

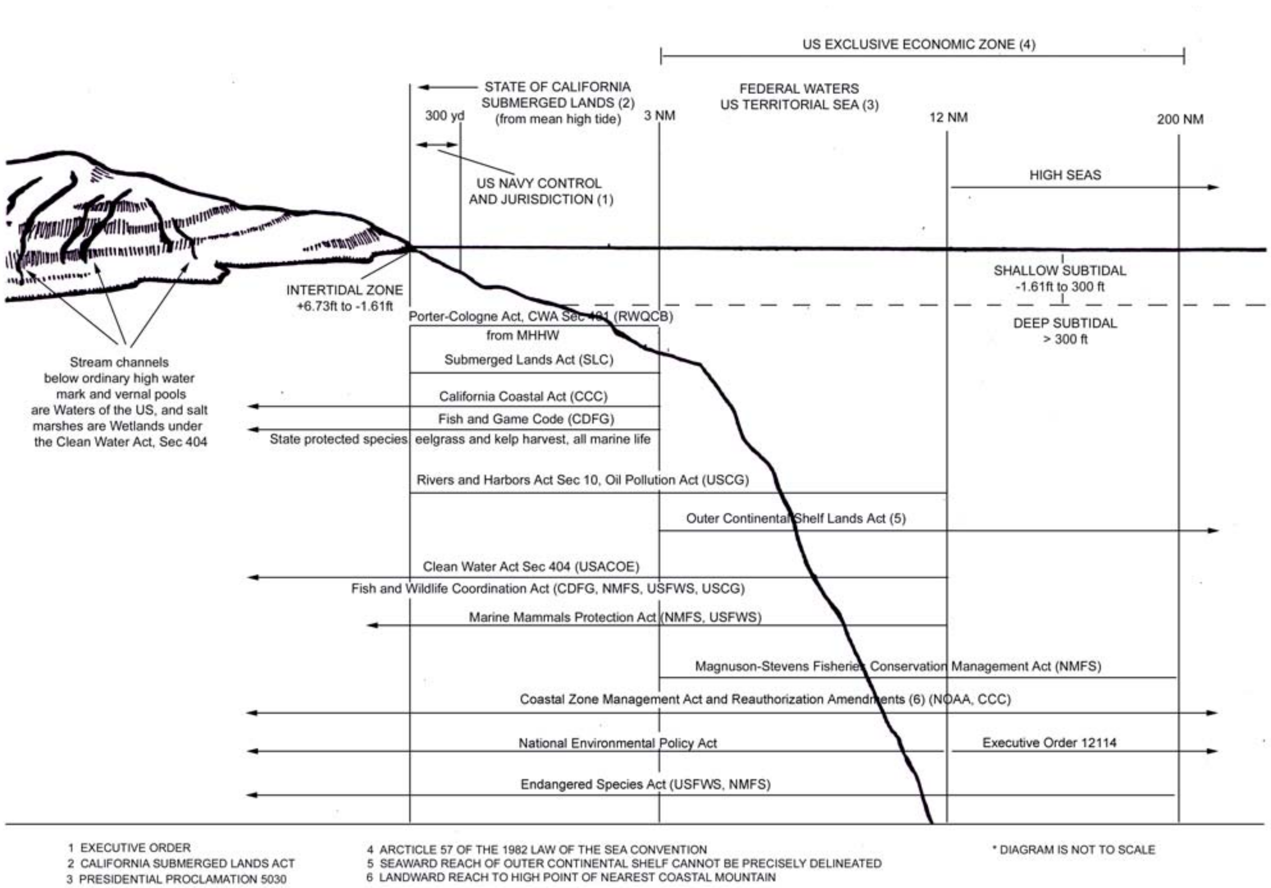


Figure 2-2. Legal control and jurisdictions relevant to managing the San Clemente Island Range Complex.

3.0 Natural Resource Condition and Management Strategies

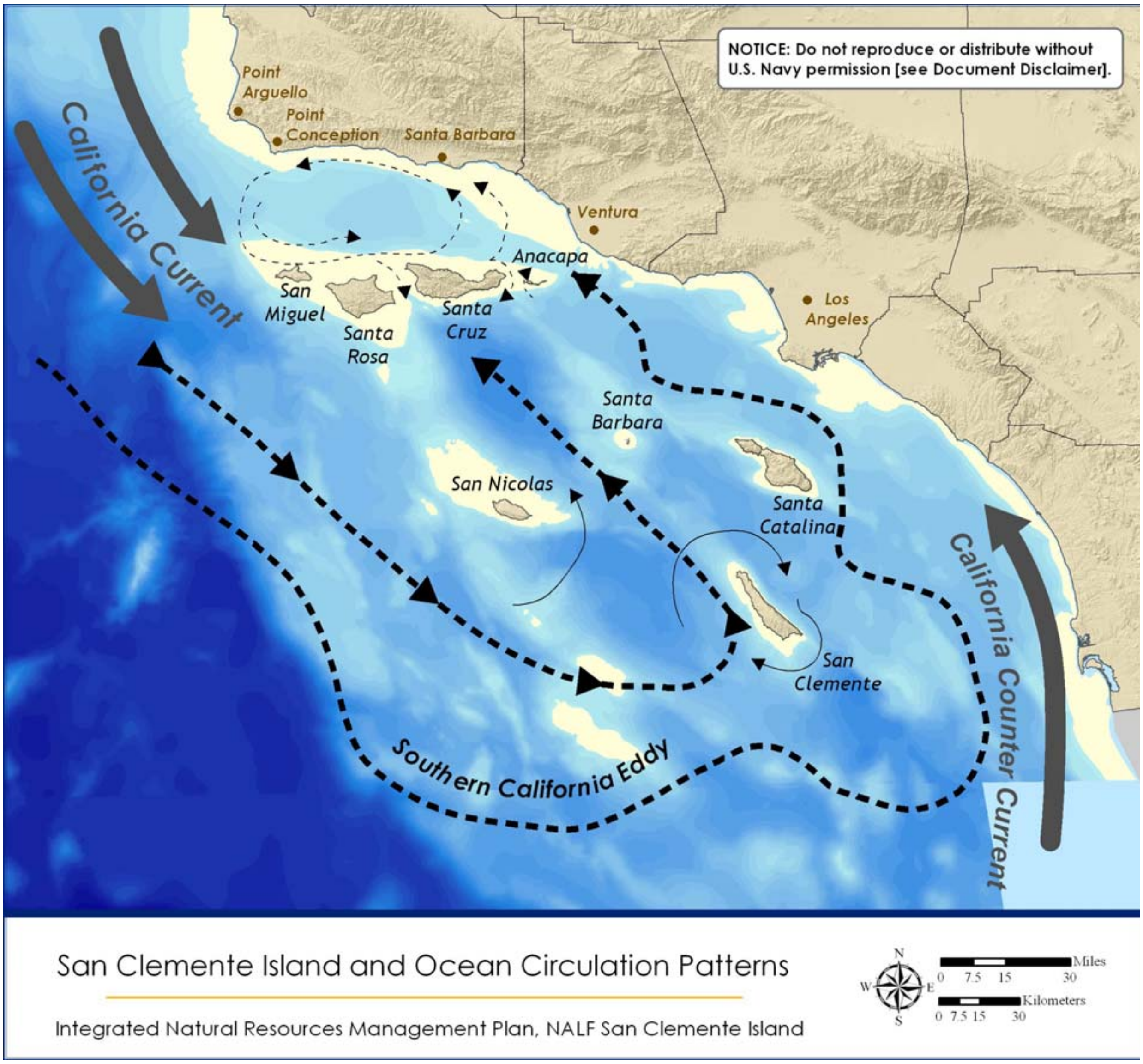
Management of San Clemente Island's natural resources demands an understanding of the island's ecology. This chapter is intended to provide managers with current status and trends of natural resources found on San Clemente Island, and describes and assesses management. It then sets objectives and provides strategies for achieving each objective.

3.1 Ecoregional Setting

San Clemente Island (SCI) and its surrounding waters are located in the Southern California Bight (SCB). The SCB is a recessed curve in the southwestern California coastline from Point Conception in Santa Barbara County to just south of the United States–Mexican border (Map 3-1). SCI is the southern-most island in the California Channel Islands, an archipelago of eight islands located within the SCB. The Channel Islands are separated into northern islands and southern islands. The northern group of Channel Islands includes San Miguel, Santa Rosa, Santa Cruz, and Anacapa Islands. The southern group of Channel Islands consists of San Clemente, Santa Barbara, San Nicolas (SNI), and Santa Catalina Islands.

San Miguel, Santa Rosa, Santa Cruz, Anacapa, and Santa Barbara Islands were made into the Channel Islands National Park (CINP) in 1980. Santa Catalina Island is the only island with significant permanent civilian settlement. A large portion of Santa Cruz Island, the largest of the Channel Islands, is owned by The Nature Conservancy.

The marine region of the SCB is among the most productive and diverse in the world due to a unique water circulation pattern. The SCB is influenced by two major oceanic currents: the southward-flowing, cold water California Current and the northward-flowing, warm water California Counter-Current (See Map 3-1). Warm equatorial waters flow up from the south eddy nearshore along the coastline, while subarctic waters flow south from Point Conception to create cool offshore water conditions. For marine species, the SCB represents a mixing zone, where the northern range of many tropical species and the southern terminus for temperate species share waters.



Map 3-1. Channel Islands and the adjacent mainland. The intermediate beige tone surrounding each island approximates the extent of the islands at sea level minima (17,000-18,000 years before present). The large southward pointing arrows (dark) represent the California Current. The large northward pointing arrow (grey) indicates the California Counter-Current. The large dashed lines indicate the Southern California Eddy. The small dashed lines indicate a small eddy flow in the Santa Barbara Channel (Modified and combined from Seapy and Littler 1980; and Browne 1994).

Cyclical seasonal phenomena also contribute to the richness of the marine biological diversity present within the SCB. An upwelling current in the SCB occurs from February or March through August. High nutrient levels, combined with increasing day length and light intensity, produce exceptionally high phytoplankton and algal production. Thorough and frequent mixing of these waters creates conditions to support a rich, varied marine flora and fauna year-round (Leatherwood et al. 1987). This increase in food supply supports greater numbers of fish, shellfish, and other marine life.

3.2 Ecological Isolation and Consequences for Island Communities

On SCI, food webs have been disrupted by an introduction of feral mammals, non-native species, and other effects of human disturbance. Competition from non-native, annual grasses and the presence of short fire intervals altered or disrupted present vegetation communities. This affects the ability of primary and secondary consumers to locate food and protective cover. For example, it is believed that one of the reasons for the historic decline of the San Clemente loggerhead shrike (*Lanius ludovicianus mearnsi*) was the lack of suitable woody vegetation used for nesting sites during a period when feral herbivores decimated island habitats (Scott and Morrison 1990). Additionally, in the marine environment, humans have over-harvested populations of primary consumers, such as abalone, which could have unknown effects on populations of both producers and higher consumers.

Since SCI is an oceanic island originating from volcanic activity at the sea floor three million years ago, all plants and animals that populate the island originated from the mainland. To get to the island, plants and animals had to find a mode of transportation (e.g., flying/floating, ocean currents, rafting, hitch hiking).

When an organism reaches an island it is often presented with slightly different conditions than are found on the nearby mainland. For example, the island may have a different climatic pattern or a different geologic history, which in turn will affect the island's soil types and vegetation. In addition, competition and predation are often less prevalent because island communities support fewer species overall than their mainland counterparts. If there are vacant niches to occupy or new habitats to expand into, this lack of competition will allow organisms to become established and diversify. This diversification can lead a species down a different evolutionary path than its mainland or neighboring island counterpart, resulting in one or more new species or subspecies. The new species or subspecies is now considered endemic to that area, meaning it is unique and found only in the place in which it evolved. This process is referred to as adaptive radiation.

The relatively high number of endemic land snail species, 17 out of 23 total species (Cohen 1978), found on the Channel Islands is a good example of adaptive radiation. Even though terrestrial snails cannot disperse easily across the ocean, they have diversified once becoming established on an island.

SCI harbors more endemic species than any other island in the Channel Islands archipelago (Table 3-1). Unlike most other Channel Islands, SCI has not been completely covered by the ocean during times of high sea level, due to its relatively high relief. Consequently, many species currently inhabiting the island have been present for millions of years.

Islands may also contain relictual endemic species, which are the living remnants of species that have become extirpated on the mainland. On three Channel Islands, including SCI, the Santa Cruz Island ironwood (*Lyonothamnus floribundus* subsp. *aspleniifolius*) represents the last surviving individuals of the species, which were formerly widespread on the mainland (Bushakra et al. 1999). After the last ice age, the mainland individuals were presumably unable to cope with the new warmer and drier climate present in California. While on the islands, the species survived in what remained a slightly cooler and foggier climate (Schoenherr et al. 1999).

Table 3-1. Number of endemic species (including subspecies) within the San Clemente Island footprint.

Group	Total Number of Species on SCI[a]	SCI Endemics	Channel Islands Endemics [b]	Number of Federally- or State-Listed [c]
Terrestrial Invertebrates	536	20	21	0
Reptiles	2	0	1	1
Native Resident Breeding Birds	30	2	5	2
Terrestrial Mammals	6	2 [d]	1	1
Marine Invertebrates	92	0	0	2
Marine Vertebrates	55	0	0	5
Vascular Plants	272	14	29	8
Total	993	38	57	20

[a] Total number of species currently identified. Some taxonomic groups may not have been adequately surveyed at this time.
[b] No overlap of SCI endemics and Channel Island endemics unless stated.
[c] Federally-listed species are listed under the Endangered Species Act. State-listed species are listed under the California Endangered Species Act.
[d] Subspecies of island fox and deer mouse are endemic to SCI. Fox species that are endemic to the Channel Islands are counted in both columns.
Sources: M. Booker, pers. com. 2011; CINP 2004a, 2004b; Merkel 2007; Institute for Wildlife Studies 2010; TDI 2009, 2010, 2011a, 2011b.

Endemic island populations are often considered high priority for conservation because of their vulnerability to extinction. Small, isolated populations are vulnerable to extinction for a number of reasons. A resulting population with little genetic variability may be unable to respond to sudden environmental change or the introduction of a disease (Simberloff 1988, 1994). Within a population, the higher the genetic variability, the better the chance that at least some individuals will adapt to changing conditions. Small populations are also vulnerable to extinction from singular catastrophes. Large-scale, catastrophic events, such as hurricanes, devastating fires, or droughts, can affect an entire island and leave few places untouched. Extinction may be the direct result of a catastrophe or an indirect result of the further shrinking of an already small gene pool.

In addition, further shrinking of the gene pool can occur when rare alleles are lost to a population through genetic drift. Genetic drift is a random fluctuation in allele (two or more expressions of the same gene in the gene pool) frequency that occurs in most populations. In small, isolated populations, genetic drift results in the random loss of genetic diversity. Its expression in small, isolated populations can result in deleterious effects and the collapse of the remnant population.

Island species may also be particularly susceptible to the introduction of non-native species. Frequently, island species evolve without the presence of many predators or competitors, which may inhabit the mainland. Consequently, when a new species is introduced to an island ecosystem, native species may not have defenses to protect themselves from predation or the ability to compete with a new threat. The new threat may come in the form of a disease. The introduction of non-native species to islands by humans has been devastating to many island species, both as a direct result of predation and competition and indirectly from habitat destruction. Overall, there is often a combination of factors acting synergistically that may lead to the extinction of a species.

3.3 Ecosystem Management

Current Management

Per U.S. Department of Defense (DoD) Instruction (DoDINST) 4715.03 (18 March 2011), the U.S. Department of the Navy (Navy) is required to approach natural resources management from an ecosystem management perspective. DoDINST 4715.03 defines ecosystem management as “a goal-driven approach to managing natural and cultural resources that supports present and future mission requirements; preserves ecosystem integrity; is at a scale compatible with natural processes; is cognizant of nature's timeframes; recognizes social and economic viability within functioning ecosystems; is adaptable to complex and changing requirements; and is realized through effective partnerships among private, local, state, tribal, and federal interests. Ecosystem-based management is a process that considers the environment as a complex system functioning as a whole, not as a collection of parts, and recognizes that people and their social and economic needs are a part of the whole.”

The Navy’s removal of feral grazers at SCI was the single most effective ecosystem management action taken on the island. Current management is heavily oriented toward the conservation of federally-listed species. SCI incorporates ecosystem management (DoDINST 4715.03) indirectly through compliance with federal laws such as the Endangered Species Act (ESA), Migratory Bird Treaty Act (MBTA), Marine Mammal Protection Act (MMPA), and Magnuson-Stevens Fishery Conservation and Management Act (MSA).

Some examples of ecosystem-based management conducted on SCI include:

- Natural resources personnel conduct invasive species control, non-native predator control, erosion control, and implement the Integrated Pest Management Plan (IPMP) (Navy 2009d) to reduce negative impacts to habitats.
- Wildland fire management planning and fuelbreak installation.
- Nursery propagation and outplanting of non-listed species.
- Non-native predator control in support of the San Clemente Loggerhead Shrike Recovery Program.
- A video and pamphlet is shown to island visitors, including military personnel, civilians, and contractors, about natural resources on the island and possible non-compliance consequences to the military mission.
- Avoidance and minimization measures implemented through the Site Approval Process and Best Management Practices (BMPs) are used for routine maintenance, as well as newly proposed activities and projects. See Figure 4-1 for a flow chart of the Site Approval and Project Review Process.
- Long-term monitoring and natural resources programs, including kelp forest monitoring and the Loggerhead Shrike Recovery Program, among others.
- Resource management plans and agreements (e.g., wildland fire management, fox conservation, and clean water compliance programs).
- Implementation of Naval Safety Zones (NSZs) (i.e., Safety Zones Wilson Cove and G). These safety zone restrictions include access restrictions for the general public, commercial and recreational fishing/diving (for the public), and fishing restrictions for SCI personnel.

- Continued cooperative relationships among the National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), and California Department of Fish and Wildlife (CDFW). The NMFS has ongoing research monitoring pinniped species that haul out and breed on SCI. The USFWS and NMFS collaborate with natural resources managers on research related to ESA-listed species. The CDFW is currently working on pink and green abalone surveys and water quality monitoring.
- Cooperative partnerships support the application of best available science for adaptive management. Examples include: collection of weather data by California State University Northridge (CSUN), weed eradication completed by the Channel Islands Restoration Group, kelp forest surveys conducted by University of California Santa Barbara, black abalone (*Haliotis cracherodii*) surveys conducted by University of California Santa Cruz (UCSC), and kelp forest surveys in NSZs by Occidental College. Future partnerships include rocky intertidal monitoring in safety zones, which are planned for 2013 by University of California Santa Barbara and UCSC, and safety zone habitat mapping to be performed by California State University Monterey Bay.
- Continued use of Geographic Information System (GIS) for natural resources management.

Assessment of Resource Management

- Since the removal of feral goats from SCI in 1992, vegetation communities have been recovering very well towards pre-grazing conditions. Natural resources personnel should allow the natural progression of habitats to continue with the periodic control of erosion and non-native species.
- Although terrestrial habitats on the island have recovered significantly from historic grazing from feral mammals, there are still many threats to island communities, including invasion by non-native species, climate change, military activities, and human-induced fires.
- Wildland fire management planning and fuelbreak installation provide habitat and species conservation.
- Nursery propagation and outplantings of non-listed species contributes to habitat recovery and improved knowledge on how to assist recovery of endemic species.
- The management of federally-listed species may indirectly and positively affect other non-listed species and perhaps a greater proportion of the island ecosystem. For example, non-native predator control, in support of the San Clemente Loggerhead Shrike Recovery Program, benefits other native species.
- Focused species population surveys help document important abundance and trends of ESA-listed species and biodiversity of the habitat.
- Resource management plans and agreements (e.g., wildland fire management, fox conservation, and clean water compliance programs) contribute to habitat-level conservation and reduce threats to biodiversity.
- Implementation of NSZs complement the state’s efforts to implement provisions of the California Marine Life Protection Act (MLPA).
- Partnerships in habitat management benefit natural resources programs at SCI, such as the Channel Islands weed eradication group that volunteers on various islands.
- Continued use of GIS for natural resources management helps integrate, organize, and analyze data at multiple scales, consistent with an ecosystem approach. This

supports the application of best available science under the National Environmental Protection Agency (NEPA).

- While ecosystem management is the required approach stipulated by the Sikes Act (as amended, 2012), the SCI Natural Resources Office (NRO) must meet important compliance requirements related to ESA-listed species. Current demands of NRO staff are concentrated on species-specific recovery and working with military operators on compliance with the Southern California (SOCAL) Range Complex Environmental Impact Statement (EIS) (Navy 2008) and the USFWS Biological Opinion (BO) (FWS-LA-09B0027-09F0040) on SCI Military Operations and Fire Management Plan (USFWS 2008a).
- SCI has a range of terrestrial and marine natural resources monitoring programs, which provide valuable status and trends information on individual species and habitats. This monitoring helps to form a foundation for development of an effective ecosystem management approach.

Management Strategy

Objective: *Conserve essential ecological functions and services, including endemic biodiversity, with the maximum ecological benefit, while ensuring a full spectrum of military use possibilities.*

I. Monitor the ecosystem using terrestrial and marine indicators.

  A. Use Integrated Natural Resources Management Plan (INRMP) objectives to answer annual metrics questions.

II. Plan for and conserve natural resources at various ecological and hierarchical spatial scales.

III. Assess natural resources status and trends over time using long-term regional data.

IV. Support effective regional partnerships to protect ecosystem integrity and services while providing for the military mission (DoDINST 4715.03).

  A. Participate in or encourage consistency with regional monitoring protocols to derive additional interpretive power from Navy data sets.

  B. Support cooperative research to support natural resources management.

  C. Support regional (e.g., Channel Islands) biosecurity planning and coordinating efforts.

V. Promote adaptive management through the annual review of the INRMP, when necessary, to reflect changes in the natural environment, military use, and/or the regulatory requirements.

3.4 Climate and Climate Change

Climate and weather patterns influence natural resources seasonally and annually on the Channel Islands, including SCI. Even when all other conditions are favorable, the distribution and condition of the native terrestrial plant communities are driven by climate.

Regional Climate

The climate of the Channel Islands is characterized as Mediterranean with dry summers, winter rains, and mild temperatures for most of the year (Miller 1985). Strong winds and heavy fogs are also characteristic of the Channel Islands environment. Long-term climatic influences include El Niño-Southern Oscillation (El Niño), Pacific Decadal Oscillation (PDO), and climate change.

The recurring El Niño pattern is one of the strongest in the ocean-atmosphere system. El Niño is defined by relaxation of the trade winds in the central and western Pacific, which can set off a chain reaction of oceanographic changes in the eastern Pacific Ocean. El Niño events are generally characterized by increases in ocean temperature and sea level, enhanced onshore and northward flow, and reduced coastal upwelling of deep, cold, and nutrient-rich water. Rainfall is also elevated during El Niño events (National Oceanic and Atmospheric Administration 2012a). The intensity and duration of El Niño is variable as are its effects on the environment. El Niño often causes a decrease in plankton abundance, resulting in a decrease in survivorship and reproductive success of planktivorous invertebrates and fishes. During this time, marine mammals and seabirds, which feed on these organisms, may experience widespread starvation and decreased reproduction.

The PDO is a climate index based upon patterns of variation in sea surface temperature of the North Pacific from 1900 to the present (Mantua et al. 1997). The PDO is often referred to as in one of two phases, a warm phase and a cool phase, according to the sign of sea surface temperature anomalies along the Pacific Coast of North America. Warm and cold phases can persist for decades. This shift in temperature may affect the abundance and distribution of many species throughout the food chain.

Climate Change

While the Earth's climate has undergone shifts over the course of history caused by natural factors, such as volcanic eruptions and solar activity (U.S. Environmental Protection Agency [EPA] 2011), recent human activities, such as the burning of fossil fuels and deforestation, are starting to drive a shift in global climate. Through the increased release of greenhouse gases such as carbon dioxide, average surface temperatures have increased by 1.2–1.4 degrees Fahrenheit (°F) in the last 100 years (EPA 2011). Additionally, all of the world's oceans have warmed considerably over the last 50 years (Levitus et al. 2000, 2009). Although this warming is partially obscured by interdecadal climate shifts, the overall trend shows a marked increase in global ocean heat content. Climate change can also be observed through changes in rainfall patterns, snow and ice cover, and sea level.

Shifts in climatic patterns can have profound effects on both marine and terrestrial biota in a variety of ways (Parmesan et al. 2000):

- Phenological shifts in seasonal patterns, such as hibernation, flowering, migration, and breeding season.
- Distributional shifts either poleward or upward in elevation as temperatures rise and flora and fauna populations shift to track optimal conditions.

It is unknown how climate change will affect the flora and fauna of the Channel Islands, particularly populations of island endemics with limited distribution and/or narrow microhabitat requirements.

Regional Weather Patterns

Diurnal differences in air temperature are generally small and characterized by relatively cool days and warm nights. Air temperatures are coolest in February and warmest near September (Yoho et al. 2000). Although days in early summer may be frequently cloudy, summer is characterized by a lack of moisture. Ninety-five percent of annual precipitation falls between November and April (Yoho et al. 2000). Temperature regimes and precipitation vary from north to south, largely driven by ocean currents and wind patterns (Junak et al. 2007) such that SCI, as the southern-most Channel Island, is considerably more arid than Catalina Island, just to the north (Figure 3-1). The outer coastal waters around SCI are typically warmer than the water around the northern Channel Islands.

Much of the rain that falls regionally originates in the winter with frontal storms advancing from the northwest (Yoho et al. 2000). Air flow in the region is typically northwesterly; northwest winds are strongest and most constant during warm months. In advance of winter storms, regional winds are commonly southeasterly, shifting northwesterly as a storm passes. Relative humidity generally varies throughout the day, often reaching 100% at night and in the early morning hours, declining to about 60% as the afternoon drying effects of solar radiation increases. Relative humidity drops considerably during Santa Ana conditions in fall and winter (Yoho et al. 2000).

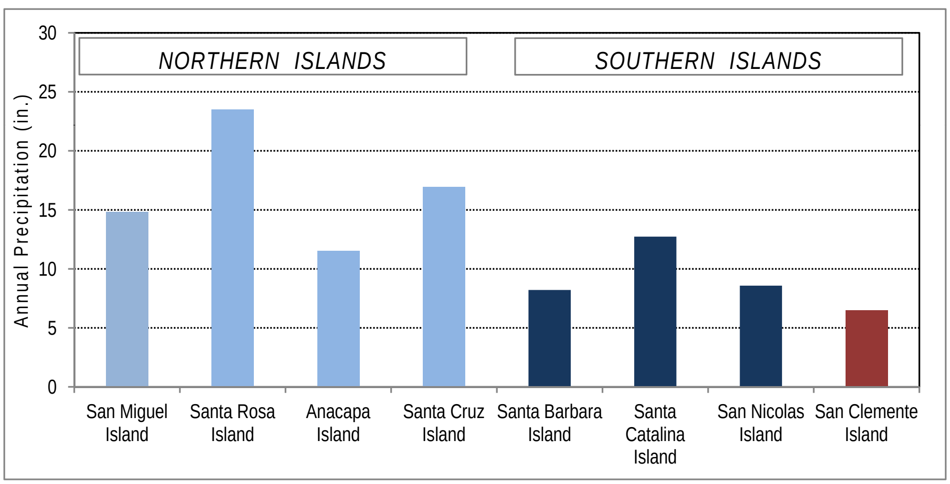
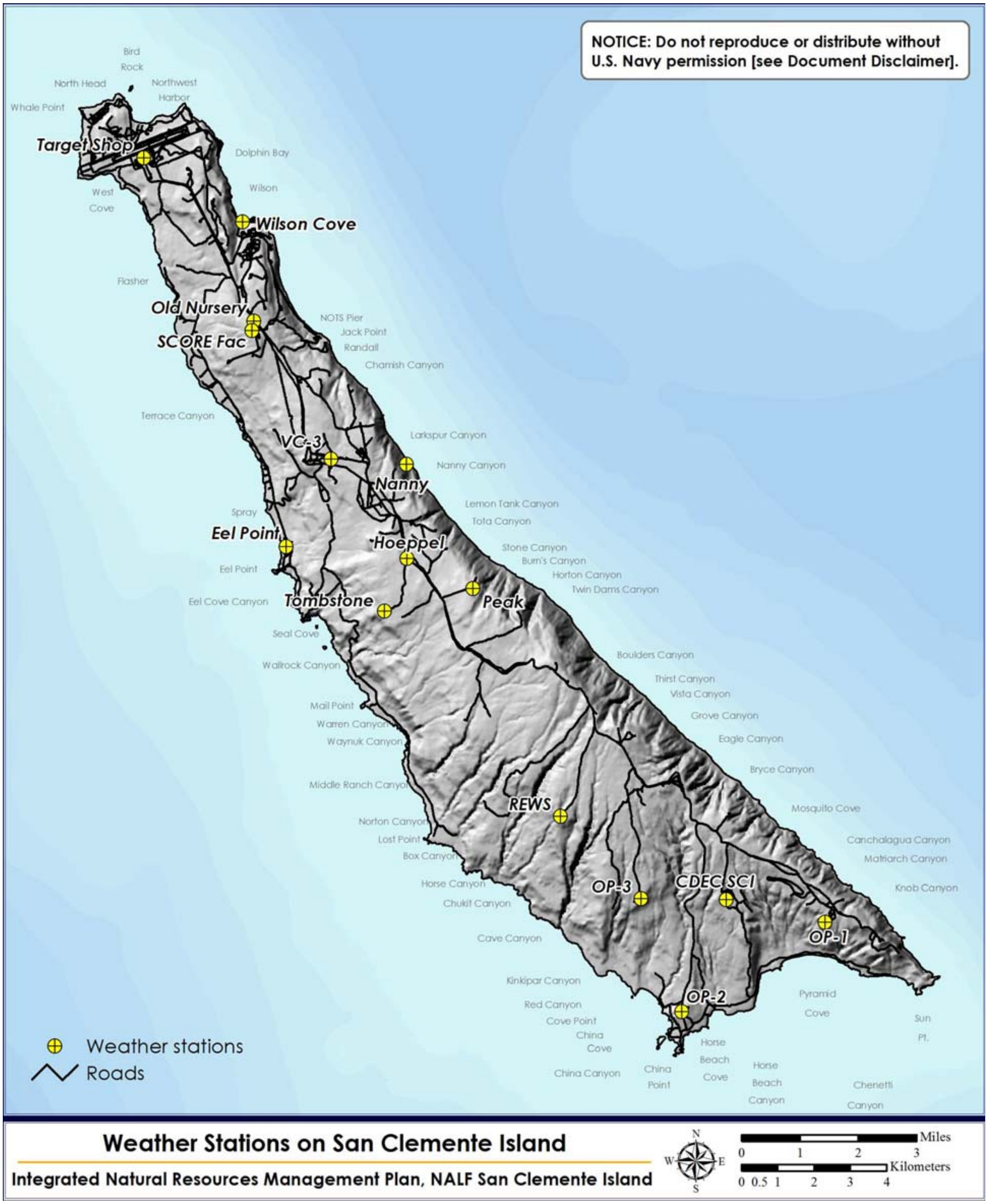


Figure 3-1. Distribution of annual rainfall within the Channel Islands, California (Data source: Western Regional Climate Center).

San Clemente Island Weather Patterns

A number of weather stations were established over the years to track weather patterns on the island (Map 3-2; Table 3-2); not all are currently in operation and some stations record data intermittently. Data collected at the stations include wind speed and direction, temperature, relative humidity, rainfall, solar radiation, and fuel moisture (note that not all of these attributes have been recorded at all stations over the entire periods of record). Current conditions at the Eel Point Station can be accessed at any time at <http://www.csun.edu/scisland/>.

Currently, five active weather stations and data sets are operated by the Geography Department at CSUN, and ten are operated by the Southern California Offshore Range (SCORE) (Table 3-2).



Map 3-2. Location of weather stations on San Clemente Island.

Table 3-2. Weather stations on San Clemente Island, arranged in a roughly north-to-south order as they occur on the island.

Weather Station	Station Data Administrator	Period of Record	Currently Operating	Elevation (in feet)
Target Shop	SCORE	November 2008–present	Yes	160
Wilson Cove	SCORE	November 2008–present	Yes	50
Old Nursery[1]	CSUN	May 1996–March 2001; March 2008–present	Yes	667
SCORE Fac	SCORE	April 2011–present	Yes	700
VC3	SCORE	September 2010–present	Yes	960
Nanny	CSUN	January 1996–August 1998	No	223
Eel Point[1]	CSUN	January 1996–August 1998; January 2009–present	Yes	45
Hoeppel[1]	CSUN	January 1996–August 1998; April 2008–present	Yes	1,187
Tombstone	SCORE	September 2009–present	Yes	1,050
Peak	SCORE	November 2008–present	Yes	1,603
REWS	SCORE	November 2008–present	Yes	1,515
Observation Post 3[1,2,3]	CSUN SCORE	January 1996–March 2005; April 2008–December 2010 November 2008–present	Yes	1,123
SCI (California Data Exchange Center)	California Data Exchange Center	January 2002–October 2008	No	915
Observation Post 1[1,2,3]	CSUN SCORE	October 1996–December 2001; January 2007–February 2010; September 2010–December 2010 November 2008–present	Yes	926
Observation Post 2	SCORE	September 2010–present	Yes	250

[1]Archived data, currently available on the CSUN website, runs through 2010 only. Data for 2011 is not yet available.
[2]Both CSUN and SCORE operate stations at these locations, apparently using different equipment arays; the two datasets do not match where they overlap in the respective periods of record.
[3]These weather stations are factored into calculations for the Fire Danger Rating System.

The following summaries of monthly weather patterns on SCI were derived from three representative weather stations operated by SCORE from 2008–2011 (Wilson Cove, Peak, and Observation Post 3).

Air Temperature

Average monthly temperatures at Wilson Cove range from a low of 58°F (14 degrees Celsius [°C]) in February, March, and December to a high of 66°F (19°C) from August through October (Figure 3-2). Average monthly maximum temperatures at Wilson Cove reach 72°F (22°C) in August, while monthly minimum temperatures reach about 51°F (10°C) in December. At the Peak and Observation Post 3 weather stations, average monthly temperatures are cooler in the winter months and warmer during the summer (Figure 3-2).

Relative Humidity

Average monthly relative humidity at Wilson Cove is between 70–80% much of the year, reaching a low of nearly 60% in November (Figure 3-3). Further south at both Peak and Observation Post 3 weather stations, relative humidity fluctuates throughout the year, from a high of 85.8% relative humidty in June (Peak station) to a low of 54% in November (both Peak and Observation Post 3 stations).

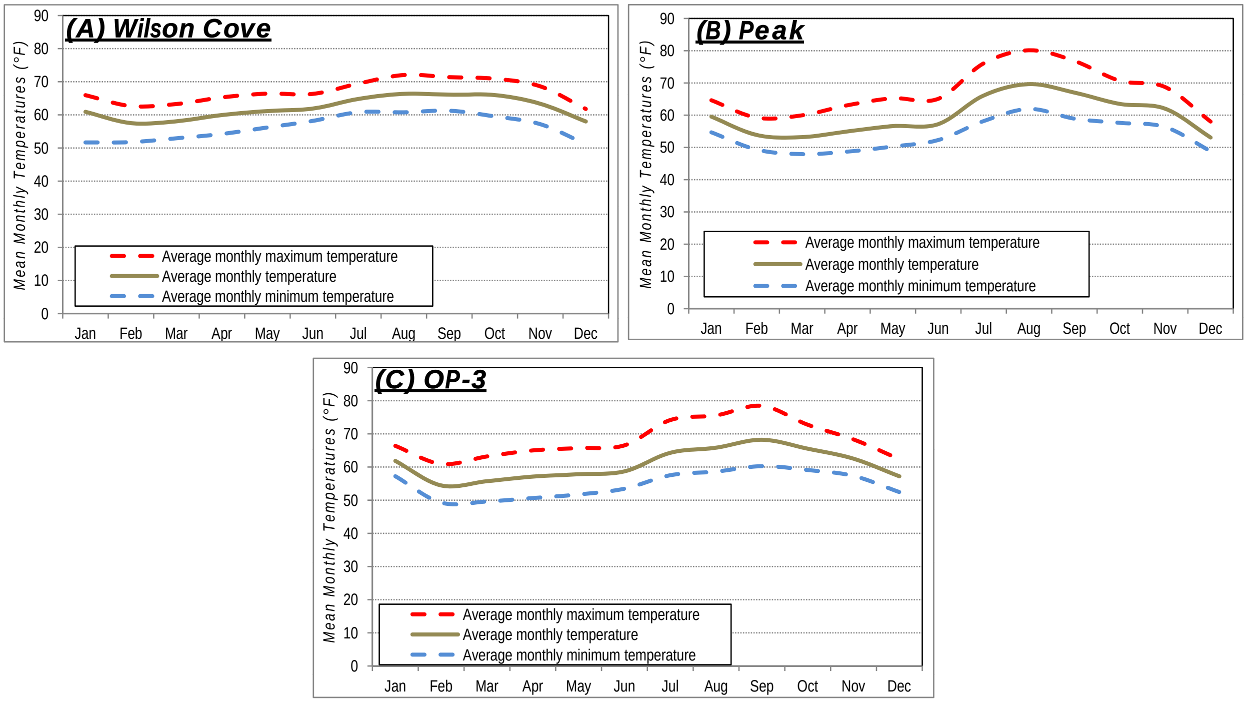


Figure 3-2. Monthly temperature regimes at (A) Wilson Cove, (B) Peak, and (C) Observation Post 3) on San Clemente Island. Data Sources: Southern California Offshore Range weather stations at Wilson Cove and Peak, and Observation Post 3.

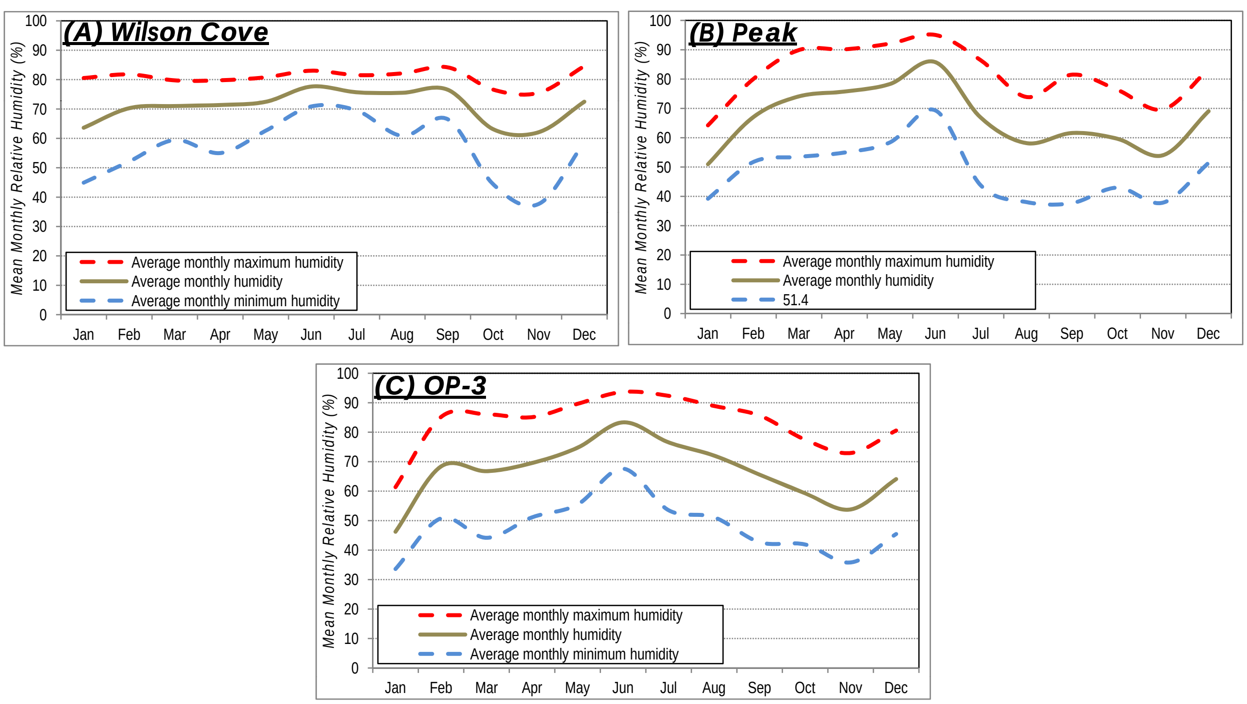


Figure 3-3. Monthly average relative humidity at (A) Wilson Cove, (B) Peak, and (C) Observation Post 3) on San Clemente Island. Data Sources: Southern California Offshore Range weather stations at Wilson Cove and Peak, and Observation Post 3.

Precipitation

SCI experiences dramatic fluctuations in annual rainfall, even over relatively short time spans (Figure 3-4, top), with an average of 6.6 inches (16.8 centimeters [cm]) annually (CSUN and SCORE weather stations, 1997–2011). Rain year data (i.e., total precipitation falling from July of one year through the June of the following year) yields a more dramatic fluctuation (Figure 3-4, bottom), although the average across all rain years is similar at 6.8 inches (17.3 cm). The rain year total is particularly key in that it represents the rainfall input leading into the growing season on the island, where annual growth is often greatly influenced.

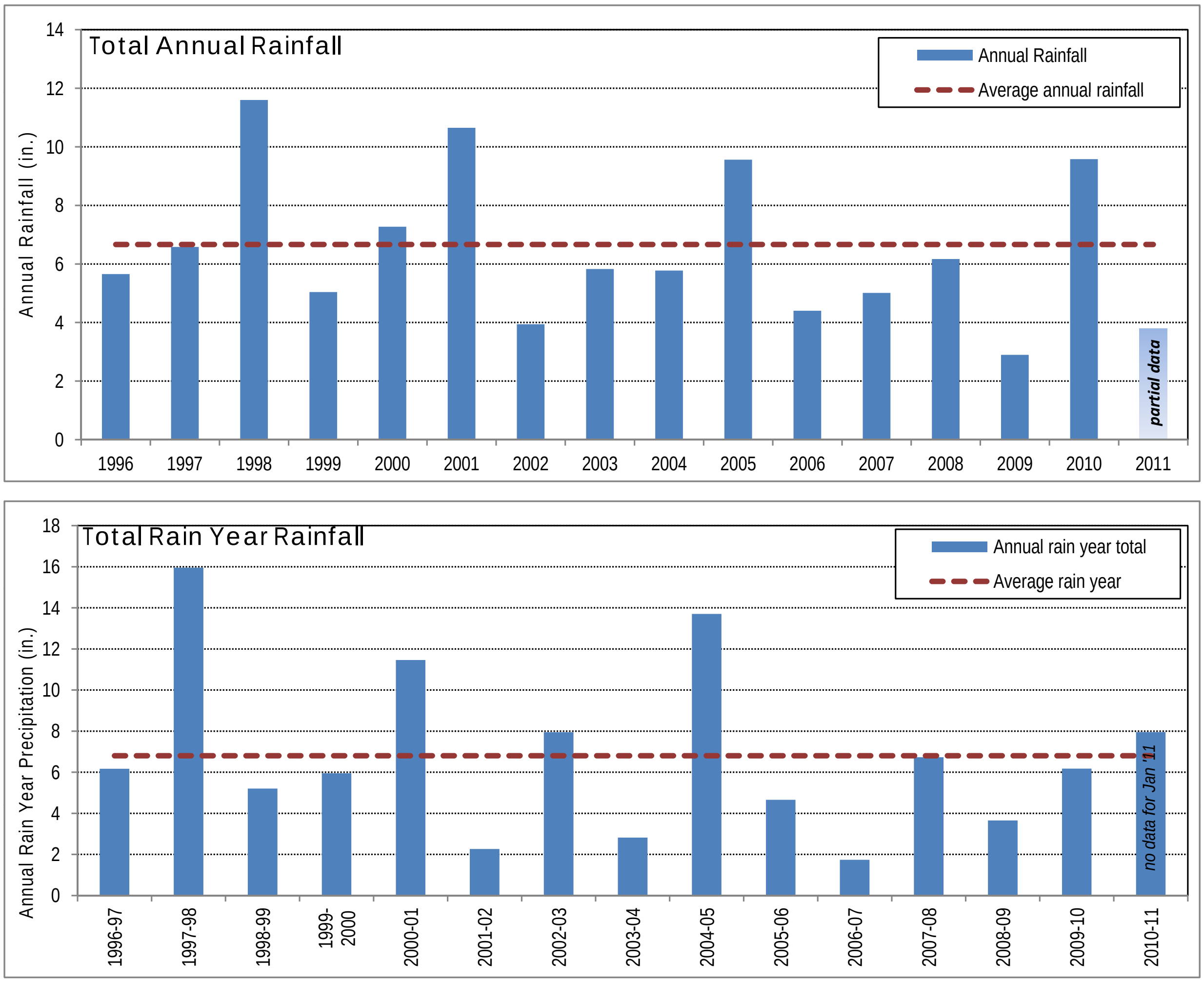


Figure 3-4. Total annual rainfall (top) and total Rain Year rainfall (bottom) at San Clemente Island, 1997–2011 (Data sources: California State University Northridge and Southern California Offshore Range weather stations).

Most rainfall that occurs on SCI falls from October through April (Figure 3-5). An exception was an unusually dry February and March in 1997, leading up to the 1997–1998 El Niño winter. No rainfall was recorded at most stations on SCI for those two months. Little rain falls on SCI between May and October, and fog drip at that time is likely a vital source of moisture to the SCI ecosystem during the typical dry season (Photo 3-1).

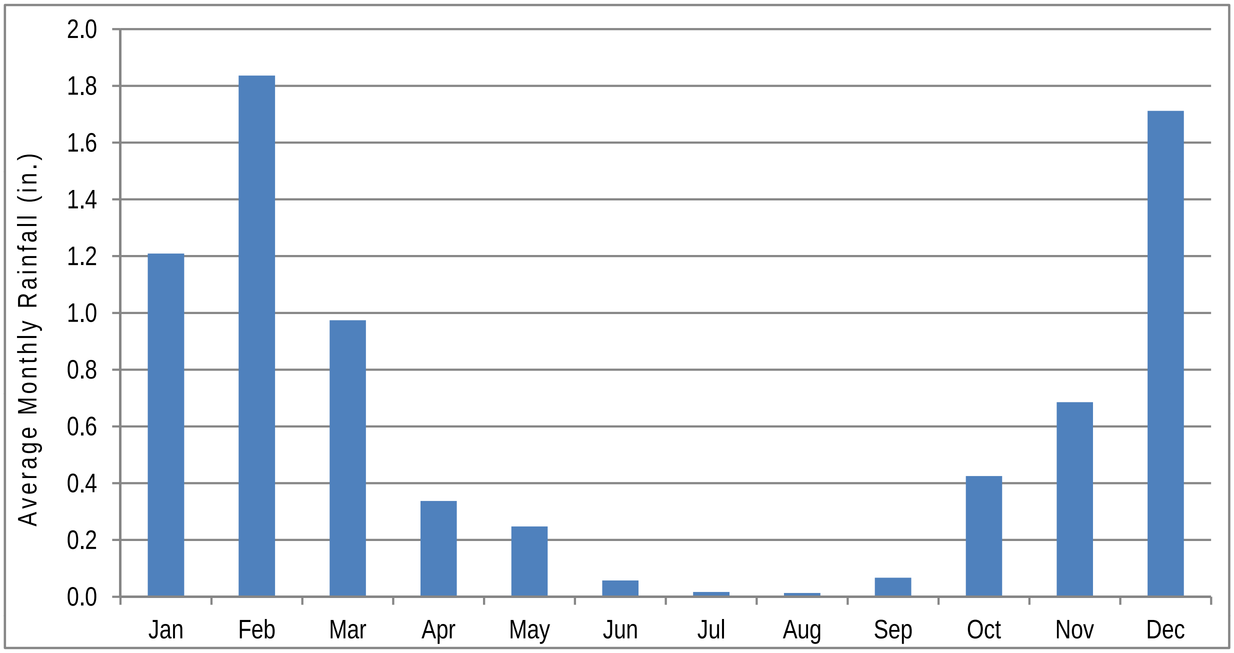


Figure 3-5. Average monthly rainfall at San Clemente Island (Data sources: California State University Northridge and Southern California Offshore Range weather stations, 1997–2011.

Photo 3-1. Summer afternoon fog blanketing the north end of San Clemente Island.

Island location and topographic position have an important effect on precipitation. The higher parts of the island tend to receive more rainfall than the lowest elevations (Figure 3-6, A). Along the north-south axis of the island, however, there is little difference in average annual rainfall, although the northern end tends to be slightly wetter (Figure 3-6, B).

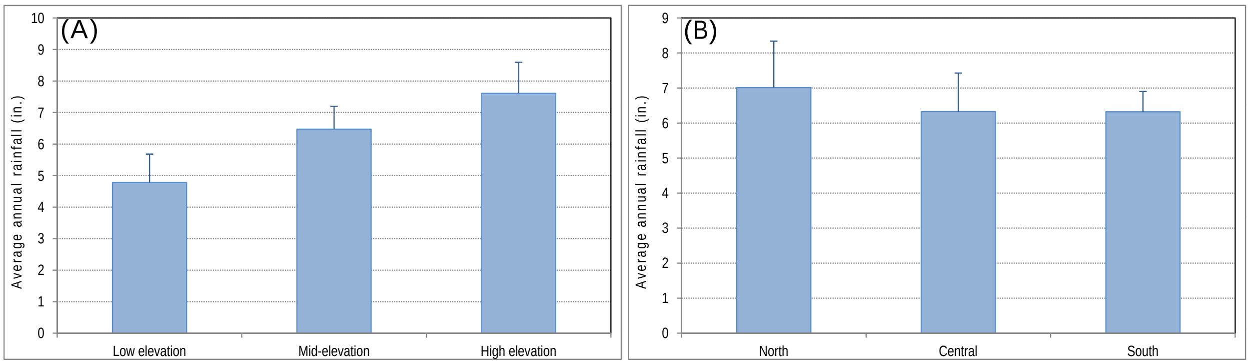


Figure 3-6. A) Average annual rainfall by elevation level (Low = 4 stations, 45'-225' elevation; Mid-elevation = 3 stations, 667'-926' elevation; High = 5 stations, 1060'-1603'). B) Average annual rainfall by island location along a north-south axis (North = 3 stations, Central = 5 stations, South = 4 stations).

Wind

Average monthly wind speeds at Wilson Cove are fairly consistent throughout the year, ranging between 5 and 7.5 miles per hour (mph) (8–12 kilometers per hour [kph]), with average maximum gusts of 15.1 to 22.5 mph (24.3–36.2 kph) (Figure 3-7). Average wind speeds at both the Peak and Observation Post 3 weather stations tend to be somewhat higher than at Wilson Cove (Figure 3-7), with average monthly wind speeds of 7.1 to 13.7 mph (11.4–22.0 kph) (both Peak and Observation Post 3 stations; Data sources SCORE and CSUN weather data, respectively). Wind speeds at the Peak and Observation Post 3 Stations are similar to one another throughout the year.

Although the direction of the winds on SCI tend to be predominantly from the west or northwest quadrants, there are seasonal shifts in some locations. Figure 3-8 and Figure 3-9 depict wind data for six weather stations. The data is analyzed across four seasons: spring (March–May), summer (June–August), fall (September–November), and winter (December–February). At the Peak Station, summer winds shift and blow more from the southeast, rather than the predominantly westerly winds of the remainder of the year. At Eel Point there is a shift in the winter months such that winds are blowing at least as much from the northeast as from the northwest. The Wilson Cove Station is the only station that varies from this west or northwesterly wind pattern with winds blowing almost exclusively from the north throughout the year.

3.5 Physical Conditions

SCI lies northwest and southeast. Its length is just under 21 miles (34 kilometers [km]), with a width of 1.5 miles (2.4 km) towards the northern end that broadens to over 4 miles (6 km) towards the southern part of the island (Walcott 1897; Olmstead 1958). The island's area is about 56 square miles (145 square kilometers [km^2]) and is 36,073 acres (plus 54 acres of offshore rocks). The highest point of elevation is Mount Thirst, located slightly east of the center of the island, at 1,965 feet (599 meters [m]) (Navy 2008).

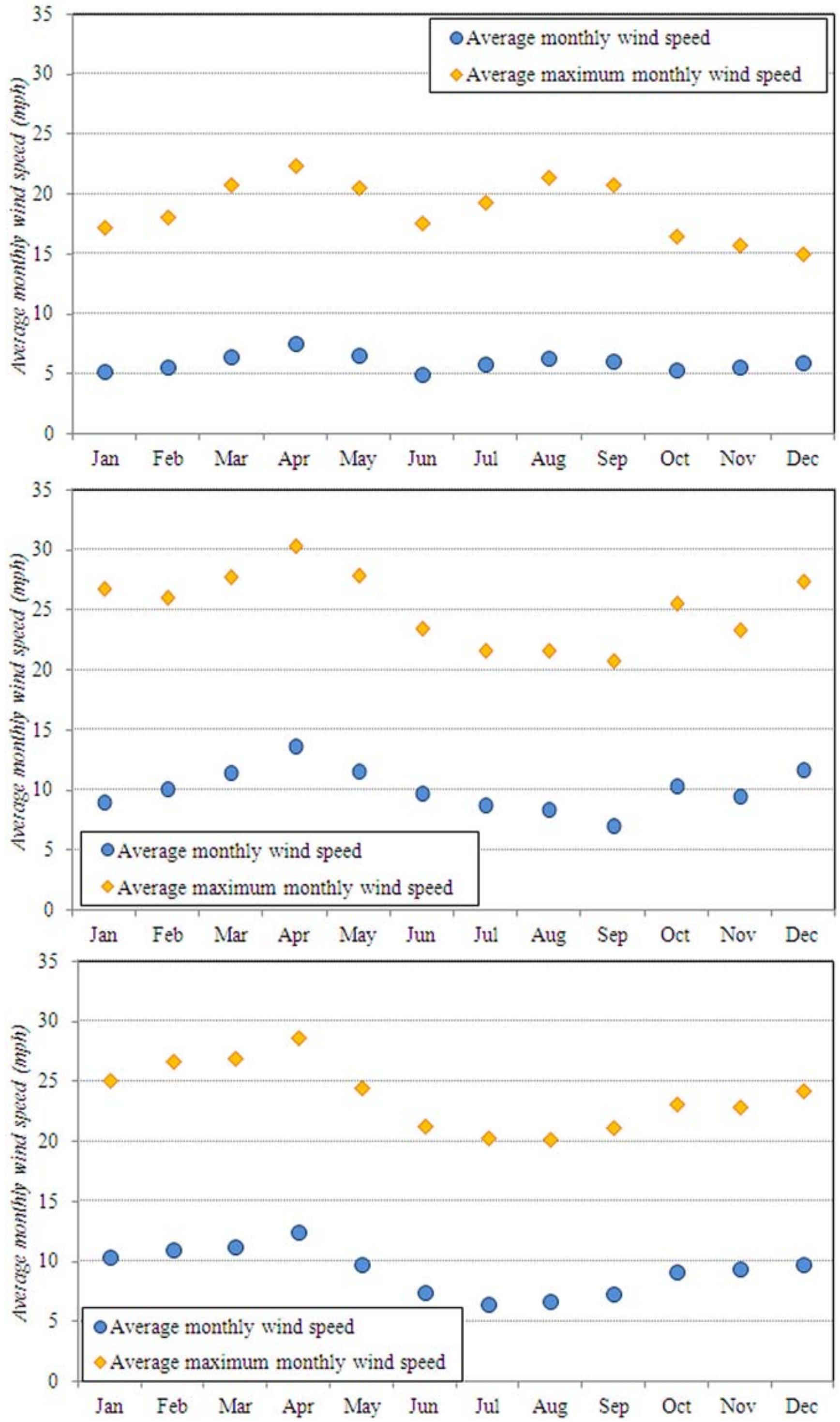


Figure 3-7. Monthly average wind speeds and average maximum wind gusts at A) Wilson Cove, B) Peak, and C) Observation Post 3 on San Clemente Island. Data Sources: Southern California Offshore Range weather stations at Wilson Cove and Peak, and Observation Post 3.

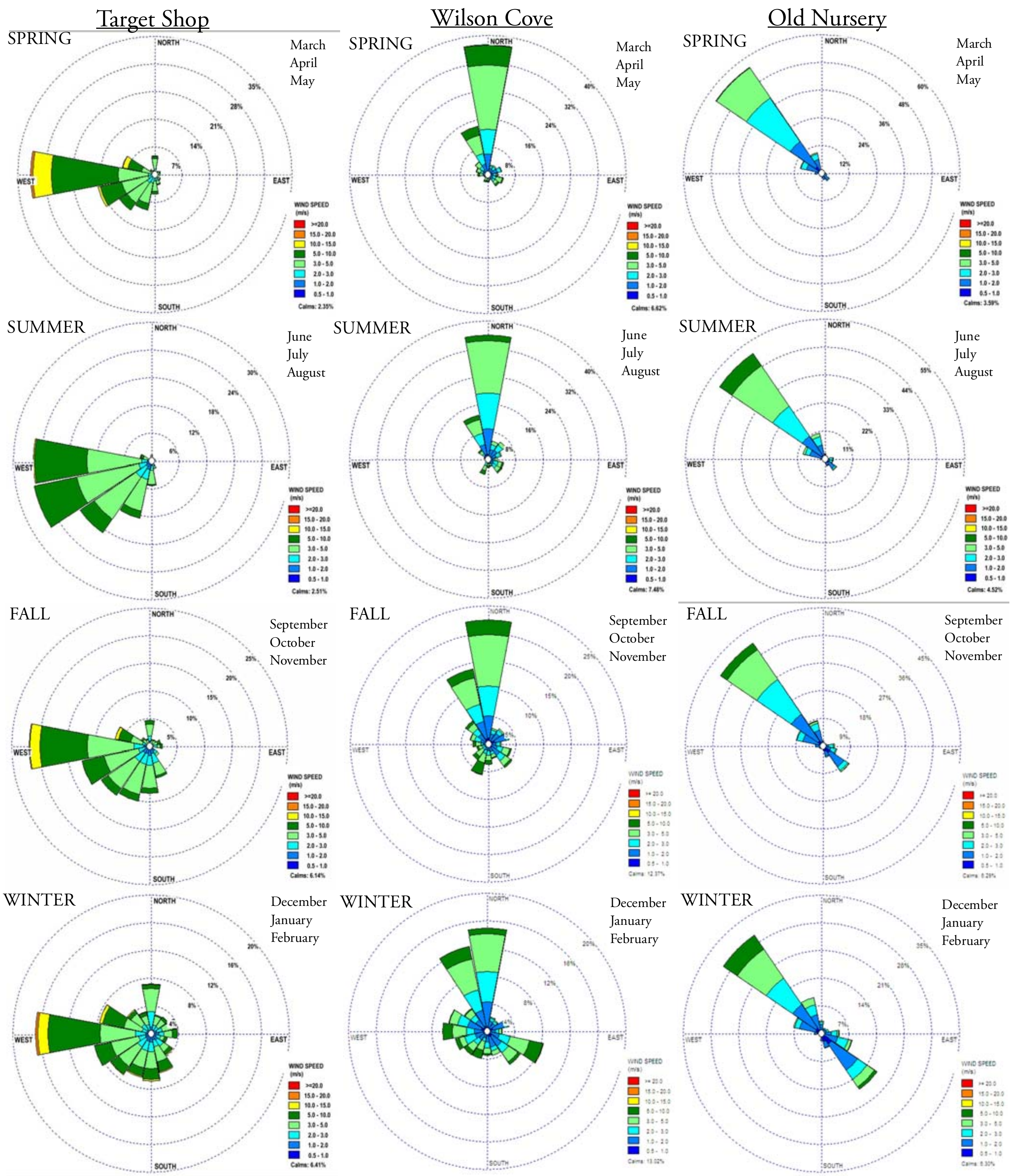


Figure 3-8. Seasonal wind rose charts for the Target Shop (left), Wilson Cove (center), and Old Nursery (right) weather stations. (Data sources: California State University Northridge and Southern California Offshore Range weather stations.)

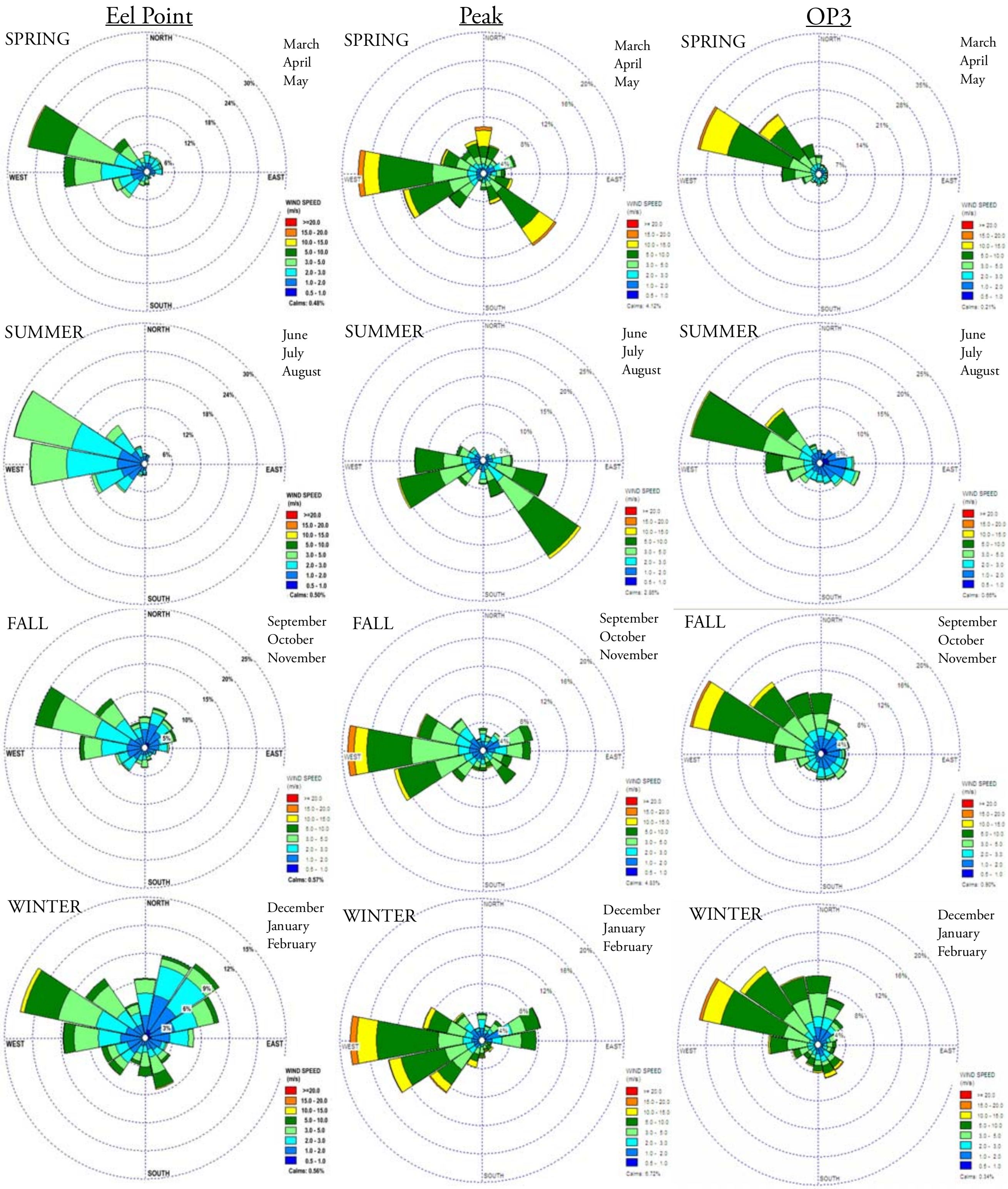


Figure 3-9. Seasonal wind rose charts for the Eel Point (left), Peak (center), and Observation Post 3 (right) weather stations. (Data sources: California State University Northridge and Southern California Offshore Range weather stations.)

3.5.1 Seismicity

SCI is located entirely on the Pacific Plate, a highly active seismic zone with several faults (Map 3-3). Tectonic mechanisms have fragmented the landscape of SCI, forming unique geologic features. The San Clemente Escarpment is bounded on the northeast by the San Clemente Fault, a major active fault. The San Clemente Fault is at least 131 miles (211 km) long and exhibits right lateral and vertical offset faulting. Several small, unnamed faults are located on the island and in the offshore area nearby.

3.5.2 Geology

SCI is the exposed portion of an uplifted fault block composed primarily of a stratified sequence of submarine volcanic rock (andesite, dacite, and rhyolite). The volcanic rock is over 1,969 feet (600 m) thick (Navy 2008). These volcanic rocks are overlain and interbedded with local sequences of marine sediments.

The volcanic and sedimentary rocks that form the bulk of SCI have been dated to the Miocene Epoch (Olmstead 1958; Ward and Valensise 1996; Walcott 1897). The rocks eroded before the deposition of marine sediments, indicating that the island entered a period of submergence sometime in the Middle Miocene. Walcott (1897), who gives one of the only thorough descriptions of the geologic history of the island, believes that the San Clemente volcanics poured over Catalina long after they reached San Clemente, forming a continuous mass during the Miocene Epoch. Based on this theory, San Clemente did not exist as a separate land mass, but formed part of a large area of low relief, consisting of volcanic flows.

The San Clemente crust-block had no significant elevation during the late Miocene, since erosion occurred during this time period. It was during the succeeding Pliocene Epoch that further faulting occurred and the San Clemente crust-block became an island with significant elevation for the first time. This faulting created the steep eastern escarpments currently seen on the island, while the west shore remained at a low elevation. This low angle, in addition to the strong wave action coming from the west, provided favorable conditions for the formation of marine terraces (Walcott 1897).

Dacite, a volcanic rock with a purplish hue, occupies a significant area near the center of the island (from about Lemon Tank to Twin Dams, and west to Seal Cove), exposed at the summit and the southern tip of Pyramid Head. Where present, dacite overlays andesite and often takes the form of outcrops. In the central part of SCI, the dacite ranges in thickness from 100 to 225 feet (30 to 69 m) (Muhs 1980).

The youngest volcanic rock is rhyolite, light-colored with a reddish tinge. Rhyolite occurs at the northwestern end of the island (in the uplands of Northwest Harbor and Wilson Cove), forming a band from one shore to the other, and southeast of Wilson Cove, where its width averages approximately 0.5 miles (0.8 km). Thickness of the flows range from 33 to 150 feet (10 to 46 m). Rhyolite is found in the form of loose boulders or stacks on the terraces and, more commonly, at the base of the eastern escarpments.

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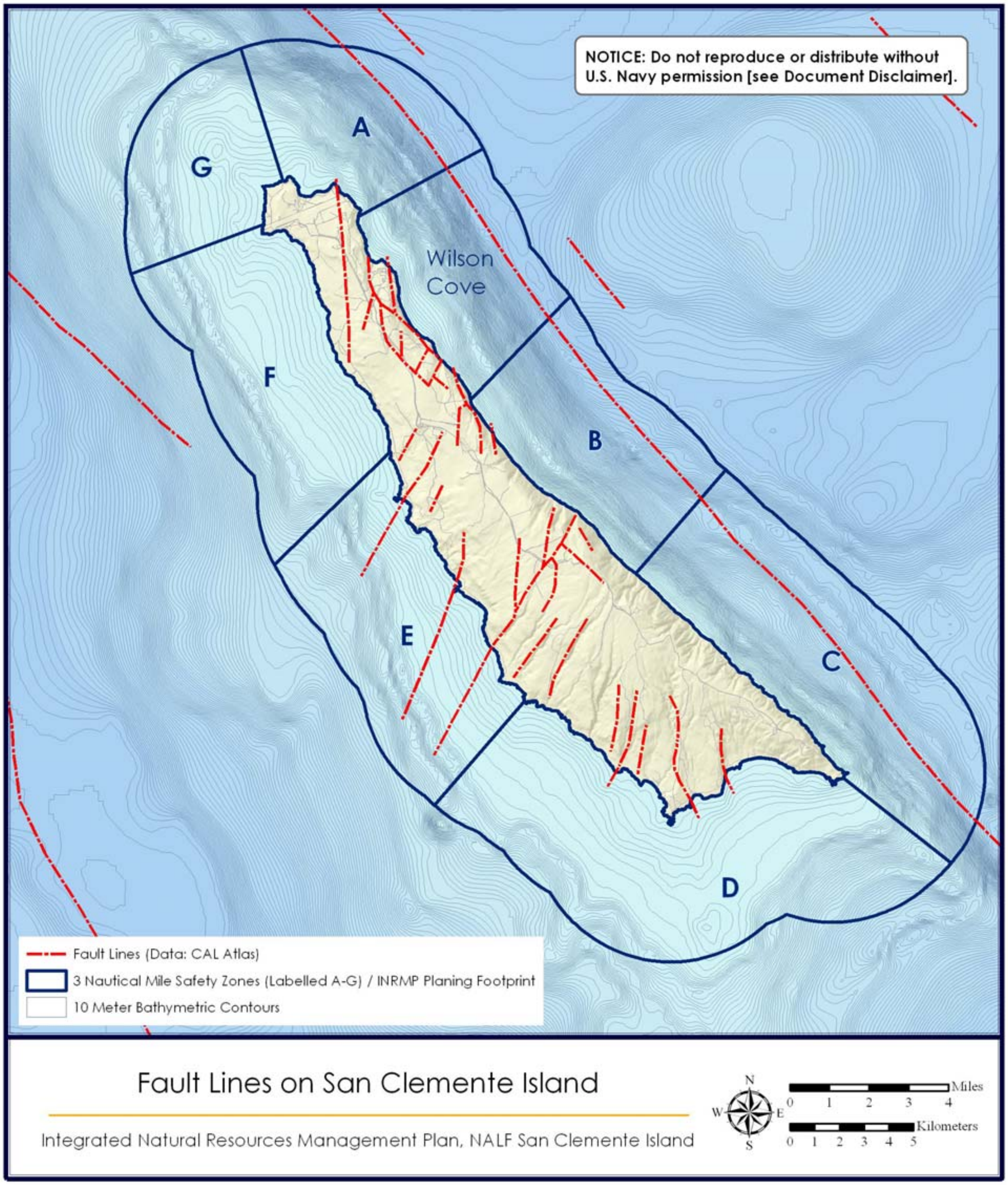

2 *Map 3-3. Fault lines on San Clemente Island.*

3

Sedimentary limestones, siltstones, diatomites, and shales from the middle to upper Miocene partly overlay each other and, in some places, are interrelated with the upper part of the volcanic rocks (Olmstead 1958). Marine sedimentary rocks contain diatoms, Forminifera, and Mollusca, indicating that these materials were deposited in a marine environment of shallow to moderate depth during the Miocene Epoch. Marine sedimentary rocks mostly overlay the volcanic rocks, are exposed in some places on the island, and vary in thickness from 250 to 300 feet (76 to 91 m). Olmstead (1958) believes these deposits were once much thicker and more extensive.

3.5.3 Terrestrial Topography

The terrestrial topography of SCI includes coastal terraces, upland marine terraces, a plateau, an escarpment, major canyons, sand dunes, and sandy beaches.

Coastal and Upland Marine Terraces. The coastal and upland marine terraces dominate the western side of SCI (Photo 3-2) as well as its northern and southern ends, and include over 20 distinct wave-cut marine terraces (Navy 2008). The coastal terrace is made up of the first two marine terraces, gently sloping from sea level to about 98 feet (30 m) above mean sea level (MSL), where it meets the upland marine terrace. The latter includes up to 19 marine terraces in some areas, ranging from 394 feet (120 m) above MSL in the southern portion of SCI, to 1,476 feet (450 m) above MSL mid-island, and 902 feet (275 m) above MSL at the southern end of SCI (Navy 2008). Terraces are absent from 1,500 feet (457 m) to the island's summit at 1,965 feet (599 m) (Navy 2008). The lack of terraces above 1,500 feet (457 m) led some geologists to believe that the island was never fully submerged during the Miocene Epoch or that the island rose steadily above sea-level, rather than intermittently, prior to the cutting of the highest terrace at 1,500 feet (457 m) (Olmstead 1958; Ward and Valensise 1996).

Plateau. The plateau is a moderately rolling, upland terrain that encompasses roughly the middle third of SCI (Photo 3-3). The highest point on SCI is about 2,000 feet (610 m) above MSL (Navy 2008). Elevations gradually slope toward the northern and southern ends of SCI (Olmstead 1958).

Escarpment. The steep escarpment, known as the San Clemente Escarpment, borders the entire eastern side of SCI, rising dramatically from the ocean (Photo 3-4) and contrasting sharply with the more gently sloping southwestern portion (Soil Conservation Service [SCS] 1982). The San Clemente Escarpment extends from Pyramid Head at the extreme southeastern end of SCI to Wilson Cove near its northwestern end with an isolated segment between Wilson Cove and Lighthouse Point (Dolphin Bay) farther north. Elevations of the eastern escarpment range from sea level to 1,965 feet (599 m) above MSL (Navy 2008).

Canyons. Steep, narrow canyons are located throughout SCI (Photo 3-5), but are more common in its southern half. Some canyons are over 500 feet (152 m) deep, dropping sharply into the sea (SCS 1982; Navy 2008).

Photo 3-2. Coastal terraces on San Clemente Island.

Photo 3-3. Plateau near Cave Canyon.

Photo 3-4. Eastern escarpment on San Clemente Island.

Photo 3-5. Box Canyon on San Clemente Island.

Sand Dunes. Whereas marine terraces record sea level maxima, older sand dunes (Photo 3-6) may record sea level minima on SCI (Muhs 1980). During high sea level periods, terraces are cut and calcareous sands are deposited. As sea level drops these sediments can be deflated and redeposited downwind as dunes. The oldest dunes, found extensively over the north central part of SCI, formed from sand deposited above marine terraces during the early Pleistocene (Navy 2008). Active and recently stabilized dunes, found mainly on the northern end of the island, are the youngest sand deposits on the island (Photo 3-7; Photo 3-8).

Photo 3-6. Aerial view of San Clemente Island showing dune systems circa 1930 (Navy).

Photo 3-7. West Cove Beach and the dune that supplied sand to it before construction of the airfield (Ralph Glidden Collection 1923). The beach is much narrower today as the sand has eroded away.

Photo 3-8. Sand dunes on San Clemente Island.

Sandy Beaches. Sandy beaches are found near the northwestern and southern ends of the island at West Cove (See Photo 3-7), Northwest Harbor (BUD/S Beach), Graduation Beach, China Beach, Horse Beach Cove, and Pyramid Cove (Walcott 1897). Beach deposits are found on some of the lower terraces, frequently capped by alluvial fans 10–33 feet (3–10 m) thick, particularly at the mouth of the main southwest draining canyons (Ward and Valensise 1996). Alluvial fan deposits are ill-sorted gravels, sands, and silts with larger fragments consisting mainly of andesite, which were deposited on the lowest terraces near the mouths of the larger canyons along the southwestern and southern margins of the island.

3.5.4 Nearshore Island Bathymetry and Currents

A narrow island shelf surrounding SCI extends to a depth of about 330 feet (100 m), extending from 0.3 to 3 nautical miles (nm) (0.6 to 6 km) from the island's coast (Navy 2008). Due to the San Clemente Escarpment, the ocean floor on the east side of the island drops quickly, leveling off at a depth of about 1,000 m (3,280 feet) below MSL. Ocean depths decrease at a more gradual rate on the south and west sides of SCI. The ocean floor surrounding SCI is characterized by high relief rocky habitat surrounded by soft sandy bottoms (Navy 2008).

SCI is located in the pathway of the warm, northerly flowing California Counter-Current (Navy 2008) (See Map 3-1). Dye studies conducted from the Wilson Cove wastewater outfall indicate that the predominant water movement is generally southern (Coastal Resources Management 1998). Nearshore local currents are driven by wind and tides. The leeward (mainland) side of SCI is relatively free from substantial wave and swell disturbance.

3.5.5 Marine Ecoregions

Four distinct marine ecoregions (Map 3-4) have been identified at SCI: north island, east shore, pyramid, and west shore (Merkel and Associates 2007). The differences between ecoregions are associated with variations in nearshore island bathymetry, variations in substrate composition, exposure to different oceanic water masses (e.g., warmer or cooler waters), and winds.

Given the bathymetry and exposure to winds and oceanic swells on the northern portion of the island, the north and west regions are dominated by mature kelp forests and sand bottom with sub-canopy brown algae (Merkel and Associates 2007). These mature kelp forests in the north and west regions support dense stands of understory algae, unlike the pyramid and east regions that are dominated by encrusting invertebrates on hard substrate (Merkel and Associates 2007). The pyramid ecoregion has a southeast aspect and typically experiences less wind and swell than other exposures throughout the island (Merkel and Associates 2007). This difference in aspect between the northern and pyramid regions of the island and their concomitant exposure to cooler and warmer water masses, respectively, causes variation in community assemblages in similar sandy, intertidal, and subtidal habitats in nearshore waters of the island.

3.5.6 Water Resources and Hydrology

The steep eastern escarpment differs in water regimes (Map 3-5) from the west side SCI; this difference can be seen in the varying habitats and vegetation communities on each side. Physical infrastructure on the island, such as the road system, also affect the course of water and sediment movement by redirecting and channelizing runoff.

Past overgrazing of island vegetation and trampling compaction of the soil by non-native sheep, goats, cattle, and pigs affected the water regime through the removal of vegetation that intercepts moisture from the air and root systems that anchor the soil in place. It is thought that the loss of fog moisture captured by vegetation significantly impacted available soil moisture, and the resulting aridification may preclude recovery of native fog-harvesting vegetation (McEachern 2010). The inability to capture fog may also affect the potential of a site to resist invasive annual grasses (Evola and Sandquist 2010). As expected in this maritime climatic regime the hydrologic cycle has a high percentage of source moisture tied to fog.

Current Management

The water resources and hydrology of SCI are not managed directly; however, the resource benefits by properly maintained roads and vegetation restoration on slopes, especially certain kinds of perennial grasses, shrubs, trees, and cryptogams that have evolved to capture and retain moisture from the air. Additionally, the removal of feral grazers and the subsequent increase in shrub cover during the past 20 years benefited soil water retention overall.

Assessment of Resource Management

- Since the removal of feral goats in 1992, the vegetation communities of SCI have been recovering remarkably well. Natural resources personnel should allow the natural progression of habitats to continue with periodic control of erosion and non-native species.

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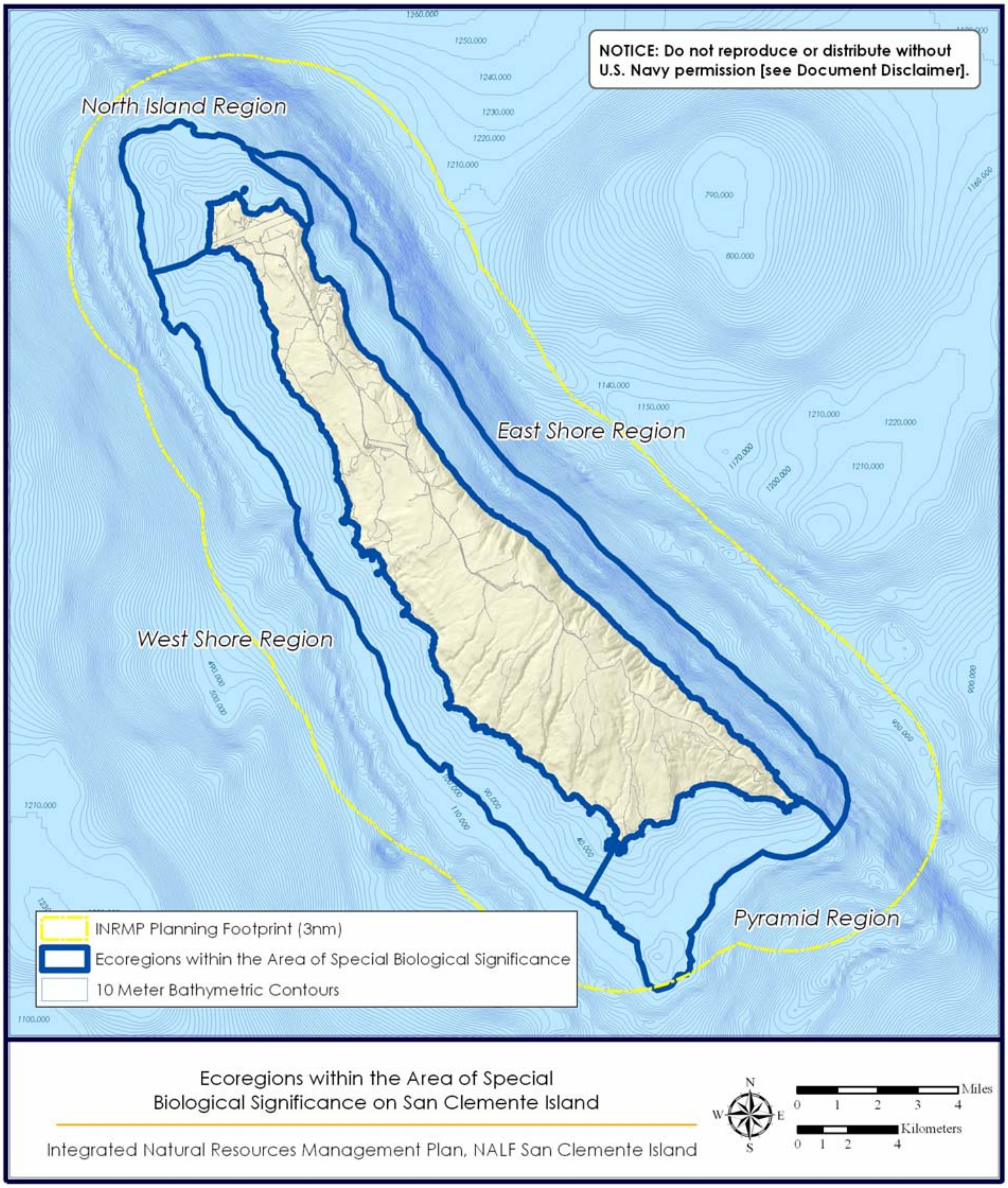


2 *Map 3-4. Ecoregions within the Area of Special Biological Significance on San Clemente Island*
3 *(Merkel and Associates 2007).*

Map 3-5. Hydrology on San Clemente Island.

- The description of the role of fog on SCI has not been described. The identification of these roles would help to identify potential management gaps for SCI vegetation communities.
- Current natural resources projects and programs provide indirect, positive benefits to water resources and hydrology on SCI.

Management Strategy

Objective: *Maintain and enhance the water holding capacity of the island's native plants and cryptogams to facilitate recovery of SCI's ecosystems.*

I. Continue to investigate fog capture for support of various isolated restoration sites on the island.

II. Perform island-wide surveys to inventory surface water courses and determine each water course relationship to the ocean.

III. Increase vegetation cover that increases fog collection and shading.

IV. Support efforts to analyze and integrate current imagery data obtained from high resolution aerial reconnaissance surveys to inform the development of accurate topographic contour maps for SCI (e.g., Light Detection and Ranging Contour Mapping).

V. Integrate water resources management strategies into various natural resources plans.

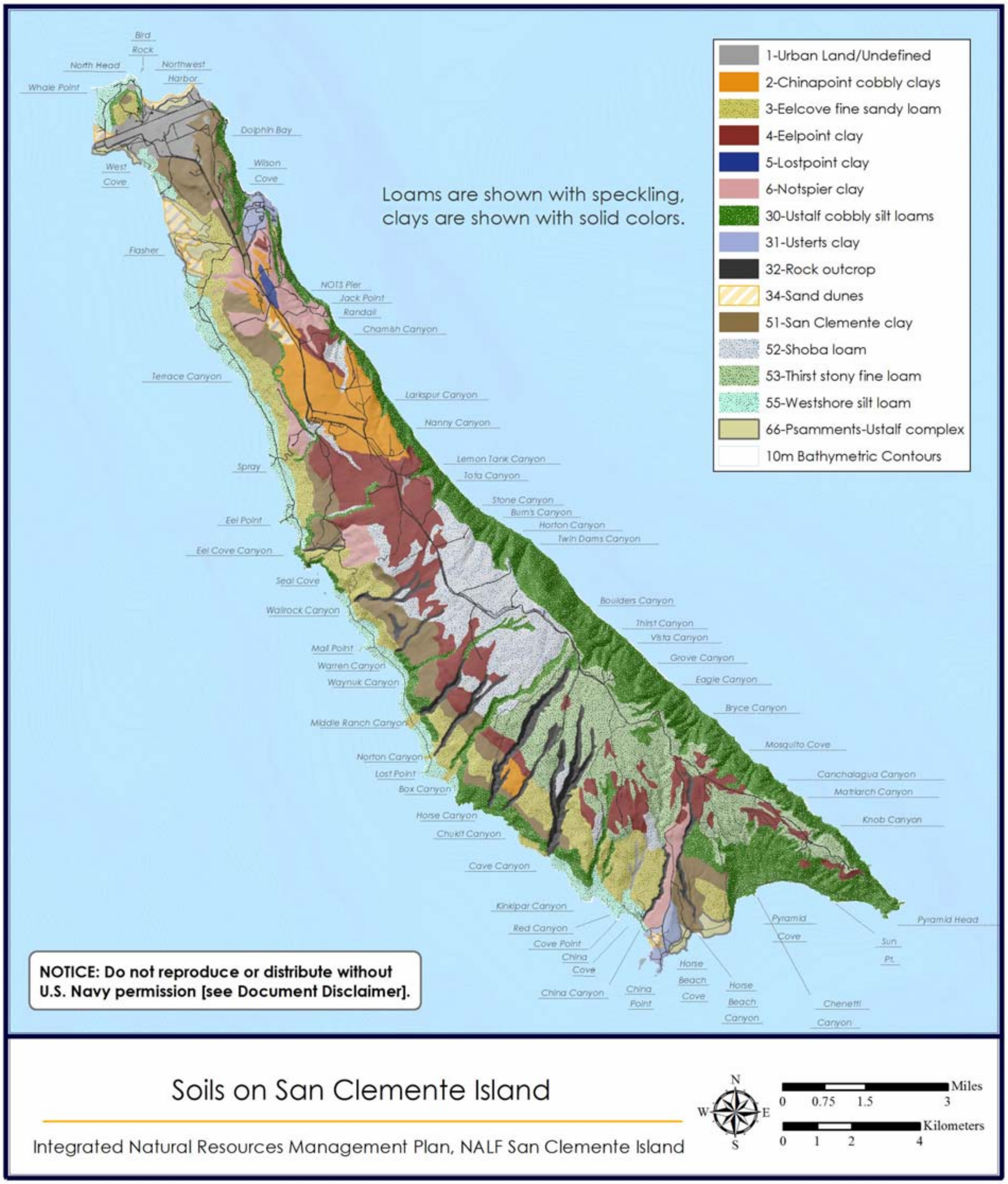
- ***A.*** Continue to implement watershed-based approaches, wherever possible, in support of Navy policy on Watershed Management (Naval Operations Instruction [OPNAVINST] 5090.1C: 9-5.2).
- ***B.*** Improve the integration of natural resources professionals into sustainability planning for water resources.

3.5.7 Soils and Soil Condition

The Natural Resources Conservation Service completed a draft soil survey for SCI in 1982 (SCS 1982). The survey identified eight series, three soil variants (soils distinctive from existing series, but not widespread enough to warrant the creation of a new series), and 43 mapping units. Areas that were difficult to access were mapped only to the soil suborder level as Ustalf. This included the Pyramid Cove area, eastern escarpment, and west shore canyons.

All soils (Map 3-6) on the western slopes have a distinctive silt loam surface cap or horizon that has been described by both Muhs (1980) and the Natural Resources Conservation Service (SCS 1982). The silt loam horizon was formed, according to Muhs (1980), from windblown transport of airborne dust. This horizon is a thin (2–8 inches [5–20 cm]), light colored layer with a silt loam texture and, judging from its unique mineralogy, is unrelated to the profile beneath. It is found on all geomorphic surfaces on the island from andesitic and dacitic marine terraces and alluvial fans to calcareous dune sand, covering surfaces ranging in age from 2,760 years to greater than 1.2 million years (Muhs 1980).

There are conflicting theories regarding the origin of the surface horizon on the western island terrace flats (hypotheses below), such as slopewash or deposition, formation through profile leaching, and windblown transport (Muhs 1982). The slopewash theory suggests that sediment is carried by water downhill and deposited in areas of low elevation, but this seems unlikely due to the fact that the silt horizon is almost uniformly distributed throughout the island. The silt horizon does show some properties of a leached horizon (which implies in-situ soil development), but ferrolysis, the chemical reaction responsible for such horizons, requires far more rainfall than SCI receives.



Map 3-6. Soils on San Clemente Island (U.S. Department of Agriculture 1982).

Muhs's theory of windblown transport is the more plausible of the three. The uniform thickness of the silty layer, its occurrence over the entire island and on other Channel Islands, and its distinct mineralogy (quartz, biotite, and K-feldspar) suggest something other than local origin (Muhs 1980). Muhs' studies show that soils in the southwestern deserts of the United States are presently eroded by wind and are transported to coastal regions of southern California, including Santa Barbara Island, SCI, and SNI. Eroding soils in the Mojave Desert are most likely the main source of dust for SCI and other Channel Islands. Soil samples taken from these areas contain all of the minerals found in the silt fraction of the silty horizon on SCI. In particular, the high concentrations of quartz, plagioclase, and mica in the Mojave soils are matched by the distribution in the silty surface horizons on SCI. The silty materials are transported primarily in winter, but also during the fall and spring when Santa Ana winds prevail. The path of these winds has been well traced. Air from the high pressure fronts of the Great Basin finds outlets to the west through the canyons of the coastal mountains as well as to the south toward the Gulf of California. Wind speeds in the Mojave Desert during a Santa Ana can reach up to at least 32 mph (51 kph), well within the range of velocities capable of transporting silt sized particles to SCI (Muhs 1980).

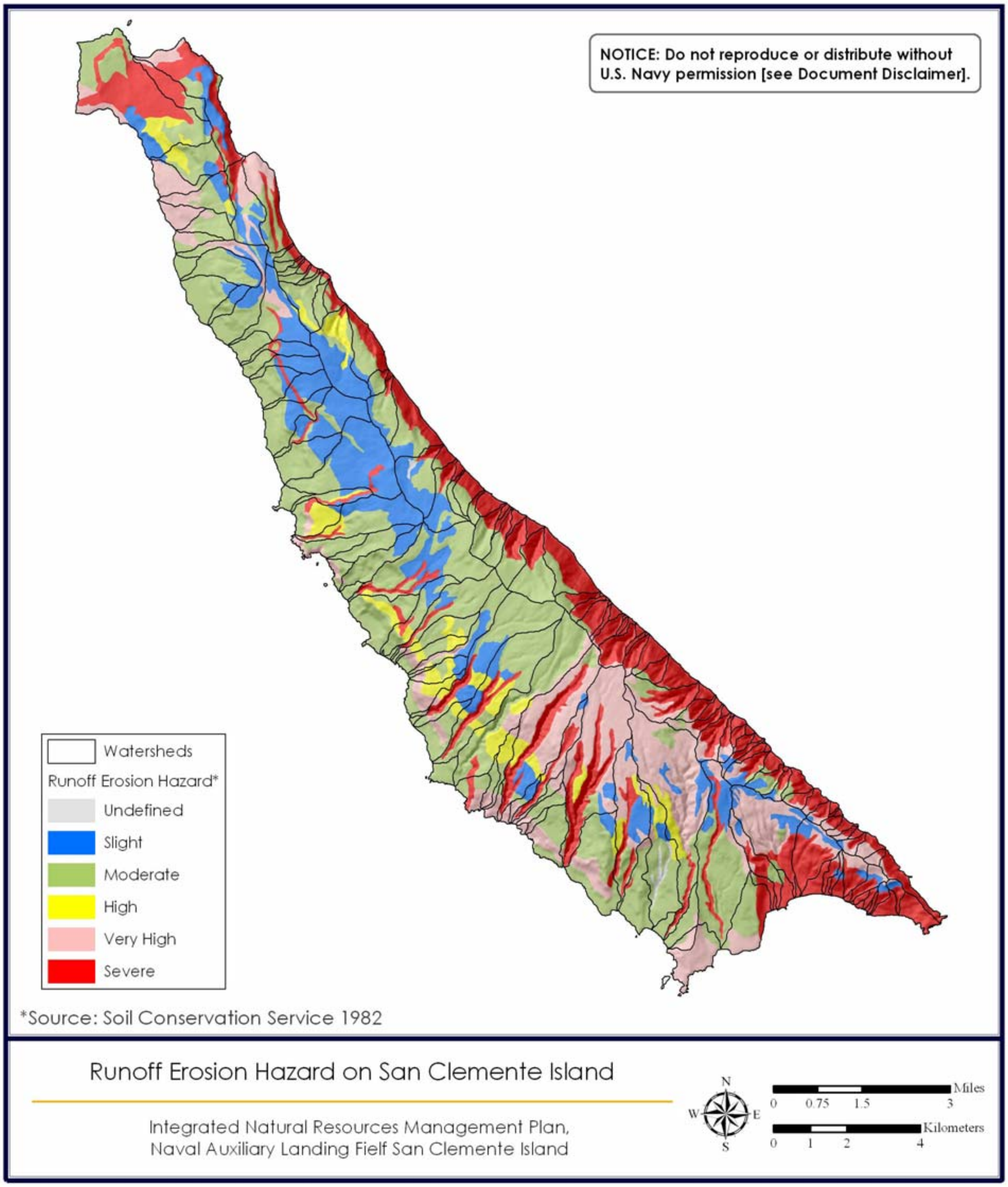
Variation in plant communities of the island is expected to correlate primarily with a gradient of soil moisture availability, or evapotranspirative stress (Westman 1983). In Map 3-7 soils are grouped by their water holding capacity, which is a measure of how much soil water is accessible to a plant. The droughtiest soils are along the west shore, immediately adjacent to the coast where the California boxthorn (*Lycium californicum*) plant community is best expressed, and the very shallow loams on the southern high plateau grasslands. Clay soils at intermediate elevations have the highest water holding capacity, and support a mix of grassland on the flats and maritime desert scrub vegetation on the rockier slopes. Most west shore soils also support low total annual production of vegetation (0–1,499 pounds/acre/year), which depends upon a mix of water availability and soil fertility. The grasslands and scrub areas of the plateau are moderately productive (1,500–2,499 pounds/acre/ year), with the exception of some of the heavy clay soils, such as near the Old Airfield (VC-3) which are the most productive soils on the island (2,500–3,500 pounds/acre/year).

Salinity gradients can also place controls on vegetation. Along the west shore, salt aerosols from wave action result in soil salinity levels from 3.9 to over 8 millimhos per centimeter, high enough to affect species composition on the terraces close to shore. Plateau and upper terrace soils are essentially non-saline.

Although not well-investigated, nutrient cycling on SCI is tempered compared to the mainland because of the general lack of burrowing animals and low numbers of soil arthropods to turn the soil (D. Estrada, pers. com. 1995). Soil anthropods are fundamental to the breakdown of organic materials (e.g., leaves, vegetation, and carcasses) and the release of nutrients for new plant growth in mainland systems. This absence no doubt has profound local effects on the distribution and abundance of plants and, by extension, carrying capacities for animals that rely directly or indirectly on plant materials for energy.

Soil Erosion

Soil erosion is a naturally occurring process caused by the action of water and wind wearing away the land's surface. Accelerated soil erosion is a net loss of soil beyond the natural background levels due to land use.



Map 3-7. Runoff erosion potential by drainage on San Clemente Island.

Under natural conditions in southern California, undisturbed vegetation acts as a check on the erosion process. The onset of fall rains trigger the germination of seeds from herbaceous species with as little as 0.50–0.75 inches (1.3–1.9 cm) of rainfall within days. Roots of perennial, shrub, and tree species begin to produce the annual mass of tiny feeder roots just beneath the surface of the soil.

Two major factors that can negatively impact vegetation cover and species composition on SCI are overgrazing and fire. A century of ranching on the island greatly reduced and simplified the natural vegetation cover and composition of the island. With the removal of the feral goat population in 1992, the vegetation cover of the island recovered remarkably well. Fire has become a significant factor in vegetation cover as a result of military training activities. Both overgrazing and relatively frequent fire events can lead to the invasion of non-native species, especially annual grasses, which do not possess the permanent deep roots typical of native perennial grasses. In a positive feedback loop, annual grasses can make the ecosystem more flammable and more likely to burn in accelerated intervals, suppressing native, deep-rooted species. This is evident on SCI in numerous natural drainages that have eroded into canyons hundreds of feet deep. Map 3-7 shows the relative water erosion potential on SCI by drainage (Tierra Data Inc. [TDI] 2007). An estimated 70% of eroded soils eventually are transported to the ocean, amounting to 1,428 tons per year for the island (Navy 2006b).

Large and small gullies have been documented across SCI, at least since the late 1970s (SCS 1982). While gullying is sometimes natural, gullies on SCI have been attributed to surface runoff from unpaved roads, road maintenance activities, military vehicle maneuvers without erosion control measures (SCS 1982), and a soil process known as piping. Piping is concentrated flow, unbroken or continuous from a disturbed point of origin. Notable examples of gullying with at least some active piping occur just south of Stone Station. Soils that are high in clay, such as China Point, Eel Point, Lost Point, and NOTS Pier, have a high shrink-swell potential due to the presence of montmorillonite clays. If early rains are moderate to light, the clay's cracks in these soils reabsorb the water and swell to close the cracks. However, early heavy rain causes sufficient surface runoff that enters the cracks and moves directly downward. When the free water reaches the bedrock or about 3 feet (1 m) in depth, it continues laterally. With increasing velocity it detaches soil prisms and becomes a pipe-like underground tunnel, ranging 20–200 feet (6–60 m) long (SCS 1982). The soil above eventually collapses onto itself, and the pipe continues as a gully with nickpoints creeping upslope each year.

Additionally, the island's constant sea spray adds sodium to most of the soils. Sodium disperses the clays, which impedes drainage and makes them more vulnerable to erosive forces of rain (SCS 1982) and wind; this is most detectable on the west shore soils.

Current Management

Island activities are required to comply with federal statutes on soil conservation (Title 16 U.S. Code [USC] 590a–590q 3), non-point source pollution (Title 33 USC 1323, Soil Conservation), and management with a watershed approach (Unified Federal Policy for a Watershed Approach to Federal Land and Resource Management, pp. 62565 to 62572, Vol. 65, Federal Register [FR]).

The focus of soil management is compliance with measures from the SOCAL EIS (Navy 2008) and the BO on SCI Military Operations and Fire Management Plan (USFWS 2008a). These documents identified erosion from military activities as a concern and specific measures were committed to by the Navy as a result. Additionally, the Navy is in the process of completing an Erosion Control Plan for the island. Measures in place to conserve soil resources on the island are described below (Table 3-3).

Table 3-3. Conservation requirements for soil resources.

Conservation Measure AVMC-M-3. The Navy will develop a plan that will address soil erosion associated with planned military operations in the Assault Vehicle Maneuver Area, Artillery Firing Points, Artillery Maneuver Points, and Infantry Operations Area. The Navy will finalize Assault Vehicle Maneuver Areas, Artillery Maneuver Points, and Artillery Firing Points based on field review with soil erosion experts and military personnel, such that operational areas minimize inclusion of steep slopes and drainage heads. The goals of the plan would be to: 1) minimize soil erosion with in each of these operational areas and minimize offsite impacts; 2) prevent soil erosion from adversely affecting federally-listed or proposed species or their habitats; 3) prevent soil erosion from significantly impacting other sensitive resources, including sensitive plant and wildlife species and their habitats, jurisdictional wetlands and non-wetland waters, the Area of Special Biological Significance surrounding the island, and cultural resources. The erosion control plan would lay out the Navy's approach in assessing and reducing soil erosion in the Assault Vehicle Maneuver Areas, Artillery Maneuver Points, Artillery Firing Points, and the Infantry Operations Area, as well as routes used to access these areas. The plan would consider the variety of available erosion control measures and determine the most appropriate measure(s) to control erosion in the area. The plan would include an adaptive management approach and contain the following essential elements: maps defining boundaries of operational areas that provide appropriate setbacks; a BMP maintenance schedule; a plan to monitor soil erosion and review the effectiveness of BMPs; site-specific BMPs to minimize soil erosion on site and minimize offsite impacts, which could include: (a) setbacks or buffers from steep slopes, drainages, and sensitive resources; (b) site specific engineered or bio-engineered structures that would reduce soil erosion and transport of sediment off site; and (c) revegetation. The Navy will coordinate with the USFWS during development of the erosion control plan and will submit the draft erosion control plan to the USFWS for review. If the USFWS does not provide comments within 30 days, the Navy will move forward with implementation of its plan.
Conservation Measure AVMC-M-6. The Navy will develop and implement a project to monitor for erosion, dust generation, and deposition of dust in adjacent habitats.
Conservation Measure AVMC-M-9. The Navy will direct tracked and wheeled vehicles to use the existing route for ingress and egress to/from the beach at West Cove.
The DoD shall incorporate the BMPs for runoff for the state in which the installation is located to minimize nonpoint sources of water pollution (DoDINST 4715.03).
Conservation Measure FMP-M-7. The Navy will monitor soil and vegetation responses to retardants and herbicides and use this information to maximize the effectiveness of fuelbreak installation and minimize impacts to native vegetation.

Road maintenance responsibilities come under the Public Works Department. Off-road use is only permitted in designated off-road areas or on established trails approved by the NRO through a Naval Air Station North Island Instruction to minimize erosion. Portions of Ridge Road have been paved, and some areas north of VC-3 have been graveled and graded. REWS Road is also now paved. A majority of secondary roads are maintained, although not on an annual basis. The Amphibious Construction Battalion has also performed road maintenance activities on SCI.

Revegetation efforts have been attempted at the airfield and West Cove beaches to address coastal erosion. Areas on SCI considered to have erosion issues include: West Cove, the Airfield, near Arizone Road, portions of West Shore Road, Wilson Cove, along Flasher Road, Tota Road, Magazine Road, Vista Escarpment, Tombstone Trail, scattered areas on the upland terrace flats from Eel Point south to Horse Canyon, and Dolphin Bay at the fuel farm.

Assessment of Resource Management

- There is concern about sedimentation plumes in nearshore waters, during and after storms, especially since the nearshore waters of SCI are designated as an Area of Special

Biological Significance (ASBS). The soil retention in the uplands and filtering capacity of the drainage system is ineffective compared to historic vegetation conditions.

- BMPs identified in Categorical Exclusions for road improvement projects are not always followed. Failure to implement these BMPs could result in non-compliance with NEPA requirements.
- Soil surface stabilization is needed to minimize erosion and maximize opportunities for soils to self-stabilize after disturbance. This threshold is not known for the soils and vegetation of SCI. This is in part because training load impacts on soils are not quantified, but also because no conceptual model has been developed that links site hydrology, soil health, sedimentation, fire, non-native species invasion, historic site potential to grow vegetation, and recoverability. Such conceptual models are derived by interdisciplinary teams and are in development internationally, led by the Natural Resources Conservation Service, and are a component of Ecological Site Descriptions; this approach should be emulated at SCI.

Management Strategy

Objective: *Conserve soil resources, especially erodible soils near the heads of canyons, knick-points of gullies, and areas threatening the uninterrupted continuation of the military mission or special status species, to provide drainage stability, native vegetation cover, and soil water holding capacity and protect site productivity, native plant cover, receiving waters, and access for the military mission.*

I. Develop, implement, and enforce an island-wide erosion prevention and control plan for a five- to ten-year time frame, including a handbook of BMPs.

- ***A.*** Comply with the BO on SCI Military Operations and Fire Management Plan (USFWS 2008a) by developing a soil erosion plan for planned military operations at SCI.
  - *1.* Implement proposed measures to minimize impacts of Assault Vehicle Maneuver Corridor (AVMC), Assault Vehicle Maneuver Road, Assault Vehicle Maneuver Area (AVMA), Artillery Firing Points (AFPs), Artillery Maneuvering Points (AMPs), Infantry Operations Area (IOA), and Amphibious Landing Sites.
    - *a.* Regularly monitor storm runoff and its effect on particularly vulnerable areas such as steep slopes.
    - *b.* The Navy will develop and implement a project to monitor for erosion, dust generation, and deposition of dust in adjacent habitats.
  - *2.* The Navy will identify an ingress/egress and travel route that avoids impacts to wetlands and minimizes impacts to coastal dune scrub at the Horse Beach Cove Amphibious Landing and Embarkation Area at Training Area and Range (TAR) 21.
- ***B.*** Continue to prioritize erosion control based on potential impact to the military mission or the legally protected resources. To reduce impacts to natural resources and maintain the desired level of training, erosion control activities should be prioritized according to the seriousness of the degradation and its potential impacts using the following parameters:
  - *1.* Potential impact on high-value facilities, including frequently-used roads that, if impassable, could hamper training access.
  - *2.* Likelihood of sediment entering a jurisdictional wetland or waters of the U.S., impacting a listed species, or affecting significant cultural resources.
  - *3.* Volume of potential soil loss.

4. Cost-effectiveness of the control measure.

C. Implement standardized BMPs from a handbook or other compiled source, as well as emerging technologies for control.

1. Keep informed and up-to-date on improved methods for preventing environmental impacts during maintenance activities and on revisions in laws, regulations, guidance, and policies.
2. Install water bars, retaining walls, or diversion culverts in areas of high runoff to provide drainage.
3. Support proper road and utilities development and maintenance in a strategic manner that secures soil from erosion and considering wildland fire management.
4. Implement roadway improvement recommendations.
5. Assure that all project work areas, including transit routes necessary to reach sites, are clearly identified or marked. Workers shall restrict vehicular activities to identified areas.
6. Stabilize disturbed sites with protective materials or erosion control plants.
   a. Vegetate disturbed sites with appropriate erosion control or landscape plants that are native to SCI and grown in the island nursery.

D. Soil conservation should be considered in all site feasibility studies and project planning, design, and construction. Appropriate conservation work and associated funding shall be included in project proposals and construction contracts and specifications.

1. Use specific guidance for selecting BMPs as presented in the California Stormwater BMP Handbook, including project planning and design guides, Stormwater Pollution Prevention Plans (SWPPPs), Water Pollution Control Programs preparation manuals, Construction Site BMPs Manual (California Department of Transportation 2003), other specifications in use on SCI projects, and other proven techniques.
2. Evaluate the success of BMPs utilized at SCI.
3. Minimize disturbance by locating ground disturbing activities on previously disturbed sites whenever possible. Staging areas shall be prohibited within sensitive habitat areas. Staging areas shall be delineated on the grading plans and reviewed by the resource agencies and project biological monitors prior to start of construction.

E. Natural resources management at SCI may save costs in the long term with an investment in staffing to ensure BMPs are implemented on the ground, as required for the project. A soil erosion expert should also be involved in developing BMPs and NEPA Categorical Exclusion erosion control measures.

F. Develop a Naval Base Coronado (NBC) Instruction to enforce best practices.

II. Continue to evaluate and adapt techniques for revegetation through a log of work accomplished. Ensure it is available to improve future techniques.

A. Inventory non-essential roads, retire them, and restore to native habitat.

III. Implement an integrated strategic soil conservation plan in concert with non-point source management, watershed management (including the hydrologic cycle and fog harvesting plants), wildland fire management, non-native species, and island recovery goals (See Section 3.9.7.3 Non-Native Terrestrial Wildlife).

A. SCI shall use a watershed-based approach to manage operations, activities, and lands to avoid or minimize impacts to wetlands, ground water, and surface waters on or adjacent to installations. This is in accordance with the guidelines and goals established in the Unified Federal Policy for a Watershed Approach to Federal Land and Resource Management, pp. 62565 to 62572, Vol. 65, FR.

IV. To support the evaluation of sustainability, incorporate into long-term monitoring programs: measures of ground cover, residual biomass, or other indicators of soil and watershed health.

3.5.8 Water Quality

Nearshore Marine Water Quality

Geographic separation from the mainland tends to separate SCI from many sources of mainland pollution and anthropogenic inputs. Dynamic current regimes, seafloor topography, and meteorological influences all interact to isolate SCI nearshore water quality, and are primarily subjected to impacts from point sources. Direct impacts and point source discharges may result from sea and/or shore based training activities.

To assess impacts from these types of activities, water quality within the nearshore waters of SCI were tested in 2005 and compared to the California Ocean Plan criteria for the protection of aquatic life (Table 3-4) as promulgated by the State Water Resources Control Board (SWRCB). SCI reference site samples exhibited pollutant concentrations below the water quality objectives for the instantaneous maximum, daily maximum, and six-month median thresholds.

Table 3-4. Water pollutant concentrations in surface waters at San Clemente Island (Navy 2006a).

	Concentration (micrograms per liter)	
Constituent	**SCI Reference Sampling Site**	**Ocean Plan Objective**
Antimony	0.18	1,200 [b]
Arsenic	1.19	8 [a]
Beryllium	ND	0.033 [b]
Cadmium	ND	1[a]
Copper	0.142	3 [a]
Lead	0.228	2 [a]
Mercury	ND	0.04 [a]
Nickel	0.25	5 [a]
Selenium	ND	15 [a]
Silver	ND	0.7
Thallium	ND	2[b]
Zinc	2.65	20 [a]
PCBs	ND	0.000019[b]
Phenols	ND	30 [a]
Chromium, hexavalent	ND	2 [a]
Cyanide	ND	1 [a]

Notes: (a) 6-month median value; (b) 30-day arithmetic average; ND - nondetectable concentration.

Zinc had the highest concentration (2.65 micrograms per liter) of all pollutants tested; however, the concentration was an order of magnitude below the water quality objective (the six-month median). Most concentrations of pollutants tested were determined to be below or slightly above analytical detection limits (Navy 2006a). Pollutants detected above limits included copper (0.142 micrograms per liter) and lead (0.228 micrograms per liter). Non-detectable results were reported for both mercury and total polychlorinated biphenyls (PCBs), among others.

These results suggest that training events and activities on or around SCI have an insignificant impact, if any, on nearshore water quality. Many priority pollutants (e.g., metals and PCBs) were detected in concentrations that were below Ocean Plan objectives, indicating reduced concentrations within the nearshore waters of SCI, and negligible impacts from point source inputs.

In 2011, comprehensive sampling of ecological communities occurred in rocky intertidal habitats as part of a regional study in the SCB to assess the potential effects of discharge on intertidal communities that are located in an ASBS. On SCI, two sites were selected, a reference site, Eel Point, and a discharge site, Boy Scout Camp. Raimondi et al. (2011) found there was no general difference in species richness or biological communities at discharge sites compared to reference sites. These results strongly support the idea that there is no common impact associated with discharges.

Nearshore Sediment Quality

Sediment quality within the nearshore environment of SCI is largely influenced by point source discharges and SCI operations. The Navy conducted receiving water and sediment testing at eight locations around SCI in support of an ASBS exception application. Four locations were selected to represent areas that receive stormwater discharges associated with distinct Navy operational activities, such as airfield operations, training ranges, or in one case, underwater detonation. Other locations were chosen representing areas that receive stormwater runoff not associated with Navy activities, considered a reference condition. Data were evaluated using a simplified weight-of-evidence approach that compared data collected at sites associated with Navy activities with accepted water quality benchmarks (e.g., Ocean Plan limiting concentration), guidelines (e.g., Effects Range Low [ER-L]), and reference conditions (Navy 2006a).

Table 3-5 indicates chemical concentrations within SCI reference sediments are below National Oceanic and Atmospheric Administration and EPA sediment quality guidelines. Metals, such as copper, mercury, and chromium, were found to be below ER-L and Effects Range Medium (ER-M) concentrations. ER-L and ER-M are indicators of potential toxicity within sediments. ER-L values are concentrations suggesting a potential for observable toxicity in sediments. ER-M values are concentrations where observable toxicity might be expected. In either case (ER-L or ER-M), concentrations above these thresholds do not imply toxicity (or adverse benthic effects), rather concentrations above the ER-L and ER-M criterion indicate potential for adverse effects, and can be used as a surrogate for potential sediment toxicity, when bioassay data is not available.

Solid phase amphipod testing data is also available for the SCI reference station. The ten day solid phase amphipod test is a direct effects test, exposing amphipods to collected sediment for ten days under laboratory conditions. After ten days of exposure the amphipods are assessed for survival and statistically compared to both a sediment control and a reference station. Toxicity is determined based on survival when compared to reference sediments. SCI reference sediment showed no signs of elevated mortality in test sediments, suggesting limited to no toxicity through direct exposure pathways.

Table 3-5. Contaminant concentrations in bottom sediments at San Clemente Island (National Oceanic and Atmospheric Administration 1999; Navy 2006a).

Constituent	Sediment Concentration at SCI Reference Sampling Site (ppm)	EPA Sediment Quality Guidelines (ER-M Values) (ppm)
Arsenic	2.87	70
Cadmium	0.11	9.6
Chromium	8.56	370
Copper	7.48	270
Lead	2.19	218
Mercury	0.275	0.71
Nickel	4.6	51.6
Selenium	0.56	NA
Silver	0.09	3.7
Zinc	19.2	410
PCBs	ND	180
Phenols	ND	NA
Dioxins	0.0 - 0.028	NA

Notes: ppm - parts per million; ER-M - Effects Range Median; ND - nondetectable concentration; NA: not available; TEQ - toxicity equivalency factor.

Using a simplified weight-of-evidence approach, there appeared to be no impact to beneficial uses at any of the sampling locations for the following reasons: 1) Chemical constituents measured in receiving water and sediment at sites affected by Navy operations did not exceed Ocean Plan Objectives or numerical guidelines (ER-L), respectively, or were below values measured at reference locations, and 2) No toxicity was observed in receiving water and sediment.

Current Management

While pollution entering storm drains is usually from diffuse or non-point sources, outfalls from storm drains represent a point source of discharge to SCI waters. The federal Clean Water Act (CWA), as amended in 1987 (402[p]), and the Coastal Zone Act Reauthorization Amendments of 1990 (Section 6217) are driving regulatory forces in addressing non-point source pollution from stormwater runoff. The Coastal Zone Act Reauthorization amendments require the EPA and the state to develop and implement management measures to control non-point source pollution in coastal waters, which California has done through a procedural guidance manual produced by the California Coastal Commission (1997).

The waters surrounding SCI fall under the jurisdiction of the Los Angeles Regional Water Quality Control Board (LARWQCB). SCI is included in the San Pedro Channel Islands Hydrologic Unit, along with Anacapa, Santa Barbara, San Nicolas, and Santa Catalina Islands (LARWQCB 1994). The LARWQCB identifies water quality standards, which are mandated under the California Water Code and CWA, through the Los Angeles Basin Plan. Congress delegated certain responsibilities under the CWA to the states and, within this federal-state partnership, the federal government sets the agenda and standards for pollution abatement, while states carry out day-to-day activities of implementation and enforcement. In California, this is accomplished through the SWRCB and coordinated through regional boards.

The SWRCB adopted the Ocean Waters of California Water Quality Control Plan (Ocean Plan) in 1974. The Ocean Plan establishes beneficial uses and water quality objectives for waters of the Pacific Ocean adjacent to the California coast outside of enclosed bays, estuaries, and coastal lagoons. Additionally, the Ocean Plan authorizes the SWRCB to designate waters as an ASBS, which SCI is designated in the Los Angeles Basin Plan. The SCI ASBS includes waters to a distance of 1 nm (1.9 km) or to the 300-foot (91-m) isobath, whichever is greater, along its 58-mile coastline. The ASBS designation prohibits all waste discharges, both point and non-point; it is intended to protect species or biological communities, due to their value or fragility, from an undesirable alteration in natural water quality. Exceptions to the discharge prohibitions exist for the Wastewater Treatment Plant at Wilson Cove in the SWRCB Resolution No. 77-11, which created a 1,000-foot radius ASBS exclusion zone around this discharge and for discharges of stormwater consistent with Water Resources Control Board Resolution No. 2012-0012. As an ASBS, SCI is recognized as a federal Marine Protected Area (MPA) (Executive Order [EO] 13158) but is not included in California's network of MPAs and is managed under state water quality regulations for an ASBS.

According to the California Coastal Commission, there are piers, roads, structures, and military activities (including the use of ordnance and an airfield) that contribute to discharges into the ASBS. A watershed characterization delineated 214 watersheds on SCI, many of which drain into the ASBS (TDI 2007). There are 23 direct discharges. Some of the discharges are industrial storm drains, some carry runoff from roads, and others are associated with pier or marine landing facilities. A sewage treatment plant, operated by the Navy, discharges into an excluded zone within the ASBS, under an exception from the SWRCB.

As part of the SCI ASBS exception application, SWRCB requested that the Navy conduct quantitative intertidal and subtidal biological surveys. A total of ten locations were chosen for sampling; these included five locations representative of areas that receive stormwater discharges associated with distinct Navy operational activities, such as airfield operations, training ranges, or, in one case, from underwater detonation operations. The total also included five locations representing areas that receive stormwater runoff not associated with Navy activities and, thereby, are considered a reference condition. The five reference locations were chosen because historical data indicated that there are four ecoregions around the island that result in different reference conditions.

Two metrics were derived from these surveys: number of taxa and abundance or percent cover. Since there are no benchmarks available for these metrics, comparisons were made to reference conditions within an associated ecoregion. Two separate surveys were conducted; the first survey was conducted from 29 November to 03 December 2005 and the second survey from 16 May to 21 May 2006.

Results indicated a high degree of biological variability in the intertidal and subtidal zones within an ecoregion, primarily due to differences in substrate type and coverage (e.g., cobble, boulder, bedrock, sand). Generally, different substrata supported different assemblages of organisms and, at some locations, the presence of competitive dominants (e.g., mature giant kelp forest) led to biological interactions. All marine habitats surveyed at SCI had diverse, healthy communities. Variability amongst communities was attributed to normal variability and there was no indication of direct impacts associated with naval activities. The metrics used to determine potential impacts to SCI ASBS beneficial uses further indicated biological variability within an ecoregion, supporting the need to have multiple reference locations. The biological data in combination with water and sediment chemistry and toxicity provided the weight of evidence that Navy discharges do not compromise protection of ocean waters for beneficial uses, which include: commercial and sport fishing; preservation and enhancement of designated ASBS; rare and endangered species; marine habitat; fish migration; fish spawning; and shellfish harvesting (Merkel and Associates 2007).

In 2006, the Navy established 11 intertidal/subtidal monitoring locations to support the exception for discharging into ASBS. These sites are co-located with kelp forest monitoring sites and locations of special interest, such as ephemeral stream discharge points. These sites are intended for inclusion in the island's overall intertidal/subtidal monitoring program as recommended in the SCI INRMP.

The Navy Public Works Center Environmental Projects Team provides Pollution Prevention Plans, and Spill Prevention, Control, and Countermeasures Plan Updates. The LARWQCB conducts the Surface Water Ambient Monitoring Program,[1] which includes SCI waters and coordinates with other monitoring programs. This watershed was a focus for Surface Ambient Monitoring Program monitoring in 2004–2005.

The Bight '08 regional monitoring study coordinated its Cooperative Research Assessment of Nearshore Ecosystems and Partnership for Interdisciplinary Study of Coastal Oceans Rocky Intertidal efforts with existing monitoring programs at SCI.

Stormwater discharges are regulated by the CWA through the National Pollution Discharge Elimination System (NPDES) permitting program. SWRCB is responsible for administering permits at SCI. SWRCB has not developed water quality objectives for the inland surface waters or watercourses. SCI is required to comply with the SWRCB Water Quality Order No. 97-03-DWQ, NPDES General Permit No. CAS000001, and Waste Discharge Requirements for Discharges of Stormwater Associated with Industrial Activities Excluding Construction Activities (General Permit). The General Permit requires development and implementation of a SWPPP and a Stormwater Monitoring Program. Both plans were included in a Stormwater Discharge Management Plan, developed for SCI in September 1993, updated annually. The Industrial General Permit will likely be reissued early in calendar year 2013 (C. Haynes, pers. com. 2012). The SCI stormwater monitoring program conducts an assessment, which compares results from stormwater samples at SCI to EPA benchmarks. The EPA benchmarks are intended to provide comparison values for sampling results that allow operators to gauge the effectiveness of their BMPs, not to establish effluent limitations. The EPA stormwater benchmark exceedances have been observed occasionally, such as suspended solids, and are reported in NBC's annual stormwater reports (J. Cronin, pers. com. 2011).

To meet discharge prohibitions and effluent limitations from entering receiving waters, the General Permit requires SCI to meet specific provisions, including annual compliance evaluations, monitoring, assessing BMPs, maintaining records, and providing annual reports. SCI continues to implement new BMPs, described in the revised SWPPP, and complies with all permit requirements regarding monitoring, recording, and reporting. The installation

1. Available online at: http://www.waterboards.ca.gov/water_issues/programs/swamp/.

addressed non-compliance issues that resulted in a Notice of Violation in 2001, issued by the RWQCB to Navy Region Southwest Environmental, concerning effluent limit and reporting violations at the SCI Waste Water Treatment Plant. A letter report detailing corrective actions initiated the extension to the existing outfall, completed in 2008.

The Navy has coverage under two stormwater permits: the statewide General Industrial NPDES Stormwater Permit and the statewide General Construction NPDES Stormwater Permit to support the beneficial uses of the ASBS designation. The Industrial permit requires wet and dry season monitoring and an annual report to regulators with stormwater sampling results. The permit also includes the development and implementation of a SWPPP and maintenance of a GIS record-keeping system. The NPDES General Permit authorizes SCI to discharge stormwater from the date the Navy submitted a Notice of Intent. The SWPPP is intended to eliminate illicit discharges, implement BMPs, conduct stormwater monitoring, conduct industrial inspections, and train employees. SCI personnel currently implement specific BMPs at each Industrial Activity and general base-wide BMPs to reduce pollutants in stormwater discharges from a site. Additional monitoring requirements are defined in SWRCB Resolution No. 2012-0012. These requirements include sampling all ASBS stormwater discharges greater than 18 inches (46 cm), sediment sampling, and receiving water and reference receiving water sampling. This work is being completed as part of ASBS Regional Monitoring during the 2012/2013 wet season (winter).

Assessment of Resource Management

- To improve water quality measures and reduce costs, additional methods could be investigated to increase the percentage of reclaimed water from the wastewater treatment facility or expand the facility to develop a tertiary treatment process.
- The SWPPP and Stormwater Monitoring Program are updated annually, addressing new and expanded permit requirements.
- The extent of ongoing violations, resulting from wastewater and stormwater discharge, is intermittent and primarily attributed to exceeding parameters from specific stormwater outfalls within Wilson Cove. An integrated approach is needed to communicate and implement the BMPs defined in the SWPPP to eliminate compliance issues related to stormwater discharge.
- As SCI recovers from grazing pressures, the island’s hydrologic processes are also responding to changes. There is a need for baseline data to determine if water quality conditions represent natural hydrologic and erosion processes or rather are an indication that industrial processes and military training are adversely affecting conditions.
- In support of a precautionary approach, and given that operational changes are occurring, there is a need to maintain compliance with the BO on SCI Military Operations and Fire Management Plan (USFWS 2008a) and develop and implement an erosion control plan for the AVMA and IOA. Furthermore, erosion needs to be managed in support of an ecosystem approach to comply with ASBS requirements. A draft of the erosion control plan is anticipated to be submitted in September 2012 (C. Escola, pers. com.).
- There is a lack of sufficient baseline data for water resources at SCI. Environmental staff do not have island-wide, comprehensive water resources information, which would allow them to identify where surface water courses are located, the jurisdictional status of those water courses, their ecological functions, and/or their natural resource value.

- During rain events in the wet season, stormwater discharge causes sediment plumes at canyon mouths; these sediment plumes affect the water quality of the ASBS. There are also potential concerns that stormwater discharge from Wilson Cove may inadvertently degrade ASBS water quality due to urban influences from the infrastructure located there.

Management Strategy

***Objective:** Comply with applicable water quality regulations or directives to reduce and minimize water pollutants from entering the watershed and nearshore waters of SCI.*

I. Assess and report on the status and condition of water quality.

- ***A.*** Continue dry and wet season monitoring of storm drains.
- ***B.*** Continue annual stormwater reporting to the LARWQCB.
- ***C.*** Assess and monitor BMPs to support their stated goals.
- ***D.*** Continue to use data from regional long-term monitoring efforts to evaluate baseline conditions of key water quality parameters at established and representative sampling locations throughout the ASBS, such as building on the work of the Southern California Coastal Waters Research Program Bight 1998 (Bay et al. 2000), 2003 (Schiff et al. 2006a), and 2008 (Bight 2008).

II. Integrate water quality management into soil erosion and watershed management, as well as other natural resource plans under this INRMP.

- ***A.*** Continue to update and implement the SCI-specific SWPPP associated with the Industrial General Permit and integrate into general management strategies.
- ***B.*** Continue to update and implement the SCI Oil and Hazardous Substance Integrated Contingency Plan.
- ***C.*** Continue to develop, update, and implement an Erosion Control Plan for the AVMA and IOA.
- ***D.*** Comply with water quality permit requirements when required by project size or if a project may affect jurisdictional wetlands or waters of the U.S.
- ***E.*** Support BMPs that suggest that potable water not be used for landscape purposes. Increase the use of rain and fog capture for landscape use.

III. Comply with water quality regulations.

- ***A.*** Coordinate with the U.S. Army Corps of Engineers (USACE), EPA, USFWS, and LARWQCB, as appropriate, with regard to restrictions on, or required permits for, any Navy actions that may affect water resources.
- ***B.*** Continue to implement BMPs for SCI that include pollutant source controls, management practices other than source controls, preventative maintenance, spill prevention and response, erosion and sediment controls, identification of stormwater pollution prevention personnel, and structural controls for runoff.
- ***C.*** Implement BMPs to protect and improve water quality and prevent erosion and sedimentation from SCI land and roads into receiving waters, especially jurisdictional waters.
- ***D.*** Assess and monitor BMPs to ensure stated goals are achieved.

IV. Continue to focus efforts on habitat protection, erosion control, and stormwater pollution prevention as a primary means to maintain SCI marine water quality health.

V. Implement watershed-based approaches wherever possible when evaluating the impact of overall activities on water resources, including fog-harvesting vegetation as part of the hydrologic cycle and consideration of wildland fire.

VI. Continue cooperative management within the INRMP footprint where jurisdictions adjoin or overlap.

3.6 Wildland Fire

The SCI Wildland Fire Management Plan (WFMP) was adopted in June 2009. The WFMP shapes fire-related policy, management, and decisions on the island (Navy 2009a). It sets the course for sound integration of the Navy's mission, fire protection, and natural resources protection on SCI. Its primary purpose is to provide for a full and complete range of training opportunities for military users, while complying with environmental laws and achieving sustainable ecosystem management.

3.6.1 Fire History

Prior to about 1979, there is little direct information on fire history for SCI. Lightning-caused fire appears to be rare in recorded history for the Channel Islands (three documented fires over the past 140 years, on Catalina in 1967, Santa Cruz Island in 1987, and Santa Rosa in 1988) (Carroll et al. 1993). However, two recent lightning fires have occurred since these records on Santa Catalina Island (P. Schuyler, pers. com. 2002). Additional lightning strikes are documented on other islands that did not result in fires (Carroll et al. 1993). Charcoal deposits from the Pleistocene and Holocene on San Miguel Island (Johnson 1972) and Holocene on Santa Cruz (Brumbaugh 1980) may have resulted from natural prehistoric fires. It is appropriate to assume that fire played at least a minor ecological role in shaping the island's natural resources and will continue to do so in the future.

During habitation by the Gabrieliño people (See Section 2.1.1 Native Americans), it can be assumed that residential fires occasionally escaped developed areas and that these aboriginal occupants may have intentionally set fires systematically (A. Yatsko, pers. com. 2002). Prehistoric manipulation of the botanical environment has been clearly demonstrated in the results of archaeological, ethnographic, ethnohistoric, and paleobotanical research in the American Southwest. Evidence of these activities by California tribes was compiled by Blackburn and Anderson (1993). Although none of their assembled data derive specifically from SCI, the island's late prehistoric island Gabrieliño occupants were socially, economically, and linguistically integrated with their mainland counterparts, who did use fire as a tool to draw out seed yields from plants important to them (A. Yatsko, pers. com. 2002).

No direct archaeological evidence of intentionally-set aboriginal fires has been examined for the island, although sedimentary deposits containing charcoal could be investigated with this in mind. However, because prehistoric island dwellers would have had immediate knowledge for this use of fire, it can be inferred that they most likely followed the mainland pattern and frequently burned selected vegetation communities. Although these aboriginal residents depended to a large degree on the sea for subsistence, archaeological evidence from their groundstone seed processing tools suggests a certain reliance on terrestrial plant resources as well. Some genera commonly used by Native Americans, including *Stipa*, *Cistanthe*, *Dichelostemma*, and *Datura*, are known to be favored by fire over other species (Keeley 1991; Menke 1992).

Fires continued to be set at least intermittently after sheep ranching commenced, from about 1862 to 1934. There is written documentation of three instances when sheep ranchers set fire to increase forage for their herds (Andrew 1996).

Sheep grazing leases were immediately canceled when the Navy took control of the island in 1934. The goat population expanded without controls at this point, and fuel loads probably became progressively lower and less continuous as goats browsed it down. Military use of SCI began to take on the pattern it has today, with the airfield and other localized developments for human occupation and areas of live ordnance use. A change in fire pattern coincided with the use of incendiary ordnance (Navy 2009a).

3.6.2 Current Fire Pattern

All Channel Islands, except SNI and Anacapa, experience human-ignited fires commonly compared to natural fires, especially those islands with high levels of human activity (Carroll et al. 1993) (Photo 3-9; Table 3-6).

Since 1996, approximately half of the fires occurring on the island have occurred within Shore Bombardment Area (SHOBA) (Table 3-7). A majority of fires do not go downslope; therefore, topography contains wildfires to areas with fewer sensitive species (B. Munson, pers. com. 2011). Although some fires have not been fought in the past due to the presence of Unexploded Ordnance (UXO), new NBC policy allows for aerial suppression assets to fight fires in all areas outside of Restricted Access Areas and Impact Areas. It is anticipated that fires will be fought with primary focus on human life and facilities and secondary focus on high priority natural resources. Fires in the northern portion of the island, where most humans reside while on the island, are usually suppressed before they spread. This disparity in fire suppression practices within and outside of SHOBA, at least partially, accounts for the fact that the fires in SHOBA total approximately 90% of the total acreage burned from 1996–2010 (Table 3-7).

Photo 3-9. Burned grasslands on San Clemente Island. Photo was taken in August 2000, but exact date and cause of the fire is not known (Tierra Data Inc. 2000).

Table 3-6. Number of historical fires on the Channel Islands (1830–1986) based on literature and dozens of interviews, compiled by Carroll et al. (1993). Data from 1987–2010 are sourced from California Department of Fish and Wildlife. Fires greater than one hectare are recorded by size range. Fires less than one hectare are not recorded (Navy 2009a).

	Number of Historical Fires by Range in Size of Fires (hectares)			
Island	**1–9**	**10–99**	**100–999**	**1000+**
Anacapa	0	0	0	0
San Clemente	9*	2	1	2
San Miguel	12*	0	2	1
San Nicolas	0	0	0	0
Santa Barbara	0*	4*	1	0
Santa Catalina	21*	3	3	1
Santa Cruz	5	2	0	1
Santa Rosa	0	3	0	0

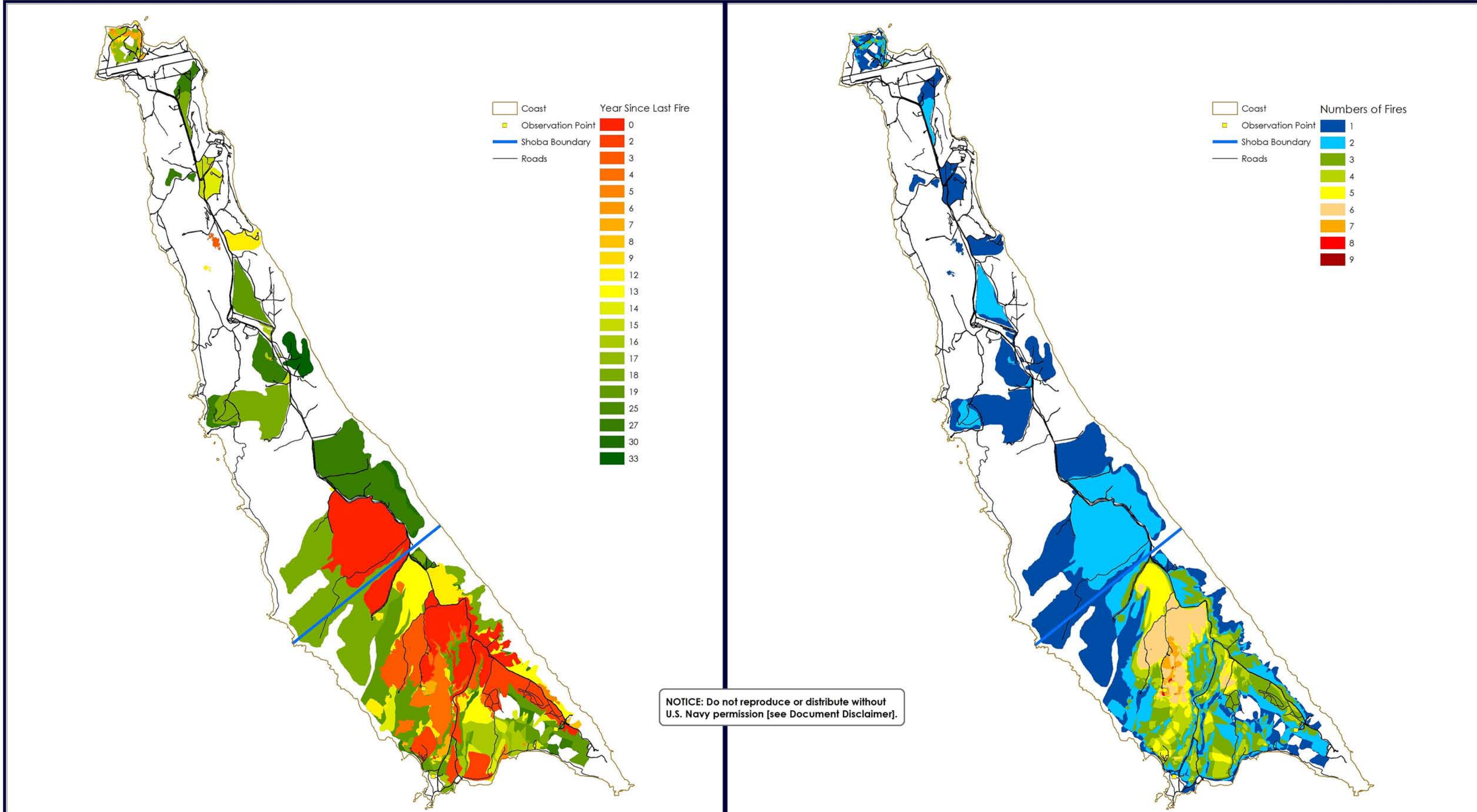
* Estimate due to lack of accurate records.

Table 3-7. Recorded wildfires comparing the Shore Bombardment Area to north of the Shore Bombardment Area for 1996–2010.[1]

	Number of Fires	Percent of Total	Acres Burned	Percent of Total
In SHOBA	78	49.7%	9992.4	91.3%
North of SHOBA	79	50.3%	953.3	8.7%
Totals	157	100%	10945.4	100%

1. Sources: Navy 2009a; Naval Facilities Engineering Command GIS data (2005–2010).

Early records are inadequate, but many fires covered only a small area and burned out with no serious impact on natural resources. However, some fires, such as the 1980 fire from Stone Gate south, spread over much of the island (Navy 2009a). Map 3-8 shows the fire history on SCI, based on records from 1979 through 2010 (Naval Facilities Engineering Command GIS Data 2010).



Fire History* 1979-2012 at NALF San Clemente Island

Integrated Natural Resources Management Plan, NALF San Clemente Island

Miles 0 1 2 3 4 5

Kilometers 0 1 2 3 4 5 6 7 8

N W E S

*All fire data has been collected by either CNRSW biologists, SERG, or SCORE.

Map 3-8. Fire history on San Clemente Island 1979-2012.

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3.6.3 Ignitions and Ignition Sources

Most fires on the island today are ignited by various types of live ordnance training (Table 3-8 and Table 3-9).

Table 3-8. Known ignition sources, total ignitions, and total acreage burned from 1990–2010.[1]

Ignition Source	Total Known Ignitions 1990–2010	Percent of Total Ignitions	Acres Burned 2002–2010	Percent of Total Acreage
Unknown	92	46.7%	22,119.0	72.8%
Training (Unspecified)[2]	16	8.1%	799.1	2.6%
Naval Shell	12	6.1%	680.0	2.2%
Demolition Charge	14	7.1%	108.0	0.4%
Electrical Wiring/Transformer	4	2.0%	1,931.0	6.4%
Flare	9	4.6%	893.0	2.9%
Missile	6	3.0%	4.5	0.0%
Illumination Round - Naval	6	3.0%	237.7	0.8%
Grenade	5	2.5%	228.0	0.8%
Small Arms	6	3.0%	117.0	0.4%
Tracer Round	9	4.6%	1,521.7	5.0%
Vehicle exhaust pipes	3	1.5%	458.0	1.5%
Controlled Burn	3	1.5%	317.0	1.0%
Helitorch during fuelbreak instruction	2	1.0%	646.0	2.1%
UAV Crash	2	1.0%	8.0	0.0%
Artillery Shell	1	0.5%	2.5	0.0%
Air to Ground Ordnance	2	1.0%	238.0	0.8%
Spark off Target	1	0.5%	55.0	0.2%
Illumination Round - Mortar	4	2.0%	32.7	0.1%
TOTAL	197	100.0%	30,396.2	100.0%

1. Sources: 1990–2010 wildland fire inventories, GIS data 1993, 1994, 1996, 1999, and 2010; USFWS 2001; Navy 2009a.

2. In 2007, SCORE began recording some fire ignition sources as unspecified 'Training'. This new category undoubtedly shares some overlap with the similar and previously existing ignition source category, 'Unknown'. Despite the great potential for overlap between these categories, they have been kept separate here for the sake of coherence with NAVFAC GIS data.

Table 3-9. Known number of ignitions and acres burned each year between 1990 and 2010 by ignition source.[1]

Ignition Source		1990	1993	1994	1995	1996	1997	1998	1999	2000	2001	2003	2004	2005	2006	2007	2008	2009	2010	Totals
Unknown	#Fires	1	4	16	4	5	1	4	1	4	0	1	11	18	15	0	0	1	6	92
	Acres	1,000	8,446	6,271	2,430	1,287	5.0	800.0	2.5	162.0	0.0	6.8	73.4	221.0	29.6	0.0	0.0	221.0	1,164.0	22,119.2
Training (Unspecified)[2]	#Fires															11	3	2		16
	Acres															77.7	721.0	0.5		799.2
Naval Shell	#Fires						7		4	1										12
	Acres						176.0		481.0	23.0										680.0
Demolition Charge	#Fires					1		2	3	2	1						3	2		14
	Acres					18.0		10.0	12.0	18.0	1.0						23.0	26.1		108.1
Electrical Wiring/Transformer	#Fires							2	2	1										5
	Acres							120.0	1,483	328.0										1,931.0
Flare	#Fires		1	1		1	3				1									7
	Acres		?	845.0		4.0	43.0				1.0									893.0
Missile	#Fires					2	4													6
	Acres					2.5	2.0													4.5
Illumination Round - Naval	#Fires						1	4									1			6
	Acres						4.6	230.0									2.7			237.3
Grenade	#Fires						3	1		1										5
	Acres						216.0	2.0		10.0										228.0
Small Arms	#Fires								2	3	1									6
	Acres								2.0	114.0	1.0									117.0
Tracer Round	#Fires				1			2		2	2							1		8
	Acres				162.0			3.0		23.0	25.0							1,308.7		1,521.7
Vehicle exhaust pipes	#Fires							1		2										3
	Acres							350.0		108.0										458.0
Controlled Burn	#Fires		1.0	1.0													1.0			3
	Acres		?	73.0													244.0			317.0
Helitorch during fuelbreak instruction	#Fires					1				1										2
	Acres					300.0				346.0										646.0
UAV Crash	#Fires							1		1										2
	Acres							1.0		7.0										8.0
Artillery Shell	#Fires								1											1
	Acres								2.5											2.5
Air to Ground Ordnance	#Fires									1	1									2
	Acres									235.0	3.0									238.0
Spark off Target	#Fires							1												1
	Acres							55.0												55.0
Illumination Round - Mortar	#Fires								2							1		1		4
	Acres								5.0							0.0		27.7		32.7
TOTAL	#Fires	1.0	6.0	18.0	5.0	10.0	19.0	18.0	15.0	19.0	6.0	1.0	11.0	18.0	15.0	12.0	8.0	7.0	6.0	195
	Acres	1,000	8,446	7,189	2,592	1,611	446.6	1,571	1,988.0	1,374	31.0	6.8	73.4	221.0	29.6	77.7	990.7	1,584	1,164.0	30,396.2

1. Sources: 1900 - 2001 Wildland fire inventories, NAVFAC GIS Data 1993, 1994, 1996, 1999, and 2010; USFWS 2001; Navy 2009a.

2. In 2007, SCORE began recording some fire ignition sources as unspecified 'Training'. This new category undoubtedly shares some overlap with the similar and previously existing ignition source category, 'Unknown'. Despite the great potential for overlap between these categories, they have been kept separate here for the sake of coherence with NAVFAC GIS data.

Current Management

Wildland fire management is primarily driven by the WFMP (Navy 2009a), the BO on SCI Military Operations and Fire Management (USFWS 2008a), and the Conservation Agreement between the Navy and USFWS concerning the San Clemente island fox (*Urocyon littoralis clementae*) (10 January 2003) (Table 3-10). As part of the range certification process, fire-safe clearing on small arms and other ranges is conducted separately from other fire planning. The WFMP was signed due to the long-term commitment and collaboration among military operators, NRO, and contractors.

Table 3-10. Conservation requirements for wildland fire management.

FMP-M-1. The Navy will evaluate firelines and bladed areas disturbed by fire suppression activity and rehabilitate these areas as practicable and appropriate.
FMP-M-2. The Navy's Natural Resource Office will determine whether seeding is appropriate for post fire erosion control. Seeding would be overseen by the SCI Botany Program and would use native seed collected from SCI.
FMP-M-4. When designing and implementing fuel breaks, the Navy will factor in the need to protect canyon shrubland/woodland occupied by shrikes. Coordination between Navy Natural Resource personnel and applicators will occur prior to fuel break installation in the proximity of occupied nesting areas.
FMP-M-5. The Navy will minimize impacts to listed species and occupied habitat associated with Phos-Chek application by considering the locations of federally-listed species in advance of fuel break installation. This will allow the Navy to avoid impacts to the extent practicable. The Navy will avoid application of Phos-Chek within 300 feet (91.5 m) of mapped Santa Cruz Island rock-cress locations and avoid application of Phos-Chek within 300 feet (91.5 m) of other mapped listed species to the extent consistent with fuelbreak installation.
FMP-M-7. The Navy will monitor soil and vegetation responses to retardants and herbicides and use this information to maximize the effectiveness of fuelbreak installation and minimize impacts to native vegetation.
FMP-M-7. The Navy will coordinate the development of burn plans with natural resources staff to identify potential biological issues.
FMP-M-8. The Navy will consider the locations of federally-listed plants in advance of prescribed fire application so that impacts can be avoided by location or timing where possible and plan prescribed fire to provide a resource benefit where appropriate.
FMP-M-13. The Navy will conduct pre-season briefings on minimal impact suppression tactics for the fire fighting personnel. This would include guidelines on fire suppression materials and tactics, including limitations associated with Phos-Chek and salt water drops.
FMP-M-14. The Navy will conduct an annual review of fire management and fires that will allow adaptive management, if required, as outlined on page 4-56 of the draft WFMP (September 2005 draft). The USFWS will be included as an invited stakeholder to participate in this annual review.
FMP-M-15. The Navy will staff and train a Wildland Fire Coordinator prior to modifying existing training restrictions or increasing distribution of ignition sources on SCI. The equipment and tools necessary for this staff person to accomplish the duties of this position will be in place prior to any increasing ignition sources on the island.
BTS-M-2. Fire Danger Rating System precautionary measures at these sites will be the same measures implemented at TAR sites.
Comply with take authorization under the MBTA-Migratory Bird Rule regarding fires that are started incidental to military readiness activities. During INRMP reviews, SCI must report to the USFWS migratory bird conservation measures implemented and the effectiveness of the conservation measures in avoiding, minimizing, or mitigating take of migratory birds (See Appendix E).

The fire plan aligns weather conditions, ordnance use, and staging of suppression assets into a Fire Danger Rating System, based on expected response times. It set target acreage ceilings for certain sensitive plant communities.

The WFMP calls for aerial suppression assets during fire season under certain fire weather conditions. Per the plan, a helicopter is to be on standby at the air terminal on the island to respond to a fire in SHOBA. However, due to UXO concerns, the helicopter cannot be used in SHOBA.

Fuelbreaks using retardant foam have been laid down every year for the past several years to: manage expected fires coming from the SHOBA target areas, keep them contained in size, prevent them from entering canyons, and prevent impacts to special status species, such as the San Clemente loggerhead shrike. A primary concern of fuelbreaks in recent years has been the mild fertilizing effect from the chemical constituents of the retardant mixture. The fertilizing effect is amplified by repeated applications over the years.

As a result of fire management planning, fire research studies on adaptation of vegetation and the use of prescribed fire have arisen. Currently, a San Diego State University student is studying prescribed burns in grassland habitat (E. Howe, pers. com. 2012). Additionally, the U.S. Geological Survey (USGS) and Space and Naval Warfare Systems Command are collaborating on California boxthorn fire response plots (J. Keeley and D. Lawson, pers. com.).

For more specific information concerning wildland fire management refer to the current version of the SCI WFMP (Navy 2009a).

Assessment of Resource Management

- SCI is currently not in compliance with some portions of the WFMP (Navy 2009a), due to the inability to safely abide by requirements listed in the plan.
- Despite safety procedures in regard to when and how to Blow-In-Place UXO, there remains the risk of wildfire ignition. This needs to be addressed in the WFMP update, currently in progress.
- Suppression response for structures in developed areas is not prioritized, and with limited fire response resources, this prioritization should be conducted immediately to prevent the loss of important and necessary structures.
- Currently, not all firebreak roads meet the accessibility standards, as described in the WFMP, to function for fire suppression support.
- The burned habitat acreage thresholds from the WFMP may have been exceeded sooner than expected. In addition, habitats have increased and/or changed in acreage over time. The thresholds need to be revisited.
- The timing of fuelbreak installation is difficult to plan because it is important to place the retardant outside of fire season, whereas before fire season there is the potential for heavy rains to compromise the fuelbreak. This timing should be investigated and established.
- Fuelbreaks pose ecological concerns; the potential ecological impacts of fuelbreaks should be investigated.
- While implementation of the WFMP has led to improvements in communication systems and weather monitoring, there remain uncertainties about whether more communication equipment is needed. There is also a need to revise or clarify the communication protocols before, during, and after a fire.
- There are questions about whether Remote Automated Weather Stations are being used effectively for fire weather prediction. Also, there are questions about whether fire management can improve now that weather station reporting has improved.
- There is a recognized need for more staffing to implement the WFMP, related conservation measures, and other Sikes Act (as amended) requirements for SCI.
- Current fire-related studies taking place on the island will add to the knowledge of the effects of wildland fire on island habitats.
- Annual review and adaptive management have been hampered by inadequate post-fire reporting.

Management Strategy

Objective: *Use all available wildland fire tools to minimize the cost of fire suppression while avoiding adverse impacts on military training, and consider firefighter and human safety, facilities, and promoting natural resources objectives of this INRMP.*

I. Manage fire ignition risk as hazardous weather and fuel conditions increase.

- ***A.*** Require constant monitoring of SCI weather conditions during the fire season to help prepare appropriate suppression response in high fire danger conditions.
- ***B.*** Determine whether Remote Automated Weather Stations are placed most advantageously for fire weather prediction to assist in managing live-fire training ignitions. Standardize the placement, instrumentation, and reporting of Remote Automated Weather Station data to facilitate fire management.
- ***C.*** Prioritize buildings that should be saved in the event of a wildfire encroaching into developed areas.
- ***D.*** Revise or clarify the communication protocols before, during, and after a fire. Upgrade communications equipment as necessary to achieve a three-minute notification of first fire observation.

II. Conduct strategic fuels management by establishing: safety corridors or buffers where fuels are reduced, defensible space around structures, and low-intensity landscape modification that also meets ecological objectives. These are the initial lines of defense to reducing adverse ecological effects of wildland fire and the associated cost of fire suppression.

III. Due to the high cost of providing the manning and equipment necessary for the suppression of wildland fire, use timely and appropriate suppression response through use of tactical and strategic planning. It is extremely necessary to manage the cost of suppression protection through pre-fire planning. Annual risk analysis along with recorded statistics will help in determining future funding and needs of the suppression protection of wildland fire on SCI.

- ***A.*** Produce a map showing areas where a helicopter can directly attack fires once Restricted Access Area protocols are formalized.
- ***B.*** Evaluate the use of fixed wing aircraft on standby on the mainland to assist with fire suppression.
- ***C.*** Prioritize firebreak roads that are most useful for fire management and routine maintenance to maintain accessibility for fire management purposes. Integrate into the annual road maintenance budget and schedule.

IV. Explosive Ordnance Disposal detonations in or near listed species habitat should be conducted in a manner minimizing the potential for wildfire without compromising personnel safety (Conservation measure G-M-5).

V. Minimize impacts to listed species and occupied habitat associated with fuelbreak application by considering the locations of federally-listed species in advance of installation (Conservation measure FMP-M-5).

- ***A.*** Avoid application of fuelbreaks within 300 feet (91.5 m) of mapped listed species to the extent consistent with installation (Conservation measure FMP-M-5).
- ***B.*** Reconsider habitat acreage thresholds now that more shrub exists on the island and species status has changed. Consider the long-term health and maintenance of the natural ecosystem and INRMP objectives.
- ***C.*** Update the WFMP to using a percentage of habitat instead of acreage as a threshold for adjusting management.

VI. Coordinate prescribed burns in advance of application to avoid populations of federally-listed plants (Conservation measure FMP-M-8).

VII. Plan prescribed fire to provide a resource benefit where appropriate (Conservation measure FMP-M-8).

VIII. Consider additional staffing to implement the WFMP, related conservation measures, and other Sikes Act (as amended) requirements.

IX. Conduct sufficient post-fire reporting to facilitate better decisions through adaptive management.

3.7 Terrestrial Habitats and Communities

3.7.1 Vegetation and Land Cover Types

3.7.1.1 Floristic Relationships

The flora of SCI is similar to that of the mainland coast with important exceptions. The island is rich in endemics, most of which are relictual (e.g., woody perennials), but some are a result of divergent island evolution (Axelrod 1967). The Santa Cruz Island ironwood, for example, is found on SCI, Santa Cruz, and Santa Rosa, but exists only in fossilized forms today on the mainland. A counterpart for the white-flowered San Clemente Island indian paintbrush (*Castilleja grisea*) has never been found on the mainland or any other Channel Island.

Raven (1963) also noted that certain components of the flora are related to areas in northern California, rather than the nearest mainland sites. An explanation for this floristic relationship is that a much more mesic climate predominated in California during the last glacial epoch. When a warming trend followed, a more arid flora became dominant on the mainland, while the Channel Islands acted as a refuge for the northern elements because of moist, moderate conditions. Examples of plants found on SCI and northern California, but not the nearby mainland, are: beach evening primrose (*Camissoniopsis cheiranthifolia* subsp. *cheiranthifolia*), silver burr ragweed (*Ambrosia chamissonis* var. *chamissonis*), true babystars (*Leptosiphon bicolor*), and wild pea (*Lathyrus vestitus*).

Westman (1983), on the other hand, concluded that SCI contains more floristic affinities with coastal succulent scrub of Baja California than any of the mainland coastal scrub communities in Alta California, as indicated by the prominence of fleshy stem succulents (Family Cactaceae, Crassulaceae, and Euphorbiaceae). Examples of plants found on SCI and areas south are: cliff spurge (*Euphorbia misera*), coast goldenbush (*Isocoma menziesii*), and island ragweed (*Senecio lyonii*).

3.7.1.2 Early Vegetation Mapping

A vegetation map for SCI was created in the late 1970s, and included 13 categories using the Thorne classification (1976), as adapted by Sward and Cohen (1980), based on mapping from aerial photos from on 11 March 1977 at 15,000 feet (4,572 m) in altitude. Table 3-11 shows mapping units, acreages, and percentages of the island area covered by each. Correct acreage of the island is 36,073 plus 54 acres (14,598 plus 22 hectares [ha]) in offshore islands and rocks.

Table 3-11. Vegetation mapping units, acreages, and percentages of island area for San Clemente Island (Sward and Cohen 1980).

Vegetation mapping units	***Acres***	***% of Island Area***
Grassland	11,831	33
Maritime Desert Scrub–Boxthorn Phase	5,849	16
Maritime Desert Scrub–Prickly Pear Phase	7,336	20
Maritime Desert Scrub–Cholla Phase	4,941	14
Maritime Desert Scrub–Prickly Pear/Cholla	1,514	4
Maritime Sage Scrub	386	1
Canyon Shrub/Woodland	696	2
Coastal Salt Marsh	19	0.1
Stabilized Sand Dunes	425	1
Active Sand Dunes	224	1
Sea Bluff Succulent	45	0.1
Disturbed	2,691	7
Coastal Strand	116	0.3

3.7.1.3 Ecological Units

The vegetation mapping units identified above are generalized plant associations. Since an important goal for managing SCI's natural resources is preservation of the full range of ecological niches that occur, these units by themselves cannot be used to fulfill this purpose. For the purposes of land management planning, landform, soils, and vegetation maps were brought together to define new ecosystem management units that could better address management goals. In all, 14 unique ecological units were identified (Table 3-12).

Table 3-12. Ecological units, acreages, and percentages of island area for San Clemente Island.

Ecological Units	**Acres**	**% of Island Area**
Canyon woodland	696.2	1.9
Maritime Desert Scrub–Boxthorn	3621.0	9.7
Maritime Desert Scrub–Boxthorn/Grassland	2188.8	5.9
Maritime Desert Scrub/Grassland complex (terrace faces and flats)	8921.4	23.9
Maritime Desert Scrub–Pyramid Cove and south-facing slopes	1611.5	4.3
Maritime Sage Scrub–northeast escarpment	369.9	1.0
Maritime Sage Scrub/Desert scrub–canyon walls and escarpments	5858.3	15.7
Grasslands, loamy soils	5275.9	14.2
Grasslands, clay soils	5383.7	14.5
Active sand dunes	223.8	0.6
Stabilized sand dunes	412.9	1.1
Coastal strand	166.8	0.4
Coastal salt marsh	19.3	0.1
Sea bluff succulent	36.0	0.1
Developed	359.1	1.0
Unmapped	916.1	2.5

The vegetation mapping units labeled as *disturbed* in the original vegetation mapping were re-designated with an appropriate ecological unit label, where possible. Outside of known developed areas (360 acres [145 ha] of buildings and other structures), each area was assigned to the ecological unit, verified by aerial photos taken in 2000. Approximately 900 acres (364 ha) that were originally labeled as *disturbed* were unable to be assigned to an ecological unit.

3.7.1.4 Vegetation Map 2011 Update

The vegetation communities of SCI were recently re-evaluated (Institute for Wildlife Studies [IWS] 2011, unpubl.) to align the island's vegetation map with the currently accepted vegetation mapping system used in California, described in the Manual of California Vegetation (Sawyer and Keeler-Wolf 1995) and updated in a second edition (Sawyer et al. 2009). The vegetation mapping protocols laid out in the Second Edition of the Manual of California Vegetation have been adopted by the California Native Plant Society (CNPS) and the CDFW as the standard for the CDFW's Vegetation Classification and Mapping Program. The Vegetation Classification and Mapping Program system is a systematic, hierarchical, floristic-level classification system that can be tiered up to both the International Vegetation Classification and the U.S. National Vegetation Classification Systems. The U.S. National Vegetation Classification System was established as the standard classification framework for vegetation by federal agencies in the United States (Federal Geographic Data Committee 1997), and is being developed by NatureServe and its natural heritage member programs in partnership with the Federal Geographic Data Committee, the ESA Vegetation Classification Panel (Jennings et al. 2003), and federal partners.

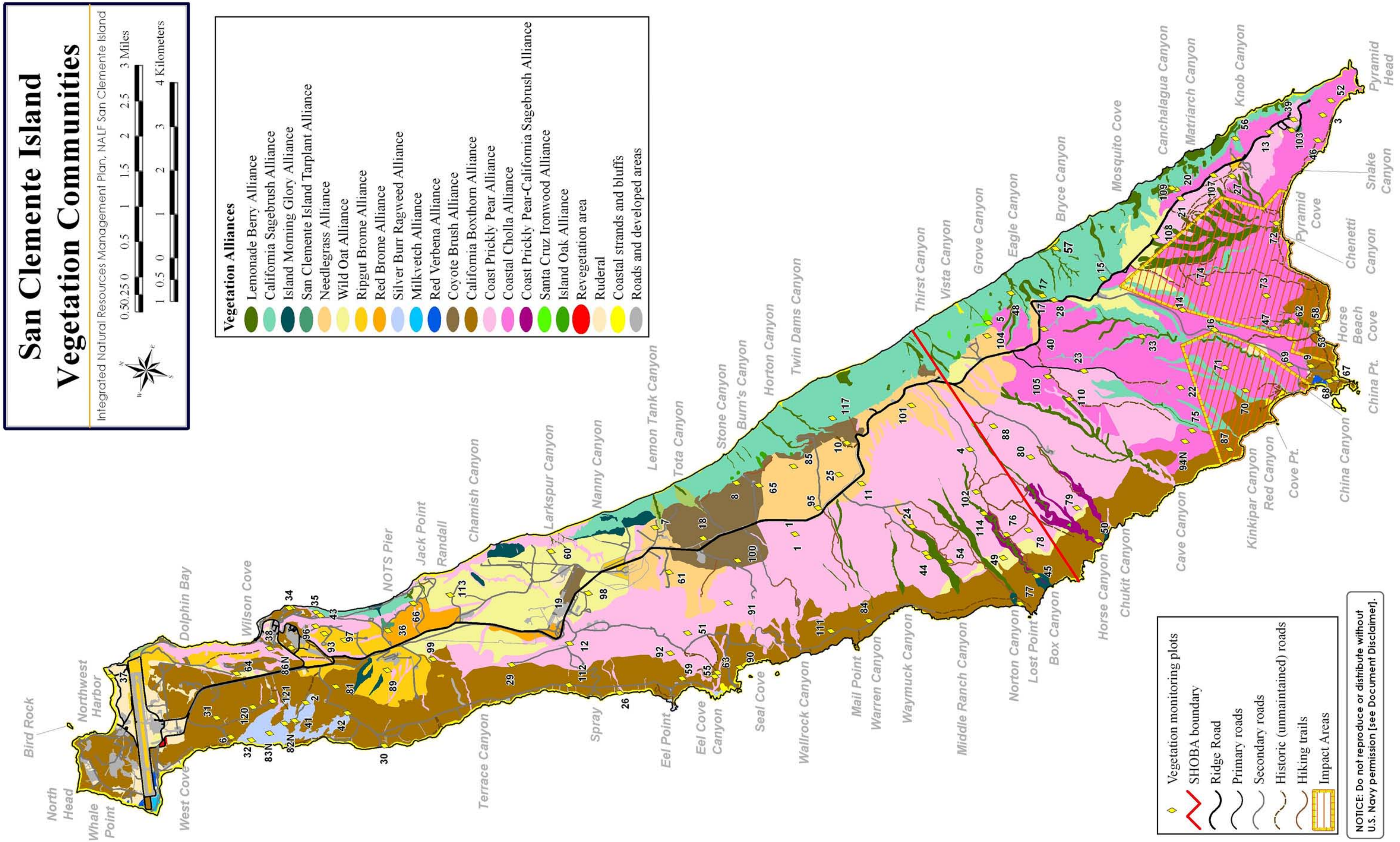
The new vegetation map now includes 19 distinct vegetation alliances, including four grassland alliances, ten scrubland alliances, two woodland alliances, and three alliances occurring on dunes. It should be noted that additional vegetation types do occur on the island but are too small to be detected by the vegetation map (e.g., coastal salt marshes, alkali marshes, and island cherry woodlands).

Table 3-13 lists the vegetation alliances of SCI and how these alliances relate to the National Vegetation Classification System. Map 3-9 shows the distribution of alliances across SCI.

Current Management

Vegetation communities are monitored through the Long-Term Vegetation Condition and Trend Analysis (LCTA) monitoring program, well as by on-island botany staff. Restoration and revegetation projects are conducted by NRO through implementation of two Environmental Program Requirements (EPRs): 1) seed collection and propagation, and 2) site selection, out-planting, and maintenance.

Annual non-native plant species control efforts are also conducted and reports are produced by NRO contracting staff. Management of terrestrial habitats also coordinates and takes into consideration the cultural resource management efforts focused on SCI's archaeological resources.



Map 3-9. Vegetation communities of San Clemente Island (Institute for Wildlife Strategies 2011).

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Table 3-13. National Vegetation Classification System hierarchy and vegetation alliances, acreages, and percentages of island area for SCI (Source: Institute for Wildlife Studies 2011 unpublished data).

National Vegetation Classification System Hierarchy and Vegetation Alliances	Acres	% of Island Area
Formation Class: Mesomorphic Shrub and Herb Vegetation (Shrubland and Grassland) Formation Subclass: Mediterranean Scrub and Grassland Formation: Mediterranean Scrub Division: California Scrub Macrogroup: California Chaparral		
Group: California Maritime Chaparral	1,232.4	3.4%
Lemonade Berry Alliance (*Rhus integrifolia*)	1,232.4	3.4%
Macrogroup: California Coastal Scrub		
Group: Central and South Coastal Californian Coastal Sage Scrub	4,123.0	11.4%
California Sagebrush Alliance (*Artemisia californica*)	3,920.7	10.9%
Island Morning-Glory Alliance (*Calystegia macrostegia amplissima*)	189.9	0.5%
San Clemente Island Tarplant Alliance (*Deinandra clementina*)	12.4	<0.1%
Formation: Mediterranean Grassland and Forb Meadow Division: California Grassland and Meadow Macrogroup: California Annual and Perennial Grassland		
Group: California Perennial Grassland	2213.5	6.1%
Needlegrass Alliance (*Stipa* sp.)	2,213.5	6.1%
Group: Mediterranean California Naturalized Annual and Perennial Grassland	3,849.6	10.7%
Wild Oat Alliance (*Avena* sp.)	2,533.7	7.0%
Ripgut Brome Alliance (*Bromus diandrus*)	1,023.7	2.8%
Red Brome Alliance (*Bromus madritensis*)	292.3	0.8%
Formation Subclass: Temperate and Boreal Shrubland and Grassland Formation: Temperate and Boreal Scrub and Herb Coastal Vegetation Division: Pacific Coast Scrub and Herb Littoral Vegetation Macrogroup: Vancouverian Coastal Dune and Bluff		
Group: Pacific Dune Mat	389.7	1.1%
Silver Burr Ragweed Alliance (*Ambrosia chamissonis*)	339.3	0.9%
Milkvetch Alliance (*Astragalus* sp.)	17.3	<0.1%
Red Sand Verbena Alliance (*Abronia* sp.)	33.1	0.1%
Group: California Coastal Evergreen Bluff and Dune Scrub	1,134.8	3.1%
Coyote Brush Alliance (*Baccharis pilularis*)	1,134.8	3.1%
Formation Class: Xeromorphic Scrub and Herb Vegetation (Semi-Desert) Formation Subclass: Warm Semi-Desert Scrub and Grassland Formation: Warm Semi-Desert Scrub and Grassland Division: Sonoran and Chihuahuan Semi-Desert Scrub and Grassland Macrogroup: Viscaino–Baja California Desert Scrub		
Group: Coastal Baja California Norte Maritime Succulent Scrub	21,441.4	59.4%
California Boxthorn Alliance (*Lycium californicum*)	6,458.8	17.9%
Coast Prickly Pear Alliance (*Opuntia littoralis*)	9,441.8	26.2%
Coastal Cholla Alliance (*Cylindropuntia prolifera*)	5,340.9	14.8%
Coast Prickly Pear-Coastal Sagebrush Alliance	173.6	0.5%
Formation Class: Mesomorphic Tree Vegetation (Forest and Woodland) Formation Subclass: Temperate Forest Formation: Warm Temperate Forest Division: Madrean Forest and Woodland Macrogroup: California Forest and Woodland		
Group: Californian Broadleaf Woodlands and Forests	43.5	0.12%
Santa Cruz Ironwood Alliance (*Lyonothamnus floribundus asplenifolius*)	22.1	<0.1%
Island Oak Alliance (*Quercus tomentella*)	21.4	<0.1%
Other Cover Types	2,070.7	5.7%
Ruderal	547.4	1.5%
Coastal strands and bluffs (sparsely vegetated)	318.1	0.9%
Roads and developed areas	812.7	2.3%
TOTALS*	36,083.3	-

Assessment of Resource Management

- The current monitoring and revegetation programs have been successful, with planting including 56 species (three trees, 24 shrubs, 23 subshrubs, three grasses, and two succulent species), restoration and revegetation efforts should continue to be a priority.
- Accessibility and logistics challenges are an on-going factor working against restoration efforts in canyons.
- While the 2011 vegetation map update provided valuable insight into the current conditions on SCI, more surveys to delineate vegetation habitat boundaries, including more rigorous ground-level verification, is needed.

Management Strategy

Objective: *Continue to update and enhance the vegetation map, working towards an accurate depiction of the condition and distribution of the island's plant communities as a tool for aiding in island resource management decisions.*

I. Conduct ground-truthing surveys, preferably by personnel trained in the Vegetation Classification and Mapping Program protocols to ensure that the vegetation mapping is consistent with state-wide standards.

  A. Coordinate with CDFW Vegetation Classification and Mapping Program personnel.

II. Consideration should be given to conducting a series of CNPS-compliant Rapid Assessment Plots to provide supporting data for a final vegetation map.

III. Determine dominant species within delineated polygons.

  A. Interview SCI botany staff.

IV. Use aerial photographs to aid in the establishment of vegetation communities.

3.7.1.5 Californian Broadleaf Woodlands and Forests

While broadleaf woodlands, which occur in many of the steep canyons, occupy only about 2% of the island's area, much vegetative structure and floral and wildlife diversity are contained within them. There is some thought that historically most of the eastern escarpment was covered with trees, with a report of up to 1,000 trees on slopes due east of Mount Thirst (Raven 1963). Ironwood trees have historically been reported in all eastern canyons from Mount Thirst south. These woodlands provide the most important structural component of habitat and food for island birds, as well as creating microsite diversity for several sensitive plant species. Vegetation within canyons is strongly affected by aspect. The hotter aspects are scantily vegetated with California sagebrush (*Artemisia californica*) and coast prickly pear (*Opuntia littoralis*). The upper canyons can be mostly grassland, with a patchwork of shrubs or trees grouped in rock outcrops, seepy areas, or pockets of water concentration and deeper soil.

Southern canyons (from about Stone Station south) harbor groves of trees and shrubs. Big berry toyon (*Heteromeles arbutifolia*), Catalina Island cherry (*Prunus ilicifolia* subsp. *lyonii*), island oak (*Quercus tomentella*), and Santa Cruz Island ironwood are the common tree species in this habitat. Canyon live oak (*Quercus chrysolepis*) and hybrids are also present. Other species characteristic of canyon walls and cliffs include: bright green dudleya (*Dudleya virens* subsp. *virens*), golden spined cereus (*Bergerocactus emoryi*), lemonade berry (*Rhus integrifolia*), Nevin's woolly sunflower (*Constancea nevinii*), San Clemente Island bedstraw (*Galium catalinense* subsp. *acrispum*), and showy island snapdragon (*Gambelia speciosa*).

The understory of these woodlands is variable, depending partly on canopy closure. Ripgut brome (*Bromus diandrus*) often dominates more open groves, with occasional shrubs of *Opuntia* spp., California brittlebush (*Encelia californica*), California sagebrush, or lemonade berry. California fuchsia (*Epilobium canum* subsp. *canum*), San Clemente Island indian paintbrush, and San Clemente Island lotus (*Acmispon dendroideus* var. *traskiae*) are appearing to be more common in the canyons since goat removal. San Clemente Island bush-mallow (*Malacothamnus clementinus*) occurs as a shrub component on several sites. The understory is also rich in many perennial herbs or subshrubs, such as Blair's wirelettuce (*Munzothamnus blairii*), California maidenhair (*Adiantum jordani*), hoary bowlesia (*Bowlesia incana*), a red-flowered form of island bush monkeyflower (*Mimulus aurantiacus* var. *parviflorus*), and San Clemente Island phacelia (*Phacelia floribunda*).

Many ironwood trees that appeared dead are sprouting abundantly after the successful goat removal program was completed in 1992, and ironwood stands have some understory. Seedling recruitment has been reported recently for a few island oak, lemonade berry, and Catalina Island cherry.

Many recent reports of new shrub sightings represent the return of structural integrity to this community. This community is recovering from past grazing by feral herbivores. However, potential long-term viability of this woodlands is only moderate because of the lack of tree seedling recruitment and stand age structure woodland components and threat of decline or even extinction of some. Decline in ironwood may be due to genetic drift and loss of variation and ability to set viable seed (J. Dunn, pers. com. 2008).

Soils. Soils are very shallow and weakly developed, but deeper pockets are sufficient to support large trees. The surface soil texture is a silt loam to clay loam with some cobble or gravel content. Steep slope has prevented significant soil development in this community. Where subsoil does exist, it is a cobbly clay underlain by extremely cobbly sediments or hard volcanic rock. Deeper soils are found on the less severe slopes or in deposition areas. Areas of exposed rock outcrop are common.

Sensitive Plants. Big berry toyon, Blair's wirelettuce, bright green dudleya, Channel Island tree poppy (*Dendromecon harfordii* subsp. *rhamnoides*) (if still on island), island big-pod ceanothus (*Ceanothus megacarpus* subsp. *insularis*), island jepsonia (*Jepsonia malvifolia*), island oak, island redberry (*Rhamnus pirifolia*), Lyon's phacelia (*Phacelia lyonii*), Nevin's woolly sunflower, San Clemente Island bedstraw, San Clemente Island buckwheat (*Eriogonum giganteum* var. *formosum*), San Clemente Island bush-mallow, San Clemente Island indian paintbrush, San Clemente Island lotus, San Clemente Island phacelia, San Clemente Island triteleia (*Triteleia clementina*), San Clemente Island woodland star (*Lithophragma maximum*), Santa Catalina figwort (*Scrophularia villosa*), Santa Cruz Island ironwood, showy island snapdragon, southern island hazardia (*Hazardia cana*), Thorne's royal larkspur (*Delphinium variegatum* subsp. *thornei*).

Sensitive/Endemic Animals (actual and potential use). Allen's hummingbird (*Selasphorus sasin sedentarius*), horned lark (*Eremophila alpestris insularis*), island night lizard (*Xantusia riversiana*), orange-crowned warbler (*Vermivora celata sordida*), San Clemente house finch (*Carpodactus mexicanus clementis*), San Clemente island fox, San Clemente loggerhead shrike.

Range of Variation. Dominance varies among big berry toyon, Catalina Island cherry, island oak, lemonade berry, and Santa Cruz Island ironwood. See below for descriptions of constituent alliances.

Potential Threats. Stand-replacing, frequent, or large fires that delay re-occupation by native wildlife; storm flows in excess of ability to process without root scour; ongoing erosion; lack of reproduction/age class structure for long-lived species.

Constituent Alliances

There are two mapped and two unmapped alliances within the Broadleaf Woodlands macrogroup on SCI.

Santa Cruz Island Ironwood Alliance (Lyonothamnus floribundus subsp. asplenifolius)

Associations	Acres
Island Ironwood/California Sagebrush Association	2.8
Island Ironwood/Lemonade Berry Association	19.2

This alliance is mapped on 22 acres (9 ha) of the island, though unmapped ironwood groves do occur as well. Santa Cruz Island ironwoods are dominant or co-dominant in the tree canopy (Photo 3-10) with other tree species, such as big berry toyon, Catalina Island cherry, and island oak. Understory shrubs primarily include island morning-glory (*Calystegia macrostegia* subsp. *amplissima*), lemonade berry, and showy island snapdragon. Herbaceous species are primarily non-native annual grasses (e.g., wild oats [*Avena* spp.] and ripgut brome and other brome species), with total annual cover varying greatly from year to year (ranging from 6–43%). Annual forbs may also contribute up to 39% cover in the herbaceous layer, generally goose grass (*Galium aparine*), miner's lettuce (*Claytonia perfoliata*), and San Diego fiesta flower (*Pholistoma racemosom*). Native perennial grasses are present at low cover, which include melic grass (*Melica imperfecta*) and needlegrass (*Stipa lepida*).

Photo 3-10. View of ironwood woodland (Soil Ecology and Restoration Group 2013).

Vegetation Monitoring Plots. 20, 109. The tree canopy on the plots has not changed appreciably over the course of the monitoring program, and only one of the two plots has seen much change in the shrub canopy. Plot #20 has increased from just 3% shrub cover in 1992 to 20% in 2006, primarily due to showy island snapdragon.

Range of Species Richness Based on Plots. 28–72 species (average = 47.7 species per plot per sampling).

Summary of Current Conditions and Long-Term Trends. The Santa Cruz Island ironwood is declining on SCI and on other Channel Islands for unknown reasons. As the keystone species for this woodland type, the cause or causes of the decline in Santa Cruz Island ironwood must be investigated. Seed viability in ironwoods appear to be very low, with poor recruitment rates. Shrub or tree recruitment is especially important for those species that reproduce infrequently, such as ironwoods. Ironwood groves appear to be genetic individuals, as identified on Santa Cruz Island, and there appears to be a genetic bottleneck. Dense, post-fire understory growth (e.g., island morning-glory, lemonade berry) may be preventing the establishment of ironwood seedlings. Seed bulking has resulted in improved seed supply and understanding of propagation techniques. Outplantings have been successful outside of areas predisposed to wildland fire.

Island Oak Alliance (Quercus tomentella)

Associations	Acres
Island Oak/California Sagebrush Association	11.9
Island Oak/Island Ironwood Association	9.5

This alliance is mapped on 21 acres (8.5 ha) of the island, although unmapped oak groves do occur elsewhere. Island oak is the sole dominant tree species present in this alliance (Photo 3-11). Understory shrubs are generally very sparse and may include California sagebrush, coyote brush (*Baccharis pilularis*), island morning-glory, and lemonade berry. The herbaceous layer is primarily comprised of the non-native annual grass ripgut brome, with total annual cover varying greatly from year to year (ranging from 26–41%). Native perennial grasses are present at low cover and include bent grass (*Agrostis pallens*), melic grass, needlegrass, and pine bluegrass (*Poa secunda*).

Photo 3-11. View of oak woodland (Plot #5 in 1992).

Vegetation Monitoring Plots. 5. The tree canopy has changed very little on this plot, with 72% cover recorded in 1992 and 77% recorded in 2006. The shrub canopy has not risen above 3% cover in any sampling year. Few tree or shrub seedlings have ever been recorded on this plot.

Range of Species Richness Based on Plots. 30–48 species (average = 38.4 species per sampling).

Summary of Current Conditions and Long-Term Trends. Many oak trees were lost due to erosion associated with the overgrazing by feral goats. Viability of acorns is six to eight weeks and mast crop is produced only in certain years.

Big Berry Toyon Alliance (Heteromeles arbutifolia)

This is an unmapped vegetation alliance found in small groves of canyon bottoms (Photo 3-12). Understory shrubs primarily include California brittlebush, lemonade berry, and showy island snapdragon, although other shrub species may occur at low cover, such as California boxthorn, California sagebrush, and island morning-glory. Herbaceous species are primarily non-native annual grasses, primarily wild oats and ripgut brome, with total annual cover varying greatly from year to year (ranging from 5–47%). Native perennial grasses are present at low cover (e.g., needlegrass and melic grass).

Photo 3-12. View of toyon woodland (Plot #47 in 2003).

Vegetation Monitoring Plots. 45, 47. While percent cover of trees has remained stable, the shrub canopy on one of the plots (#45) had expanded dramatically from just 9% cover in 1992 to 43% cover in 2002 (the plot has not been resampled since 2002). Island morning-glory and showy island snapdragon are the primary contributors to the expansion of the shrub canopy on Plot #45. The shrub canopy on Plot #47, already at 51% in 1992, has seen only a moderate expansion to 59% cover in 2003 (most of the expansion is attributable to California brittlebush).

Range of Species Richness Based on Plots. 20–42 species (average = 31.0 species per plot).

Summary of Current Conditions and Long-Term Trends. Big berry toyon appears to be increasing both in and out of canyons. Toyon forms an overstory for recruitment of oak and cherry, supports loggerhead shrike nesting, and is a winter food source for wildlife species. It is not as drought tolerant as lemonade berry or Catalina Island cherry, preferring deeper soils especially those with subterranean moisture.

Catalina Island Cherry Alliance (*Prunus ilicifolia* subsp. *lyonii*)

This is an unmapped vegetation alliance found in small groves of canyon bottoms (Photo 3-13). Understory shrubs primarily include lemonade berry and showy island snapdragon, although other shrub species may occur at low cover, such as island morning-glory and California sagebrush. Herbaceous species are primarily non-native annual grasses, such as wild oats, ripgut brome, and other brome species, with total annual cover varying greatly from year to year (ranging from 3–74%. Native perennial grasses may be present at low cover (<10%, often only 1–2%) (e.g., needlegrass and melic grass).

Photo 3-13. View of island cherry woodland (Plot #56 in 2010).

Vegetation Monitoring Plots. 33, 48, 56, 57, 114. Tree cover remained stable on all plots except Plot #57 where tree cover increased from 13% in 1992 to 37% in 2002 (the last time this plot was sampled). Island morning-glory and showy island snapdragon are the primary contributors to the expansion of the shrub canopy.

Range of Species Richness Based on Plots. 26–61 species (average = 40.3 species per plot per sampling year).

Summary of Current Conditions and Long-Term Trends. The important structural component of woodlands has decreased from its historic range, and current recruitment is unknown. Canopy cover may be degrading, based on long-term plot data, and recruitment is shade-dependent. Extensive cherry seedling recruitment has been observed on the East Side in SHOBA and in some west side canyon bottoms. Since this species only occurs in mesic canyon settings, it may be vulnerable to climate change.

Current Management

Canyon woodlands are monitored through the LCTA monitoring program. Restoration and revegetation projects are conducted by the NRO and contracting staff through implementation of two EPRs: 1) seed collection and propagation, and 2) site selection, outplanting, and maintenance. Annual invasive plant species control efforts are also conducted and reports are produced by botany staff.

Assessment of Resource Management

- Canyon woodland habitats are protected from wildland fire by seasonally installed fuelbreaks per requirements of the WFMP.
- The genetics of canyon live oak versus island oak are unclear. More genetics work should be completed.
- Accessibility and logistics challenges are an on-going factor working against restoration efforts in these canyons.
- Since the removal of feral goats in 1992, vegetation communities of SCI have been recovering remarkably. Natural resources personnel should continue to monitor the natural progression of habitats with the periodic control of erosion and non-native species.

Management Strategy

Objective: *Continue to foster the expansion of ironwood and oak woodland habitats in existing and new locations.*

Objective: *To the extent feasible, improve the age class distribution to secure woodland habitats from future extirpation from the island to conserve sensitive and endemic species and promote understory biodiversity.*

Objective: *Assess the natural recovery of cover and distribution of big berry toyon and Catalina Island cherry woodlands.*

Objective: *Recover missing landscape elements to stabilize alluvial soils and filter sediment reaching marine waters.*

I. Use established vegetation trend monitoring plots to support development of a reference condition for woodland types.

  A. Assess the current representation of woodland habitats in the LCTA plot inventory. If needed, identify new sites for monitoring to capture a representative sampling of all woodland types and range of conditions.

    1. For ironwood woodlands, use Canchalagua Canyon as a reference site to monitor composition and change. For oak woodlands, use Grove Canyon as a reference site to monitor composition and change. For big berry toyon woodlands, identify a new reference site to monitor composition and change. For Catalina Island cherry, use Eagle Canyon as a reference site to monitor composition and change.

II. Continue the current expansion of shrubs on the margins of these woodlands.

III. Promote soil recovery on eroded areas, increase water retention by soils, and reduce runoff.

  A. Provide erosion control measures to all affected woodland stands.

B. Foster recruitment in all woody species.

C. Make use of weed-free straw mulches on bare soil to reduce erosion and promote growth of native plants.

IV. Protect existing ironwood trees, recognizing the threat of short-interval, excessively hot, or large acreage fires.

A. Allow no mortality caused by excessively hot or frequent fires.

1. Consider the use of prescribed fire to protect from the catastrophic loss of entire groves, to improve seedbed conditions, and reduce non-native species.

B. Increase water retention by soils and reduce runoff on steep, eroded slopes to provide a stable substrate with a litter/duff layer that is at least 0.5 inches (1.3 cm) deep and growing.

C. Achieve recruitment and establishment of woody canopy and understory species in the ironwood stands. Achieve presence of seedlings or saplings in three locations in the next ten years. Determine if cross-pollination will increase seed set. Keep apprised of recent genetic studies and facilitate the work of those researching the genetics of ironwood.

D. Develop a propagation technique for ironwood, considering both seedling and vegetative approaches.

E. Identify priority outplanting sites. Take advantage of topography predisposed to summertime fog-drip.

F. Determine microsite needs for ironwood seedling establishment.

1. Improve seedbed conditions in grove gaps.

V. Foster oak woodland stands able to support germination and survival of seedlings, focusing efforts at the stand periphery and in canopy gaps.

A. Every season with an acorn crop, collect and plant acorns in locations identified for seedling establishment.

B. Achieve seedling establishment and survival after every reproductive event, by human intervention if necessary, which may include irrigation, nursery planting, moving to safe sites, or other means.

C. Experiment with oak introduction on upper north slopes of western canyons and upper north slopes of eastern canyons.

VI. Monitor all woodlands for non-native plant species and undertake control efforts as needed to maintain native vegetation.

VII. Protect all woodlands from extremes in fire pattern (either lack of fire or frequent fires) to avoid risks to these communities, such as:

A. Shrub or tree recruitment especially for those that reproduce infrequently;

B. Possible biodiversity decline due to loss of herbaceous perennials and short-lived shrubs from the community due to a simplified structure from shrub canopy closure (fewer edges and openings); and

C. Possible type conversion from woodland to grassland due to too short fire interval.

3.7.1.6 California Maritime Chaparral

California maritime chaparral occurs in many of the canyons throughout the island. These shrublands provide an important structural component of habitat and food for island birds and create microsite diversity for several sensitive plant species. Other species characteristic of these canyon shrublands include showy island snapdragon, San Clemente Island bedstraw, Nevin's woolly sunflower, bright green dudleya, and golden spined cereus. The understory of these shrublands is variable, depending partly on canopy closure.

Soils. Soils in these canyons are coarsely mapped. They are very shallow and weakly developed, but deeper pockets are sufficient to support dense thickets. The surface soil texture is a silt loam to clay loam with some cobble or gravel content. Areas of exposed rock outcrop are common.

Sensitive Plants. Big berry toyon, Blair’s wirelettuce, bright green dudleya, Channel Island tree poppy (if still on island), island big-pod ceanothus, island jepsonia, island redberry, Lyon’s phacelia, Nevin’s woolly sunflower, San Clemente Island bedstraw, San Clemente Island buckwheat, San Clemente Island bush-mallow, San Clemente Island indian paintbrush, San Clemente Island lotus, San Clemente Island phacelia, San Clemente Island triteleia, San Clemente Island woodland star, Santa Catalina figwort, showy island snapdragon, southern island hazardia, Thorne’s royal larkspur.

Sensitive/Endemic Animals (actual and potential use). Allen’s hummingbird, island night lizard, horned lark, orange-crowned warbler, San Clemente house finch, San Clemente island fox, San Clemente loggerhead shrike.

Range of Variation. Lemonade berry dominates most stands, although other shrub species may also be co-dominant or prominent in some locales. See below for descriptions of constituent alliances.

Potential Threats. Stand-replacing, frequent, or large fires that delay re-occupation by native wildlife; storm flows in excess of ability to process without root scour; ongoing erosion.

Constituent Alliances

There is one mapped alliance of California maritime chaparral on SCI.

Lemonade Berry Alliance (Rhus integrifolia)

This alliance is mapped on approximately 1,232 acres (500 ha) of the island where lemonade berry is the dominant or co-dominant shrub species present (Photo 3-14). Other shrubs present primarily include: California sagebrush, California brittlebush, island big-pod ceanothus, island morning-glory, and San Clemente bush-mallow. Emergent Catalina Island cherry trees are present in some locations, occasionally at sufficient densities to warrant mapping as an association. Herbaceous species are primarily non-native annual grasses, generally wild oats and red brome (*Bromus madritensis*), with total annual grass cover varying greatly from year to year (ranging from 17–67%). Annual forbs occur at very low cover (0–7% cover annually).

Associations	Acres
Lemonade Berry-California Sagebrush Association	912.7
Lemonade Berry-Island Morning-Glory/Wild Oat Association	5.8
Lemonade Berry-Big Pod Ceanothus Association	39.3
Lemonade Berry-San Clemente Bush-Mallow Association	19.7
Lemonade Berry-Catalina Island Cherry Association	258.0

Vegetation Monitoring Plots. 62. Shrub cover on the lone plot in this alliance has increased from 43% in 1992 to 76% in 2003 with both lemonade berry and sunflower contributing to that increase.

Range of Species Richness Based on Plots. 18–37 species (average = 28.3 species per plot per sampling).

Photo 3-14. View of Lemonade Berry Alliance (Plot #62 in 2003).

Summary of Current Conditions and Long-Term Trends. Lemonade berry is increasing in cover and distribution in a wide range of communities from open plateau desert scrub on the southern portion of the island to woodland understory in many canyons. Its pioneering activity promotes succession, facilitated by its fast growth and adaptation to fire through both sprouting and seeding. Lemonade berry captures fog well, modifying the microenvironment (e.g., soil profile). The capture of fog is important for improving soil moisture retention and soil recovery to support endemic species stability and improving military cover values on the plateau and terraces of southern areas that support military training activities. In coastal exposures, this alliance stays relatively prostrate for seven to ten years, but as it ages, it becomes more open in its canopy.

Lemonade berry recruits under shade, including under cactus clumps, and it could benefit the outward expansion of woodlands once its canopy becomes sufficiently open that seedlings of taller tree species can recruit as well. However, if the lemonade berry canopy becomes too dense, it could be a concern in woodland understory where critical and time-sensitive tree seedling recruitment may be impaired.

Current Management

The California maritime chaparral community on SCI is monitored through the LCTA monitoring program. Currently, the only monitoring plot for California maritime chaparral is located within an impact area, which can no longer be accessed (last sampling year on record is 2003) due to military training activities.

Annual invasive plant species control efforts are also conducted and reports are produced by botany staff.

Assessment of Resource Management

- With only one long-term monitoring plot currently active within this alliance, establishment of new plots should be a priority for the LCTA program.
- Since the removal of feral goats in 1992, the vegetation communities of SCI have been recovering remarkably well. Natural resources personnel should allow the natural progression of habitats to continue with the periodic control of erosion and non-native species.

Management Strategy

Objective: *Continue expansion and species recruitment, while avoiding, where possible, the potential impairment of recruitment of oak, ironwood, or other sensitive species due to lemonade berry throughout SCI.*

I. Use established vegetation trend monitoring plots to support the development of a reference condition for Lemonade Berry Alliance.

- ***A.*** Assess the current representation of this vegetation type in the LCTA plot inventory, and if needed, identify new sites for monitoring to capture a representative sampling of these habitats.
- ***B.*** Continue the current expansion of shrubs on the margins of these shrublands, which is currently increasing dramatically.

II. Monitor lemonade berry habitats for invasive plant species and undertake control efforts as needed to maintain native vegetation.

3.7.1.7 Central and South Coastal Californian Coastal Sage Scrub

Coastal sage scrub occurs primarily along the eastern escarpment of SCI. The primary sagebrush type, dominated by California sagebrush, occurs on the hot, dry aspects of the escarpment and canyon slopes. California sagebrush now dominates these sites along with coast prickly pear. This differs from historical accounts where sagebrush was uncommon (Dunkle 1950; Resnick 1988).

Coastal sage scrub habitat is estimated to occupy 11% of the island surface (4,131 acres [1,671 ha]) (IWS 2011). The more mesic phase on the northeastern escarpment has areas that are in good condition with high structural and species diversity. Drier sites on southern canyon exposures appear to be recovering from the peak of goat grazing around the early 1970s, while clumps of California sagebrush that occur occasionally on western terrace faces appear in remnant condition. The endangered San Clemente Island lotus, if it is like others of the genus, is a successional (seral) species, having a dormant seedbank stimulated to germinate when gaps appear. Such species may be prevalent at some stages during a community's recovery from disturbance but uncommon in the mature community. The San Clemente Island lotus commonly occurs on rock outcrops on the fringes of the more mesic phases; however, the species is beginning to occur in woodlands and other habitats farther south on the island.

On the north end of SCI, island sagebrush *(Artemisia nesiotica)* may replace California sagebrush on precipitous escarpments (this shift in sagebrush species was not mapped separately in the recently completed vegetation map). There is some thought that this sagebrush community may, at one time, have included more resilient chaparral components that now occur only as isolated individuals on the island (Navy 2008). These species include big berry toyon, island big-pod ceanothus, chamise (*Adenostoma fasciculatum* var. *fasciculatum*), island apple-blossom (*Crossosoma californicum*), Channel Island tree poppy, and laurel sumac (*Malosma laurina*) (Beauchamp 1989; Navy 2002).

In addition to sagebrush species, important structural components are lemonade berry, California brittlebush, California boxthorn, coastal wishbone bush (*Mirabilis laevis* var. *carssifolius*), coast prickly pear, Nevin's woolly sunflower, and San Clemente Island buckwheat. The type, as it occurs on terrace escarpments, is characterized by varying amounts of shrub cover, including open areas with little or no shrub components. The understory contains plentiful herbaceous perennials, except in the case of the California sagebrush-coast prickly pear patches, on southern-exposure canyon slopes.

Sagebrush and other woody perennials are indicator species for this habitat type. The northeast escarpment and some west shore terrace faces include the endangered San Clemente Island lotus. Additional indicators of diversity are aphanisma (*Aphanisma blitoides*), island poppy (*Eschscholzia ramosa*), wind poppy (*Papaver heterophyllum*), and Nevin's gilia (*Gilia nevinii*).

Shrub cover provides important erosion control on steep slopes and reduces erosion hazard.

Soils. The soils of this group are primarily Ustalf cobbly silt loams along the slopes of the eastern escarpment. Stands on the upper slopes and upper ends of some canyons on the southwestern portion of the island occur on other loam-type soils and some clay soils.

Sensitive Plants. Aphanisma, Blair's wirelettuce, golden spined cereus, island sagebrush, Nevin's woolly sunflower, San Clemente Island bedstraw, San Clemente Island buckwheat, San Clemente Island bush-mallow, San Clemente Island indian paintbrush, San Clemente Island lotus, southern island hazardia.

Sensitive/Endemic Animals (actual and potential use). Island night lizard, San Clemente island fox, San Clemente sage sparrow (*Artemisiospiza belli clementae*), San Clemente loggerhead shrike.

Range of Variation. This is a highly diverse group, with four mapped alliances and many associations on the island. Overall shrub cover varies widely, with areas of extremely dense shrub canopy intermingled with more open areas, including areas with few or no shrubs.

Potential Threats. Stand-replacing, frequent, or large fires that delay re-occupation by native wildlife; storm flows in excess of ability to process without root scour; ongoing erosion.

Constituent Alliances

There are three mapped alliances of Californian Coastal Sage Scrub on SCI.

California Sagebrush Alliance (Artemisia californica)

This alliance is mapped on approximately 3,800 acres (1,537 ha) of the island where California sagebrush is the dominant or co-dominant shrub species present (Photo 3-15). Other shrubs present include island morning-glory, big-pod ceanothus (*Ceanothus megacarpus* subsp. *megacarpus*), California brittlebush, and San Clemente Island bush-mallow. Emergent Catalina Island cherry trees are present in some locations, occasionally at sufficient densities to warrant mapping as an association. Herbaceous species are primarily non-native annual grasses, primarily wild oats and red brome, with total annual grass cover varying greatly from year to year (ranging from 17–67%). Annual forbs occur at very low cover (0–7% cover annually).

Photo 3-15. Two views of the California Sagebrush Alliance (Plot #28 in 2008), illustrating the patchy shrub canopy typical of the alliance on San Clemente Island.

Sagebrush habitat supports sensitive species such as the San Clemente sage sparrow and San Clemente loggerhead shrike, improves insect diversity and sensitive plant diversity (island sagebrush, big-pod ceanothus), reduces annual grasses, improves soil retention on steep slopes, and improves soil water retention.

Associations	Acres
California Sagebrush-Island Morning-Glory Association	2933.1
California Sagebrush-Coastal Cholla Association	654.0
California Sagebrush-Coastal Cholla-Silver Bird's-Foot Trefoil Association	54.2
California Sagebrush-Coast Prickly Pear Association	108.4
California Sagebrush-Coast Prickly Pear-California Boxthorn Association	87.4

Vegetation Monitoring Plots. 15, 17, 28, 117. Long-term trends in coastal sage scrub are difficult to determine from the four plots located within this alliance (three of these plots were originally characterized as high plateau loamy grasslands, the fourth as maritime desert scrub-complex grassland phase). Three of the four plots located in areas now mapped as coastal sage scrub actually had 0% cover of shrubs when first established in 1992–1993. The belt count data for those three plots recorded no shrubs present (except for coyote brush being recorded as *present* on Plot #17). Only Plot #28 had a significant shrub component at the time, with 23 mature sagebrush individuals and 169 seedlings, with 12% cover. When last sampled in 2008, there were 425 mature sagebrush and 71 seedlings with 35% cover on the same plot. Of the other three plots only Plot #17 had a significant amount of sagebrush, increasing from 0 individuals to 282 sagebrush shrubs in 2008 (Photo 3-16).

Range of Species Richness Based on Plots. 16–47 species (average = 28.8 species per plot per sampling).

Summary of Current Conditions and Long-Term Trends. California sagebrush may decrease cover of coast prickly pear, coastal cholla (*Cylindropuntia prolifera*), grasses, and forbs through shading. Its expansion out of canyons onto the plateau and terraces increases the likelihood of fire spread into canyons.

Island Morning-Glory Alliance (*Calystegia macrostegia* subsp. *amplissima*)

This alliance is mapped on approximately 190 acres (76 ha) of SCI where island morning-glory is the dominant shrub species present (Photo 3-17). The alliance is found in small pockets within grassland and California boxthorn alliances, primarily on the northeast escarpments, western terraces, and dunes. Other species characteristic of this alliance include California boxthorn, coast prickly pear, needlegrass, and other grass and forb species found in the neighboring grassland California boxthorn communities.

Associations	Acres
Island Morning-Glory Association*	88.0
Island Morning-Glory/ Needlegrass Association	102.9

*In the absence of other associated co-dominant species, the alliance name itself is also designated as an association.

Vegetation Monitoring Plots. There are no plots located in this alliance. This alliance is likely expanding in range on SCI, since the range of the island morning-glory is known to be increasing (originally known from 44 plots in 1992–1993, now known from 64 plots), as well as its coverage (7.1% average frequency per plot in 1992–1993, 18.4% per plot in the latest samplings).

Range of Species Richness Based on Plots. Not known.

Summary of Current Conditions and Long-Term Trends. Island morning-glory provides a valuable pioneering function and has been increasing dramatically since feral goats were removed in 1992. It is frequently used for avian nesting. Species presence has increased from 44 to 64 monitoring plots since 1992, and it is three times as dense in most plots. Dense growth can impede the establishment of some species such as San Clemente Island bush-mallow.

San Clemente Island Tarplant Alliance (*Deinandra clementina*)

Associations	Acres
San Clemente Island Tarplant-Silver bird's-foot trefoil Association	12.4

This alliance is mapped on 12.4 acres (5 ha) of SCI, located in disjunct stands where the CNPS 4.3 sensitive species island tarplant (*Deinandra clementina*) is the dominant shrub species present (Photo 3-18). One stand is at the north end of the island on the plateau above NOTS Pier with constituent species likely including grasses and forbs typical of the surrounding grasslands. The second stand is on the south end of the island at Pyramid Head and likely holds a larger cactus component than the northern occurrence since it is surrounded by polygons of Coast Prickly Pear and Coastal Cholla Alliances. Both stands include silver bird's-foot trefoil (*Acmispon argophyllus* var. *argenteus*) as an associate sub-shrub species. Additional stands of island tarplant also occur along West Shore Road, around VC3 and in Special Warfare Training Area (SWAT) 1/2, although these areas were not delineated in the vegetation mapping.

Vegetation Monitoring Plots. There are no plots located in this alliance. This alliance is likely expanding in range on the island since island tarplant itself is known to be increasing in coverage and range (the species was recorded on only 20 plots in 1992–1993 and is now known to occur on at least 35 plots).

Range of Species Richness Based on Plots. Unknown.

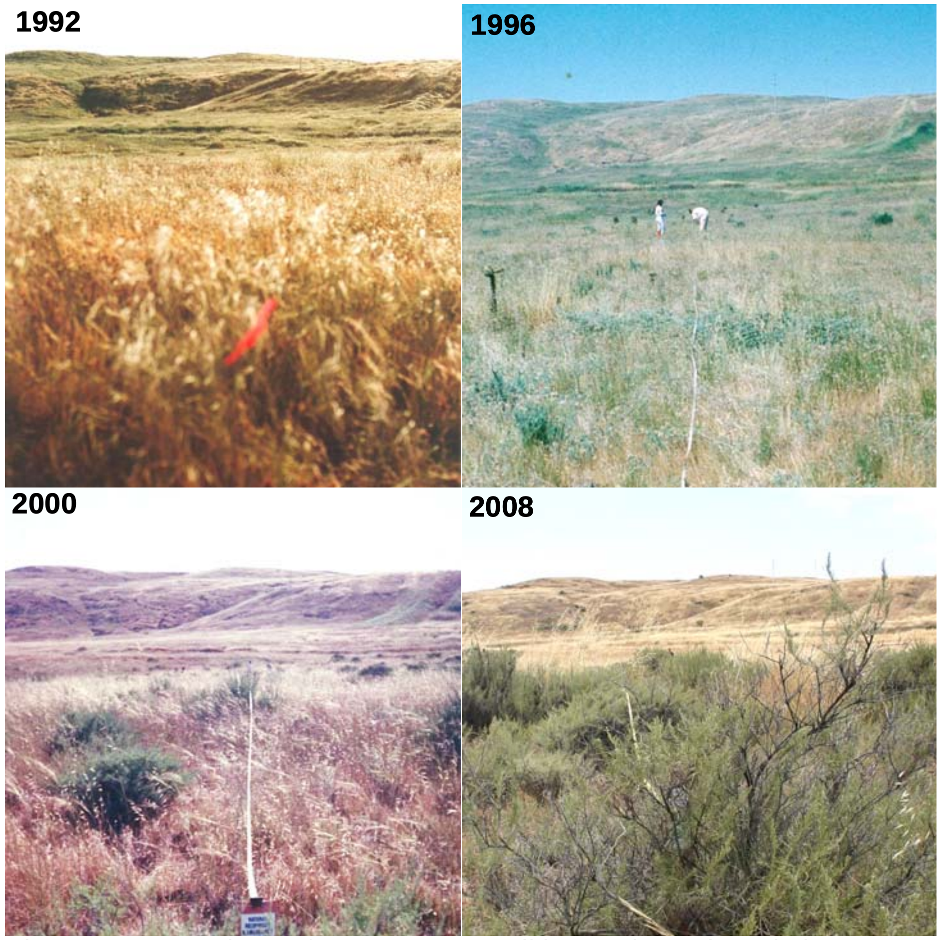


Photo 3-16. Four views of Long-Term Condition and Trend Analysis Program Plot #17, showing a marked increase in California sagebrush from 1992 through 2008.

Photo 3-17. Island morning-glory on San Clemente Island. Although no vegetation plots are currently located in the Island Morning-Glory Alliance, this photo (taken in 2010) illustrates typical growth conditions where the species occurs on the island.

Summary of Current Conditions and Long-Term Trends. Although the tarplant alliance has a limited extent as a mapped alliance, this species has important pioneering value on northern soil types. The alliance may have been much more important historically, along with island mallow (*Malva assurgentiflora*) on northern terraces and slopes. As island tarplant increases in cover and distribution, it may help to slow the invasion of non-natives by taking up excess, deep soil water that might otherwise facilitate the invasion of non-native species.

Photo 3-18. San Clemente Island tarplant on San Clemente Island. There are currently no vegetation plots located in the alliance; this photo (taken in 2010) illustrates typical growth conditions where the species occurs on the island.

Current Management

Central and south coastal Californian coastal sage scrub are monitored through the LCTA monitoring program. Restoration and revegetation projects are conducted by the NRO and contracting staff through implementation of two EPRs: 1) seed collection and propagation, and 2) site selection, outplanting, and maintenance. Annual invasive plant species control efforts are also conducted and reports are produced by botany staff.

Assessment of Resource Management

- Some unmapped subareas currently mapped as California sagebrush are, in fact, dominated by the endemic island sagebrush (CDFW special status) and need to be called out as a separate alliance.
- The current allotment of four long-term monitoring plots located in the California Sagebrush Alliance is inadequate for understanding long-term trends. Additional plots, covering the range of conditions within this alliance should be established to fully document the expansion of shrublands on the island.
- Although the expansion of island morning-glory on SCI has been documented by the LCTA program, there are currently no plots specifically located within areas mapped as the Island Morning-Glory Alliance. At least one plot should be established in this alliance.
- The San Clemente Island Tarplant Alliance is currently not encompassed by the LCTA monitoring program. At least one plot should be established in this alliance.

- Since the removal of feral goats in 1992, vegetation communities of SCI have been recovering remarkably well. Natural resources personnel should continue to monitor the natural progression of habitats with the periodic control of erosion and non-native species.

Management Strategy

Objective: *Continue the recovery of coastal sage scrub habitats while controlling fire spread into canyons and other fire-sensitive areas on drier slopes of canyons and escarpments containing soils with good drainage, especially areas supporting sage sparrows and island sagebrush to support improved biodiversity and military cover.*

Objective: *Allow the current expansion of island morning-glory to continue throughout SCI as an understory woodland component and in cactus patches, to promote shrub and tree seedling establishment on woodland edges and in coast prickly pear patches, while supporting endemic and sensitive species diversity and reducing the prevalence of coast prickly pear cactus compared to shrubland and grassland for enhanced military value over the long term.*

Objective: *Continue the recovery of the endemic Island Tarplant Alliance and species recruitment on northern island soil types derived from Pleistocene dunes.*

I. Use established vegetation trend monitoring plots to support development of a reference condition for coastal sage scrub in which all component species are provided for.

- ***A.*** Assess the current representation of these vegetation types in the LCTA plot inventory, and if needed, identify new sites for monitoring to capture a representative sampling of these habitats.
- ***B.*** Continue the current expansion of shrubs on the margins of these shrublands, which are currently dramatically increasing.

II. Improve understanding of this community's natural boundaries and shifting dominance from north to south. Re-map the boundaries.

- ***A.*** Facilitate recovery of this plant community to its former landscape position on the northern plateau grasslands, including its island mallow component.

III. Promote a fire regime which allows native shrubs and herbaceous species to out-compete coast prickly pear and coastal cholla.

IV. Monitor coastal sage scrub habitats for invasive plant species and undertake control efforts as needed to maintain native vegetation.

3.7.1.8 California Perennial Grassland

The high elevation plateau on SCI supports a grassland dominated by native perennial grasses with annual forbs in the interspaces. On the high plateau, above approximately 792 feet (240 m) in elevation, needlegrass grasslands thrive on shallow, loamy soils. Island morning-glory is common among rocks, emerging from occasional coast prickly pear patches and on the sides of gullies. Coyote bush is increasing in the mid- to high-plateau areas. Island tarplant is also scattered throughout the grassland.

Soils. Soils found towards the southern end of this landform differ from the majority of soils on the island in that they formed directly from the parent material, volcanic andesite or dacite. These soils are relatively shallow, with silty loam surface soil that extends to about four inches. Surface texture becomes stonier towards the southern end of this landform. The underlaying soil is a reddish brown with thick argillic horizons and can vary in depth from 4 to 37 inches (10–94 cm). Soil depth becomes more shallow towards the southern end of the landform and subsoil depth decreases to about 14 inches (35 cm) towards the southern range of the Mount Thirst soils (Navy 2002).

Sensitive Plants. Bobtail barley (*Hordeum intercedens*), Nevin’s gilia, Palmer’s clover (*Trifolium palmeri*), pygmy leptosiphon (*Leptosiphon pygmaeus* subsp. *pygmaeus*), San Clemente Island brodiaea (*Brodiaea kinkiensis*), San Clemente Island larkspur (*Delphinium variegatum* subsp. *kinkiense*), small flowered microseris (*Microseris douglasii* subsp. *platycarpha*), and Thorne’s royal larkspur are sensitive plants on SCI.

Sensitive/Endemic Animals (actual and potential use). The open grasslands on SCI support large populations of San Clemente Island deer mouse (*Peromyscus maniculatus clementis*) and various insect species. The San Clemente island fox, American kestrel (*Falco sparverius*), northern harrier (*Circus cyaneus*), red-tailed hawk (*Buteo jamaicensis*), common raven (*Corvus corax*), and barn owl (*Tyto alba*) all forage throughout this habitat type. The San Clemente loggerhead shrike (federally-listed as endangered), although more commonly associated with shrub habitats for breeding, also forage throughout the open grassland during the winter. Additionally, this habitat provides nesting and foraging habitat for other more common avian species, including Say's phoebe (*Sayornis saya*), western meadowlark (*Sturnella neglecta*), horned lark, and savannah sparrow (*Passerculus sandwichensis*) (Navy 2008).

Range of Variation. The needlegrass grasslands of SCI are highly variable in terms of the percent cover of needlegrass present. Non-native grasses, such as wild oats, bromes, ryes or fescues, are prominent in varying mixes, even in areas with high needlegrass cover.

Constituent Alliances

There is only one mapped alliance of Californian Perennial Grassland on SCI, characterized by high level of native needlegrass species.

Needlegrass Alliance (Stipa sp.)

Associations	Acres
Needlegrass Association*	201.8
Needlegrass-Wild oat Association	2011.7

*In the absence of other associated co-dominant species, the alliance name itself is also designated as an association.

This alliance is mapped on approximately 2,213 acres (895 ha) of the island where native needlegrass species (Photo 3-19), primarily purple needlegrass (*Stipa pulchra*), are a significant contributor to overall herbaceous cover (>10% relative cover in the herbaceous layer [Sawyer et al. 2009]). Annual grasses (e.g., wild oats, brome species, and foxtail fescue [*Festuca myuros*]) are generally low in cover (<10% cover each) but can be as high as 50–60% cover in wet years. Annual forbs characteristic of these grasslands include goldfields (*Lasthenia californica*), clovers (*Trifolium* spp.), and filaree (*Erodium* spp.), usually at low percent cover except in years of high winter-spring rainfall. The only commonly occurring shrub species is silver bird's-foot trefoil, a short-lived sub-shrub occasionally found at upwards of 30% cover.

Vegetation Monitoring Plots. 7, 10, 25, 61, 85, 95, 101, 104. Percent of needlegrass has decreased since LCTA plots were established, although the decrease is not statistically significant (average 27.6% cover per plot in 1992–1993, 18.3% average cover when in the most recent samplings for each plot (2006–2010); t-test = 1.320, p-value = 0.211.) Three of the eight plots have burned since the plots were established. However, two of the plots, which have seen the greatest decrease in needlegrass cover, have no known fire history. By far the greatest decrease in needlegrass cover has been observed on the highest elevation plots within this alliance. These three plots originally averaged 44% cover needlegrass and now average 14% cover with various non-native species increasing over the same period, primarily wild oats and filaree. None of the three high elevation plots have a record of fire or other disturbances to account for this decline.

Range of Species Richness Based on Plots. 9–45 species (average = 27.2 species per plot per sampling).

Summary of Current Conditions and Long-Term Trends. There has been a loss of the perennial component (both grasses and subshrubs), possibly due to an increase of other species, native and non-native, compared to purely native condition in grasslands. This is especially apparent on northern SCI and terrace flats.

Photo 3-19. View of the Needlegrass Alliance on San Clemente Island (Plot #95 in 2006).

Current Management

California perennial grasslands are monitored by the LCTA program, although additional plots may be needed to fully document the range of conditions within the areas mapped as this alliance. Annual non-native plant species control efforts are conducted and reports are produced by botany staff.

Assessment of Resource Management

- The 2011 mapping effort of the Needlegrass Alliance should be verified through ground-truthing.
- Additional plots may be needed to fully document the range of conditions within areas mapped as California perennial grasslands.
- Since the removal of feral goats in 1992, vegetation communities of SCI have been recovering remarkably well. Natural resources personnel should continue to monitor the natural progression of habitats with the periodic control of erosion and non-native species.

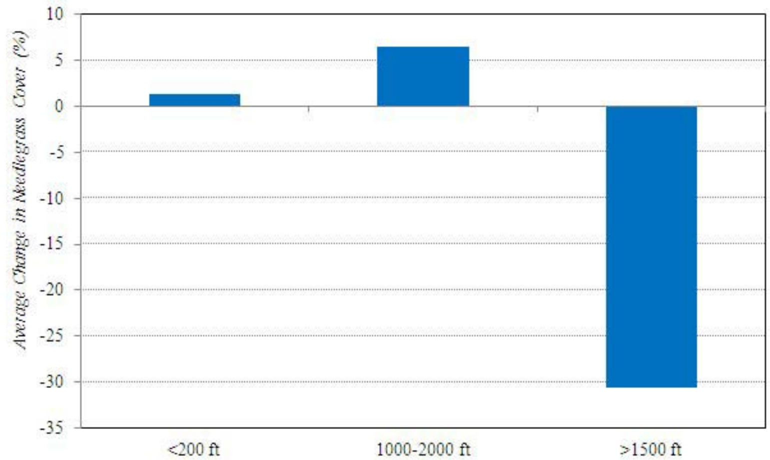


Figure 3-10. Changes in needlegrass percent cover on Needlegrass Alliance plots by elevation level (number of plots per category is 3-2-3, respectively).

Management Strategy

Objective: *Improve the ratio of native to non-native grasses in annual grassland habitats on undisturbed clay soils and terrace flats where the root system can take advantage of deeper soil water and anchor sites and where it can expand as a community.*

I. Use established vegetation trend monitoring plots to support development of a reference condition for the Needlegrass Alliance.

- ***A.*** Assess the current representation of these vegetation types in the LCTA plot inventory, and if needed, identify new sites for monitoring to capture a representative sampling of this habitat.

II. Monitor needlegrass habitats for invasive plant species and undertake control efforts as needed to maintain native vegetation.

III. Evaluate the increasing fuel hazard occurring with shrub encroachment to devise fuel management measures and manage the risk of catastrophic fire.

- ***A.*** Manage fire for openness of grasslands and native perennial herbs and grasses to enhance transit and prey availability for the San Clement island fox and San Clemente loggerhead shrike.

3.7.1.9 Mediterranean California Naturalized Annual and Perennial Grassland

Mid- and low-elevation grasslands tend to be less diverse and dominated by non-native annual grasses, but stands of purple needlegrass do occur sporadically within the annual grasslands (Navy 2002). On deeper soils with higher clay content, annual grasses, such as wild oats and foxtail fescue coexist with cryptogams (e.g., lichens, mosses, and liverworts) in the interspaces while on shallow sites an array of native annual herbs are characteristic: pygmyweed (*Crassula connata*), goldfields, common cryptantha (*Cryptantha intermedia*), and silver puffs (*Microseris lindleyi*). Island morning-glory is common among rocks, emerging from occasional coast prickly pear patches and on the sides of gullies. Coyote brush is increasing in some of these areas. Island tarplant is also scattered throughout the grassland. On mid-elevation sites the grasslands become increasingly dominated by slender wild oats (*Avena fatua*) and clustered tarweed (*Deinandra fasciculata*).

The San Clemente island fox, raptors, and other avian species forage throughout this habitat type. As with native perennial grasslands, the San Clemente loggerhead shrike also forages throughout these open non-native grasslands during the winter. Non-native grasslands also provide nesting habitat for a variety of other common avian species (Navy 2008).

There is a poor understanding of the original nature of mid-elevation grasslands on clay soils, which are currently dominated by non-native grasses. A high range in diversity occurs in the grasslands, with some large areas dominated by only a few species, such as slender wild oats, clustered tarweed, Russian thistle (*Salsola tragus*), and Australian saltbush (*Atriplex semibaccata*). Other areas might contain 30 species in a 4,305-square foot (1,312-square meter) plot and include occasional shrubs, such as coyote brush, island tarplant, lemonade berry, island morning-glory, or coast prickly pear, near rock outcrops. Many areas are in fair or poor condition because of erosion, limited ground cover, or a high percentage of invasive species (Navy 2008).

Soils. Chinapoint, Eelpoint, Lostpoint, NOTS Pier, and Usterts are all series found on these areas. Soils found towards the north end of the High Plateau Grassland, and also in some southern areas, have a high clay content but no clay horizons. Surface soils are loams or silt loams with some cobbles and stones approximately three inches deep. Subsurface soils are dark brown and extend to between 36 and 50 inches. These soils were formed in mixed alluvium and rest on either andesite/dacite or weakly consolidated sandy marine sediments (Navy 2002).

Sensitive Plants. Bobtail barley, island jepsonia, Palmer's clover, San Clemente Island brodiaea, San Clemente Island larkspur, small flowered microseris.

Sensitive/Endemic Animals (actual and potential use). Island night lizard, San Clemente island fox, San Clemente loggerhead shrike.

Range of Variation. The non-native grasslands of SCI are highly variable in composition, typical of grasslands elsewhere in southern California. Large areas are dominated alternately by wild oats and/or brome grasses. Smaller stands, not included in the new vegetation map, may be dominated by rye grasses or fescue. In all cases a wide variety of grass species occur in complex mixtures within the dominant types, including native needlegrasses.

Constituent Alliances

There are three mapped alliances of Mediterranean California Naturalized Annual and Perennial Grassland on SCI, characterized by a high level of non-native grass species (e.g., wild oats and brome species) and little or no presence of native needlegrass species.

Wild Oat Alliance (Avena sp.)

This alliance is mapped on approximately 2,534 acres (772 ha) where wild oat species (Photo 3-20), primarily slender wild oats, are the main contributor to overall herbaceous cover (>50% relative cover in the herbaceous layer [Sawyer et al. 2009]).

Associations	Acres
Wild Oat Association*	2110.6
Wild Oat-Brome Grass Association	423.1

*In the absence of other associated co-dominant species, the alliance name itself is also designated as an association.

Vegetation Monitoring Plots. 49, 60, 98, 113. Over the years annual grass cover on these plots has fluctuated greatly (range 8–92%, average median value of 51%), due primarily to annual rainfall patterns. No perennial species increased in cover since plot establishment and most are only recorded as species list entries with 0% cover.

Range of Species Richness Based on Plots. 10–31 species (average = 21.4 species per plot per sampling).

Photo 3-20. View of the Wild Oat Alliance on San Clemente Island (Plot #60 in 2008).

Summary of Current Conditions and Long-Term Trends. Wild oats predominate in a few formerly cultivated areas, sometimes along roads; it captures surface soil water and prevents deeper soil percolation. Perennial grasses in these areas cannot re-establish because they are largely absent and do not readily recolonize since their seeds are not wind dispersed (Bartolome 1981). Wild oats seems to occur on a similar soil type that is recolonizing with SCI tarplant in other areas.

Ripgut Brome Alliance (Bromus diandrus)

This alliance is mapped on approximately 1,023 acres (312 ha) of SCI, where ripgut brome (Photo 3-21) is the main contributor to overall herbaceous cover (>60% relative cover in the herbaceous layer [Sawyer et al. 2009]).

Associations	Acres
Ripgut brome-Wild Oat Association	963.1
Ripgut Brome-Soft Chess Association	16.7
Ripgut Brome-Red Brome Association	44.0

Vegetation Monitoring Plots. 89, 93, 97. Over the years annual grass cover on these plots has fluctuated greatly (range 7–61%, average median value of 25.7%), due primarily to annual rainfall patterns. California boxthorn occurs on all three plots in this alliance, ranging from 2–23% cover in the most recent samplings (2008–2010). The 2% cover of California boxthorn recorded on Plot #93 represents a sharp decline from 18% in 2006 and 9% in 2008. Australian saltbush is also prominent at times, with cover values recorded as high as 31% (percent cover of this species fluctuates greatly from year-to-year).

Range of Species Richness Based on Plots. 10–27 species (average = 18.4 species per plot per sampling).

Photo 3-21. View of the Ripgut Brome Alliance on San Clemente Island (Plot #93 in 2010).

Summary of Current Conditions and Long-Term Trends. In shaded understory woodlands, this grass may inhibit recruitment of native species by capturing surface soil water and preventing deeper soil percolation.

Red Brome Alliance (Bromus madritensis)

This alliance is mapped on approximately 292 acres (89 ha), where red brome (Photo 3-22) is the main contributor to overall herbaceous cover (>80% relative cover in the herbaceous layer [Sawyer et al. 2009]).

Associations	Acres
Ripgut brome-Wild Oat Association	292.3

Photo 3-22. View of the Red Brome Alliance on San Clemente Island (Plot #36 in 2008).

Vegetation Monitoring Plots. 36. Annual grass cover on this plot has fluctuated greatly (range 1–40%, median value of 18.0%) since it was established in 1992, primarily as a result of annual rainfall patterns. California boxthorn is present at 5% cover in 2010 (there was only 2% cover of California boxthorn in 1992). Australian saltbush is also prominent at times with cover values recorded as high as 30% (percent cover of this species fluctuates greatly from year-to-year).

Range of Species Richness Based on Plots. 8–24 species (average = 17.6 species per sampling).

Summary of Current Conditions and Long-Term Trends. Occurs on drier soils, where it may promote fire spread in coastal cholla habitat.

Current Management

Mediterranean California naturalized grasslands are monitored through the LCTA monitoring program. Annual invasive plant species control efforts are also conducted and reports are produced by botany staff.

The USGS and San Diego State University are currently completing grassland fire research to understand the process of controlling invasive plant species and restoring habitats through the use of controlled burns.

Assessment of Resource Management

- Mapping efforts of the Ripgut Brome Alliance in 2011 should be verified through ground-truthing.
- Status and trends of the Mediterranean California naturalized grasslands may not be fully captured with the currently established LCTA plots. Additional LCTA plots may be needed to fully document the range of conditions within this group.
- Since the removal of feral goats in 1992, vegetation communities of SCI have been recovering remarkably well. Natural resources personnel should continue to monitor the natural progression of habitats with the periodic control of erosion and non-native species.

Management Strategy

Objective: *Reduce non-native grasses and promote native perennial grasses and shrubs, such as island tarplant in the Wild Oat Alliance to improve resistance to fire spread, improve soil moisture levels for native species, and promote diverse and sustainable military cover conditions.*

Objective: *Reduce the extent of the Ripgut Brome Alliance where it may impair recruitment of native shrubs, trees, and endemic perennial forbs in the open woodland understory to promote sensitive and endemic species and promote more diverse and sustainable military cover conditions for the future.*

Objective: *Reduce fire-spread potential in areas near Santa Cruz Island rockcress (Sibara filifolia) populations by controlling unnaturally continuous fine fuel bed and promoting fog moisture capture and deep soil moisture penetration by perennial bunchgrasses and native shrubs to reduce the threat of fire and invasion by Mediterranean grass (Schismus spp.).*

Objective: *Support Santa Cruz Island rockcress and San Clemente Island indian paintbrush populations and reduce the extent of coastal cholla patches.*

I. Use established vegetation trend monitoring plots to support development of a reference condition for Wild Oat, Ripgut Brome, and Red Brome Alliances.

A. Assess the current representation of these alliances in the LCTA plot inventory, and if needed, identify new sites for monitoring to capture a representative sampling of these habitats.

II. Monitor grassland habitats for non-native plant species and undertake control efforts as needed.

III. Evaluate the increasing fuel hazard occurring with shrub encroachment to devise fuel management measures and manage the risk of catastrophic fire.

3.7.1.10 California Coastal Evergreen Bluff and Dune Scrub

California Coastal Evergreen Bluff and Dune Scrub occurs on the upper plateaus of SCI at elevations above 1,000 feet (300 m) and is characterized by varying amounts of shrub cover. Coyote brush is the indicator species for this habitat type on the island. The understory contains plentiful herbaceous perennials, primarily non-native grasses, although native grasses and forbs are also abundant. This scrub type is an emerging presence on the island with the removal of feral goats in 1992. In the absence of large or frequent fires this habitat is likely to continue to expand its range into neighboring grasslands (NatureServe 2011).

Soils. The southern extent of this alliance occurs primarily on SHOBA loam and Ustalf cobbly silt loams while the northern extent occurs on Eelpoint clay and China Point cobbly clays.

Sensitive Plants. San Clemente Island brodiaea, San Clemente Island evening primrose (*Camissoniopsis guadalupensis* subsp. *clementina*), San Clemente Island indian paintbrush, Nevin's woolly sunflower, island apple-blossom, San Clemente Island tarplant, San Clemente Island larkspur, bright green dudleya, San Clemente Island buckwheat, San Clemente Island bedstraw, showy island snapdragon, Nevin's gilia, island jepsonia, Blair's wirelettuce.

Sensitive/Endemic Animals (actual and potential use). San Clemente loggerhead shrike, island night lizard, San Clemente island fox.

Range of Variation. The shrub canopy in these areas is highly variable and can include areas of little or no shrub cover surrounded by areas of dense cover. The shrub canopy has been observed to be increasing and expanding over time.

Potential Threats. Stand-replacing, frequent, or large fires that delay re-occupation by native wildlife.

Constituent Alliances

There is only one mapped alliance of California Coastal Evergreen Bluff Scrub on SCI.

Coyote Brush Alliance (Baccharis pilularis)

Associations	Acres
Coyote Brush-Island Morning-Glory Association	5.9
Coyote Brush-Island Morning-Glory/Brome Grass Association	62.8
Coyote Brush/ Needlegrass Association	1066.1

This alliance is mapped on approximately 1,135 acres (460 ha) of the island where coyote brush (Photo 3-23) is the dominant shrub species (>15% relative cover in the herbaceous layer [Sawyer et al. 2009]). Coyote brush has been increasing both in range (originally recorded on 12 plots, now recorded on 26 plots) and abundance (a total of 40 coyote brush shrubs on the plots in 1992–1993, a total of 193 in the most recent samplings) in the years following the removal of the last feral goats in 1992. The coyote brush overlies herbaceous understory comprised primarily of annual grasses (e.g., wild oats, fescue, and brome species), but native needlegrass is also prominent with cover as high as 20–30%. Annual forbs may also be quite prominent, contributing an additional 15–30% cover. Sub-shrubs, such as silver bird's-foot trefoil and Australian saltbush, may also be present.

Photo 3-23. Two views of plot 18 (left) in 1992 with scattered coyote brush shrubs, and (right) in 2006 with a much more continuous coyote brush canopy.

Vegetation Monitoring Plots. 8, 18, 65, 100. Three of four plots currently mapped in this alliance have little or no shrub cover; two of those do not have shrubs recorded in the belt data. However, in the one plot (#8) that does include significant amounts of shrub cover, cover increased from 11% in 1992 to 40% in 2010. In the belt data for Plot #8, the number of coyote brush shrubs increased from 0 in 1992 to 26 in 2010 (with a peak of 45 in 2006).

On the other plot (Plot #18) with a significant shrub presence, percent cover of shrubs remains low at 7% in 2006 (up from 0% in 1992). However, belt data shows coyote brush increasing from 18 individuals in 1992 to 104 in 2006 (with a peak of 274 in 1996). In addition, island tarplant increased from a single individual in 1992 to 109 in 2006.

Since 1992–1993, the range of coyote brush expanded on SCI. Where it originally occurred on seven plots, it is now known on 22 plots, and on those has increased from 24 individuals to 194.

Range of Species Richness Based on Plots. 13–39 species (average = 30.5 species per sampling).

Summary of Current Conditions and Long-Term Trends. Coyote brush is a native pioneering shrub that takes advantage of unused moisture in the soil profile of wetland or clay soils. It is relatively short-lived. It poses as a potential fire hazard as stands mature and senesce. Coyote brush has increased dramatically from being present in four plots to 27 plots since 1992. Its fog-drip effect may be beneficial to native species, although it may shade out some endemic perennials or reduce their cover.

Current Management

The status and trends of coyote brush shrublands are monitored by the LCTA program. Annual invasive plant species control efforts are also conducted and reports are produced by botany staff.

Assessment of Resource Management

- Additional LCTA plots may be needed to cover the range of conditions in areas currently mapped as coyote brush.
- Since the removal of feral goats in 1992, the vegetation communities of SCI have been recovering remarkably well. Natural resources personnel should allow the natural progression of habitats to continue with the periodic control of erosion and non-native species.

Management Strategy

Objective: *Address potential threat as a fire management issue and promote endemism on mesic clay soils of the plateau and terraces by promoting perennial grasses for non-native annual grasses to conserve endemic and sensitive species and reduce impacts to training values on the northern half of the island.*

I. Use established vegetation trend monitoring plots to support development of a reference condition for the Coyote Brush Alliance.

- ***A.*** Assess the current representation of this vegetation type in the LCTA plot inventory, and if needed, identify new sites for monitoring to capture a representative sampling.

II. Monitor the expansion and closure of coyote brush canopy to assess potential future risks in the form of enhanced fire risks or over-shadowing of native perennial bulbs and forbs

III. Monitor coyote brush habitats for invasive plant species and undertake control efforts, as needed, to maintain native vegetation.

3.7.1.11 Pacific Dune Mats

Although the new vegetation map does not distinguish between active and stabilized dune areas, the two dune types present on SCI are highly distinctive from one another. Although holding many of the same species, the stabilized dunes contain a more complex vegetation community, both structurally and in overall species composition. Therefore, full descriptions of both dune types are provided below, followed by descriptions of alliances mapped in 2011.

Active Sand Dunes

Active sand dune areas feature a more or less open vegetation canopy over loose, shifting sands. Species diversity is typically lower than most other vegetation types on the island.

Status Summary. The active areas of the dunes comprise only about 1% of the island's acreage (Navy 2008) and typically support silver burr ragweed, San Miguel Island milkvetch (*Astragalus miguelensis*), small evening primrose (*Camissoniopsis micrantha*), San Clemente Island evening primrose, sand verbena (*Abronia umbellata*), and red sand verbena (*Abronia maritima*). San Miguel Island milkvetch and silver burr ragweed are representative of this community while the San Clemente Island evening primrose and Trask's cryptantha (*Cryptantha traskiae*) occur in pockets, adding diversity (Navy 2002).

Sensitive species, such as Trask's cryptantha and San Clemente Island evening primrose, dominate areas that are free from non-native invasive species. However, critical issues on the active dunes include invasion of non-native species and erosion. The highly invasive iceplants (*Carpobrotus* spp. and *Mesembryanthemum* spp.), are encroaching into most of the northern dune sites, and Bermuda grass (*Cynodon dactylon*) is also becoming problematic (Navy 2008). Erosion, through the loss of sand, has caused beach erosion and the stabilization of dunes.

Soils. Sand dunes are found on the north and south ends of the island in sloping and hilly areas. The majority of dunes on SCI have become increasingly vegetated over the past few decades. Younger dunes are recently stabilized or still active (Muhs 1980), and soils consist of very deep calcareous sand with minimal profile development. In some areas, sands are cross-stratified and have large, hardened discontinuous caliche layers in the form of sheets or chunks (Navy 2002).

Sensitive Plants. San Miguel Island milkvetch, San Clemente Island milkvetch, Trask's cryptantha, San Clemente Island evening primrose.

Sensitive/Endemic Animals (actual and potential use). Due to the relative lack of vegetative cover, few wildlife species tend to use these habitats. Active sand dunes support the highest densities of island foxes (Photo 3-24), as well as high densities of sage sparrows. In addition, ravens, kestrels, and harriers use active sand dunes, which may serve as a special significance for invertebrates (still unknown). Sensitive invertebrates in the active sand dunes include the Channel Islands dune beetle (*Coleus pacificus*) and the San Clemente coenonycha beetle (*Coenonycha clementina*) (Navy 2002).

Range of Variation. Overall the species composition of this alliance is fairly consistent, although the relative proportions of the dominant shrubs, such as silver burr ragweed and milkvetches, may vary slightly from one area to another.

Stabilized Sand Dunes

Stabilized sand dunes have a more consolidated soil substrate and fully developed vegetation community with greater vertical structure. The areas of open, loose sands typical of active dunes are far less common.

Photo 3-24. A San Clemente island fox in a burrow in an active dune area (photo taken in 2008 on vegetation Plot #32).

Status Summary. The stabilized sand dunes comprise approximately 1% of the island's total acreage (Navy 2002), and are currently expanding due to the stabilization of active dunes. On more stabilized sites, usually from the Pleistocene era, a number of species add to the floral diversity of stabilized sand dunes. Lemonade berry and coyote brush are prominent flora species in this habitat, while the endemic San Clemente Island milkvetch, Trask's cryptantha, San Clemente Island evening primrose, and island poppy are also found in stabilized sand dunes (Navy 2008). There are several stands of island mallow on stabilized dunes now: two natural populations in SWAT 1, planted populations near Flasher Road and at the base of terrace, and the West Cove and dunes plantings by San Diego State University's Soil Ecology and Restoration Group (SERG), which contain two plants at Flasher beach 2011 (B. Munson, pers. com. 2011). Bermuda grass, a non-native species, is most likely permanently established on the stabilized dunes (Navy 2008). Saltgrass (*Distichlis spicata*) is common on the southern dunes while dwarf coastweed (*Amblyopappus pusillus*), the introduced slenderleaf iceplant (*Mesembryanthemum nodiflorum*), and crystalline iceplant (*Mesembryanthemum crystallinum*) are widespread.

Structure and diversity are added to the dunes as they become more stabilized, generally as they progress inland away from the shore. Several sensitive species, while restricted to the dunes, are generally abundant within this habitat. A few shrubs begin to enter the ecosystem at the edges of the dunes: California boxthorn, coast prickly pear, lemonade berry, and coyote brush (Navy 2002), which add structure and wildlife benefits.

Some plants in this community may require insect pollination (e.g., *Astragalus* spp.) and, sometimes, symbiotic bacterial and fungal associations (Navy 2002). Additionally, they require protection from non-native invasive species, road erosion, and off-road vehicle damage.

Soils. Older dunes have long been stabilized and are very well developed. They have thick red argillic horizons, some carbonate cementing, and are in the soil order Alfisol.

Sensitive Plants. San Clemente Island milkvetch, San Clemente Island evening primrose, Trask's cryptantha, island mallow, leafy malacothrix (*Malacothrix foliosa* subsp. *foliosa*).

Sensitive/Endemic Animals (actual and potential use). Due to the relative lack of vegetative cover, the San Clemente island fox primarily uses stabilized dunes on the island. Ravens, kestrels, and harriers also use the habitat on a limited basis for foraging (Navy 2008).

Range of Variation. Overall the species composition of this alliance is fairly consistent, although the relative proportions of the dominant shrubs, such as silver burr ragweed and milkvetches, may vary slightly from one spot to another.

Constituent Alliances (Active and Stabilized Dunes)

There are three mapped alliances of Pacific Dune Mats on SCI and one unmapped alliance.

Silver Burr Ragweed Alliance (*Ambrosia chamissonis* var. *chamissonis*)

Associations	Acres
Silver Burr Ragweed-San Miguel Island Milkvetch Association	259.3
Silver Burr Ragweed-Lemonade Berry Association	113.2

This alliance is mapped on approximately 339 acres (137 ha), where silver burr ragweed (Photo 3-25) is the dominant shrub species. Both the San Miguel Island milkvetch and San Clemente Island milkvetch are prominent components of this alliance. Additional shrub species may include California boxthorn, island tarplant, silver bird's-foot trefoil, coyote brush, and/or lemonade berry. Island morning-glory is present at up to 14% cover. Herbaceous species typical of this alliance are brome species, barley, filaree, iceplants, and evening primrose.

Photo 3-25. View of the Silver Burr Ragweed Alliance on SCI (Plot #82N in 2008).

Vegetation Monitoring Plots. Active Dunes: 32, 41, 82N, 83N. Stabilized Dunes: 2, 42.

Range of Species Richness Based on Plots. Active Dunes: 9–22 species (average = 16.8 species per plot per sampling). Stabilized Dunes: 19–34 species (average = 26.6 species per plot per sampling).

Summary of Current Conditions and Long-Term Trends. Active Dunes: Shrub and sub-shrub cover vary greatly from year-to-year on these plots (from as low as 3% to as much as 32%), due to the shifting sands that can greatly alter a plot's appearance over time. Grasses are not a prominent feature of these plots (<10% cover is most years).

Annual forb cover has increased markedly from an average of just 6.3% per plot, when they were established, to 23.85% per plot during the last sampling event. Crystalline ice-plant is the main contributor to this increase, as well as filaree.

Stabilized Dunes: Shrub cover has remained stable on these plots at 10–19% cover each year. Annual forb cover has decreased on both plots (from 31% to 13% on Plot #2; from 8% to 0% in Plot #42).

Milkvetch Alliance (*Astragalus* spp.)

Associations	Acres
Milkvetch/Saltgrass Association	17.3

This alliance is mapped on just 17 acres (7 ha) of the island where milkvetch species (Photo 3-26) are the dominant shrub species. Both San Miguel Island milkvetch and San Clemente Island milkvetch occur in varying ratios, along with silver burr ragweed. San Clemente Island evening primrose is also abundant within this alliance. Herbaceous species typical of this alliance include sand verbena, filaree, barley, and saltgrass. Non-native iceplants may also be common, and even dominant in some locales (Photo 3-27).

Photo 3-26. View of an active dune site with milkvetch (Plot #82N in 2006). Although the site depicted is not mapped as the Milkvetch Alliance in the 2011 vegetation map, the overall appearance is similar to what would be expected. Most of the greyish green foliage in this view is milkvetch rather than ragweed.

Vegetation Monitoring Plots. 37 (active dune). Although San Miguel Island milkvetch is present at 3–10% cover, the highest cover species on this plot are non-native iceplant species (Photo 3-27). Percent cover of *Carpobrotus* sp. has increased from 3% in 1992 to 46% in 2008.

Range of Species Richness Based on Plots. 11–24 species (average = 20.5 species per sampling).

Summary of Current Conditions and Long-Term Trends. Due to the dramatic increase of non-native iceplant species since 1992, iceplant removal efforts have begun at the southeastern edge of the stabilized dunes and will proceed northward as labor is available. This strategy will hopefully encourage recruitment by native species by moving from more native-dominated areas toward areas invaded by veldtgrass (*Ehrharta calycina*) near West Cove.

Red Sand Verbena Alliance (*Abronia maritima*)

Associations	Acres
Red Verbena-Milkvetch Association	33.1

This alliance is mapped on approximately 33 acres (13 ha) of SCI, where red sand verbena is the characteristic species present. Additionally, sand verbena is often present in the alliance. Located on active dune sites, overall species composition is otherwise similar to other dune alliances, with ragweed and milkvetch as characteristic components. Overall vegetative cover is typically low.

Vegetation Monitoring Plots. None.

Range of Species Richness Based on Plots. Unknown.

Summary of Current Conditions and Long-Term Trends. Unknown.

Photo 3-27. Non-native iceplants on Plot #37 in 2008 (the plot transect runs from the bottom-center to top-center of the image).

Saltgrass Alliance (*Distichlis spicata*)

This is an unmapped alliance on a single vegetation monitoring plot, where saltgrass is the most prominent species (Photo 3-28). Shrub species do occur, such as milkvetch, Australian saltbush, California encelia, and California boxthorn, only at very low cover and density. Sand verbena species are also common, but not abundant. There is little annual grass presence, and although a variety of annual forbs occur they are not abundant.

Vegetation Monitoring Plots. 53 (stabilized dune). Percent cover of saltgrass has been recorded at 40–50%, while no other plant species typically occurs at more than 10% cover.

Range of Species Richness Based on Plots. 14–30 species (average = 23.7 species per sampling).

Summary of Current Conditions and Long-Term Trends. There are no apparent trends on these plots, with all plants either fluctuating annually or remaining unchanged.

Current Management

Active sand dunes are monitored by the LCTA program. Annual invasive plant species control efforts are also conducted in this habitat and reports are produced with methods and results.

Photo 3-28. View of the Saltgrass Alliance on SCI (Plot #53 in 2003).

Assessment of Resource Management

- Efforts to remove non-native species from active sand dunes is imperative to maintaining the ecosystem function of this habitat and should continue.

Management Strategy

Objective: *Prevent active dunes from becoming stabilized by maintaining or correcting sand sources and other processes to support sensitive and endemic species, archeological sites, and fossil root systems.*

I. Use established vegetation trend monitoring plots to support development of a reference condition for active dunes.

   A. Assess the current representation of this vegetation type in the LCTA plot inventory, and if needed, identify new sites for monitoring to capture a representative sampling of these habitats.

II. Continue to restrict access to the dunes, especially by vehicles.

III. Control ongoing erosion of the dune roads. Use BMPs to secure roads from erosion.

IV. Protect the integrity of active dunes with respect to cultural resources, root casts, and the natural abundance and diversity of native species.

V. Monitor active dune habitats for non-native plant species and undertake control efforts, as needed, to maintain native vegetation.

Current Management

Stabilized sand dunes are monitored by the LCTA program. Annual non-native plant species control efforts are also conducted and reports are produced.

In 2011 and 2012, the Channel Islands Restoration Group volunteered to assist in the removal of iceplant; more than 40 acres (16 ha) of habitat were cleared of the invasive species.

Assessment of Resource Management

- Efforts to utilize volunteer labor in removing iceplant from dune areas has been highly successful and resulted in a resurgence of native species.

Management Strategy

Objective: *Maintain native processes on stabilized dunes that favor endemic plant abundance and reduce non-native species by controlling invasions by iceplant and Bermuda grass.*

I. Use established vegetation trend monitoring plots to support development of a reference condition for stabilized dunes.

- ***A.*** Assess the current representation of these vegetation types in the LCTA plot inventory, and if needed, identify new sites for monitoring to capture a representative sampling of these habitats.

II. Coordinate non-native plant removal efforts with SCI Wildlife Biologist to ensure that impacts to sensitive and listed wildlife are minimized.

III. Continue to restrict access to the dunes, especially by vehicles.

IV. Control ongoing erosion of the dune roads. Use BMPs to secure roads from erosion.

V. Protect the integrity of stabilized dunes with respect to cultural resources, root casts, and the natural abundance and diversity of native endemics.

VI. Monitor stabilized dune habitats for non-native plant species and undertake control efforts as needed to maintain native vegetation.

3.7.1.12 Coastal Baja California Norte Maritime Succulent Scrub

This community is comprised of succulent-rich coastal scrub found along northern Baja California, Mexico and southern California coasts and offshore islands, as well as in the flat coastal plain along the west coast of Sonora (NatureServe 2011). These sites tend to be isolated maritime coastal bluffs and terraces. This scrub vegetation is characterized by shrub and succulent species, including California boxthorn, lemonade berry, coast prickly pear, coastal cholla, and golden spined cereus. The Coastal Baja California Norte Maritime Succulent Scrub community covers more than half (59%) of the island.

Constituent Alliances

There are four mapped alliances of Coastal Baja California Norte Maritime Succulent Scrub on SCI.

California Boxthorn Alliance (Lycium californicum)

Associations	Acres
California Boxthorn-Wild Oat Association	986.6
California Boxthorn-Coastal Cholla - Coast Prickly Pear Association	22.8
California Boxthorn-Golden Spined Cereus/Bright Green Dudleya Association	8.4
California Boxthorn-Coast Prickly Pear Association	135.5
California Boxthorn-Coast Prickly Pear - Golden Spined Cereus Association	5324.4

The major structural component of this alliance is California boxthorn, a drought-deciduous, low, and spiny shrub (Photo 3-29). Also characteristic are leafy malacothrix, golden-spined cereus, island tarplant, saltbushes, and coast prickly pear. On more disturbed sites, dwarf coastweed and iceplant are abundant. Natural sites feature a nearly complete cover of shrubs and perennials with periodic violet and yellow displays of wildflowers, including the endemic annual Guadalupe Island lupine (*Lupinus guadalupensis*) in association with leafy malacothrix, goldfields, and bright green dudleya. Other lupines, Palmer's clover, tomcat clover (*Trifolium willdenovii*), and, occasionally, island ragweed are present. Interspaces between the shrubs are commonly protected by a lichen layer and a varying cover of annual species, such as pygmyweed, California cottonrose (*Logfia filaginoides*), and invasive iceplants, depending on seasonal rains and local site conditions. Commonly tangled within the shrubs are the vine-like annuals fairy mist (*Pterostegia drymarioides*) and San Diego fiesta flower (Navy 2008). Occasional individuals of island apple-blossom and island bush monkeyflower may also be seen.

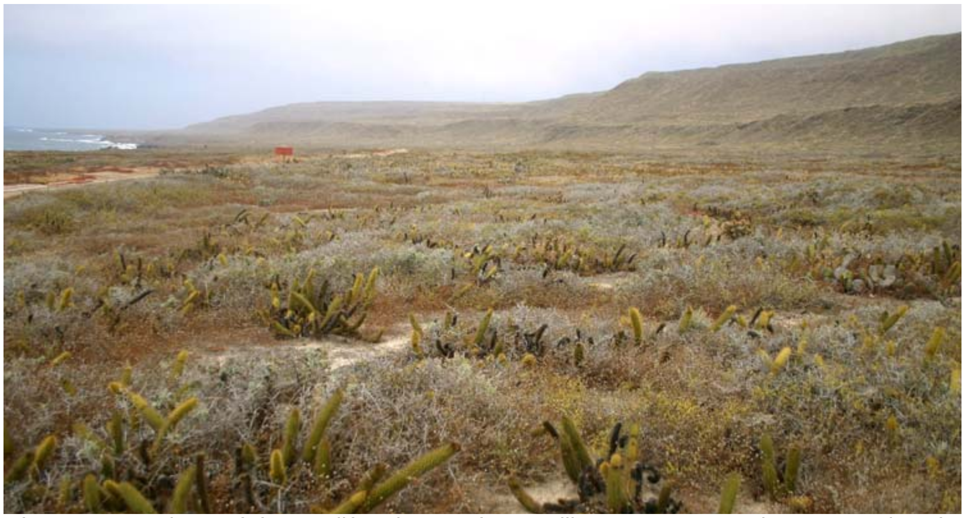


Photo 3-29. View of the California Boxthorn Alliance on San Clemente Island (Plot #112 in 2010).

The community becomes simpler both structurally and floristically on the upper terraces and southward as it grades into the Coast Prickly Pear Alliance.

California boxthorn is an important species for this alliance. Its fruits provide food for wildlife, including the San Clemente sage sparrow, which also commonly nests in California boxthorn and are known to also use cactus species for perching and nesting. In addition, the San Clemente sage sparrow has been shown to favor the interface or edge between California boxthorn and island sagebrush or California sagebrush. Birds are required for seed dispersal of California boxthorn.

California boxthorn, golden spined cereus (and the *Opuntia* cacti) and the endemic island tarplant can be considered indicators of habitat structural quality for this community. Diversity can be indexed by Guadalupe Island lupine, aphanisma, and island ragweed.

There is no evidence of fire dependency among any of the species of this community. Presumably they are not well-adapted to fire because of the succulent nature of the species present, such as the golden spined cereus, although post-fire recovery has been observed.

Status Summary. This community occurs in a band of well-drained soils on the first few terraces of the west shore adjacent to the coast. It occupies about 18% of the total island area (6,459 acres [2,613 ha]) and harbors a number of endemic plants. The terrace flats function as depositional areas for the eroding slopes and terrace faces above them.

The California Boxthorn Alliance may have been more prevalent in the past and included an island sagebrush or California sagebrush component on the terrace flats (Raven 1963). Bright green dudleya may have been a more common component as well (Moran

1995). Signs of degradation in this community include invasion of annual grasses, erosion and lack of cryptogamic cover (lichens, mosses, liverworts), which helps bind the soil, placing certain localized areas in fair to poor condition due to gullying (TDI 2009).

Soils. On the lowest marine terraces, deeper soils, classified as the West Shore Series, have formed. These soils have a stony silt loam surface horizon that can extend to six inches and subsoil that extends to forty-two inches, making them one of the more developed soils on the island. Similar to many soils on the island, these soils have a loamy surface horizon unrelated to the profile beneath. The subsoil is primarily clay with thick brown argillic horizons. West shore soils were formed in a fine alluvium deposited over sandy marine sediments.

Range of Variation. Approximately twice the average cover of California boxthorn occurs on the lowest-terrace soils west shore silt loam compared to other soils underlying this plant community.

Sensitive Plants. Aphanisma, island sagebrush, San Clemente Island milkvetch, golden spined cereus, San Clemente Island evening primrose, Nevin's woolly sunflower, San Clemente Island tarplant, bright green dudleya, island poppy, San Clemente Island bedstraw, Nevin's gilia, bobtail barley, Guadalupe Island lupine, leafy malacothrix, Palmer's clover, California dissanthelium (*Dissanthelium californicum*).

Sensitive/Endemic Animals. This habitat supports the highest densities of the island night lizard, which is especially abundant along the lowest elevation terraces on the west shore (Navy 2008). This habitat is ideal for the San Clemente house finch, the horned lark, and the threatened San Clemente sage sparrow, which feeds and nests in the area. The cover and vegetation in this habitat type also supports numerous insects and the San Clemente Island deer mouse, which attract predators such as the San Clemente island fox, feral cat, American kestrel, and northern harrier (Navy 2008).

Vegetation Monitoring Plots. 6, 9, 26, 31, 34, 50, 55, 59, 63, 67, 68, 77, 81, 84, 86N, 87, 90, 99, 111, 112, 120, 121. There has been no statistically significant change in either overall shrub cover (32.4% shrub cover when the plots were established, 28.1% in the most recent samplings) or percent cover of California boxthorn (29.0% shrub cover when the plots were established, 28.1% in the most recent samplings) on these plots. Similarly percent cover of cactus has not changed (8.3% cactus cover when the plots were established, 7.2% in the most recent samplings).

Range of Species Richness Based on Plots. 13–55 species (average = 30.9 species per plot per sampling).

Summary of Current Status and Long-Term Trends. Soils where California boxthorn dominates tend to be alkaline, and saline and have a relatively low water holding capacity. As soils become more favorable to other plants, California boxthorn takes a subdominant role. These areas are highly wind erodible and support a cryptogamic crust that protects from erosion, as well as perhaps performing other ecological functions in the community. Juvenile sage sparrows may have low survivorship in this habitat, perhaps due to rats.

Current Management

The status and trends of the California boxthorn shrublands are monitored by the LCTA program. Annual non-native plant species control efforts are also conducted and reports are produced with methods and results.

Assessment of Resource Management

- Since the removal of feral goats in 1992, vegetation communities of SCI have been recovering remarkably well. Natural resources personnel should continue to monitor the natural progression of habitats with the periodic control of erosion and non-native species.
- Although LCTA plots currently measure the status and trends of California boxthorn shrublands, additional plots may be needed to fully document the range of conditions within areas currently mapped.

Management Strategy

Objective: *Promote and expand conditions in California boxthorn habitats that favor use by the San Clemente sage sparrow, especially in areas that support movement among habitat patches while facilitating military use and reduced military conflict in non-core areas during annual consideration of fire management, nursery management, and weed control.*

I. Use established vegetation trend monitoring plots to support development of a reference condition for the California Boxthorn Alliance.

- ***A.*** Assess the current representation of this vegetation type in the LCTA plot inventory, and if needed, identify new sites for monitoring to capture a representative sampling of this habitat.
- ***B.*** Improve map boundaries of this community, as needed.

II. Protect a sufficient high-density area and cover of California boxthorn and associated native shrubs and forbs to ensure the long-term viability of the San Clemente sage sparrow population.

- ***A.*** Within delineated high-density sage sparrow areas, maintain California boxthorn and associated native shrubs and forbs in the reference condition (monitoring Plot #6).
- ***B.*** Minimize ground and vegetation disturbance in the high-density sage sparrow area, from the rifle range east of the dunes to Seal Cove.
- ***C.*** Manage the footprint of activity in high-density California boxthorn habitat.
  - *1.* Locate ground-disturbing activities on previously disturbed sites whenever possible.
  - *2.* Keep vehicle activity to clearly delineated roads or transit zones. Restore unused, closed, or unnecessary roads to native vegetation to control erosion of topsoil.
  - *3.* Where repeated use is expected, create trails.

III. Foster the expansion of this habitat into appropriate sites.

IV. Monitor California boxthorn habitats for invasive plant species and undertake control efforts as needed to maintain native vegetation.

Coast Prickly Pear Alliance (*Opuntia littoralis*)

Status Summary. This community, dominated by coast prickly pear (Photo 3-30), occurs from Santa Catalina Island to islands off the coast of Baja California, Mexico. It appears to be a southern variation of the mainland coastal sage scrub (Philbrick and Haller 1977). The Prickly Pear Alliance occupies about 26% of the land area on SCI (9,441 acres) and occurs in a band inland from the California boxthorn habitat on terrace faces, reaching its peak generally at lower elevations than the main plateau (Navy 2008).

Associations	Acres
Coast Prickly Pear Association*	72.5
Coast Prickly Pear-California Sagebrush Association	332.1
Coast Prickly Pear-California Sagebrush/Needlegrass Association	1473.0
Coast Prickly Pear/Wild Oat Association	1994.0
Coast Prickly Pear-Golden Spined Cereus Association	30.3
Coast Prickly Pear-Island Morning-Glory Association	4952.5
Coast Prickly Pear-Island Morning-Glory - Silver bird's-foot trefoil Association	31.4
Coast Prickly Pear-Island Morning-Glory - Giant Sea Dahlia Association	25.4
Coast Prickly Pear-Island Ragweed Association	17.7
Coast Prickly Pear/ Needlegrass Association	519.5
*In the absence of other associated co-dominant species, the alliance name itself is also designated as an association.	

This plant community composition ranges from dense clumps obscured by a matrix of tall annual grasses to dense thickets mixed with shrub species, such as: California sagebrush, island sagebrush, and coastal wishbone bush, mixed in with herbaceous plants like fairy mist and Nuttall's snapdragon (*Antirrhinum nuttallianum* subsp. *subsessile*) (Navy 2008). Dense thickets of coast prickly pear are especially prevalent on the terrace faces.

Coast prickly pear is important community structure and for sheltering succulent species and shrub seedlings from herbivores. With the exception of lemonade berry, most of the occasional shrubs occurring in this type are short-lived and considered seral in other locations. The wildlife value of coyote brush is not known, although on rare occasions the loggerhead shrike has been reported to use this species for nesting. Sagebrush supports insects, which are an important food source for wildlife species. It has been hypothesized that the coast prickly pear has been artificially abundant due to its tolerance of grazing and ability to withstand fire and benefited by the demise of its competitors with fire (Navy 2002). Therefore, the coast prickly pear may decrease in abundance as habitats continue to recover from the effects of grazing by non-native feral herbivores.

Diversity is represented by the herbaceous matrix between the cactus patches and is dependent on microsite conditions. Sites can include native grasses, such as needlegrass, annual hairgrass (*Deschampsia danthonioides*), bent grass, California brome (*Bromus carinatus*), or herbaceous annuals, such as Nevin’s gilia, tidytips (*Layia platyglossa*), Guadalupe Island lupine, and silver puffs (Navy 2002).

Some fire regimes may affect the competitive balance between cactus, shrub, and annual species so that decreases in cactus cover may not necessarily occur. It has been hypothesized that coast prickly pear patches dampen the intensity of a fire because of the plant's succulence. The cactus patches acted as havens for palatable shrubs and herbaceous species when goat grazing was at its peak. California sagebrush appears to be reproducing abundantly now. Unencumbered by grazing, species like island morning-glory are overtaking cactus patches (Navy 2008).

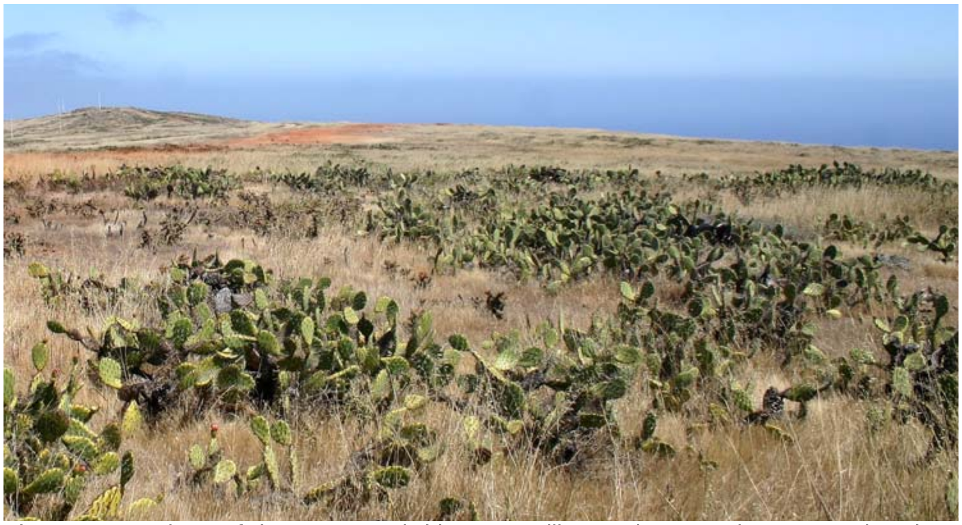


Photo 3-30. View of the Coast Prickly Pear Alliance in San Clemente Island (Plot #21 in 2010).

Soils. As slope increases on the west coast, soils become shallower. Eel Cove soils have a shallow surface horizon, with an average depth of four inches and subsurface soil that extends to approximately 33 inches; these soils are found in steep areas, but do not extend down into the canyons. The texture of the surface soil is a stony silt loam, similar to the soils found closer to the shore. Subsurface soils have clay horizons and are deep reddish brown in color. Similar to west shore soils, these soils formed in mixed alluvium, resting sandy marine sediments. In very steep areas, such as on the sides of canyons, subsoil may not be present. Some areas can be as shallow as 2 inches in the surface horizon, and contain clay in the subsurface horizon.

Sensitive Plants. Aphanisma, island sagebrush, San Clemente Island indian paintbrush, island apple-blossom, Channel Island tree poppy (if still on island), bright green dudleya, island poppy, Nevin's gilia, southern island hazardia, big berry toyon, San Clemente Island bird's-foot trefoil, Guadalupe Island lupine, San Clemente Island bush-mallow, Blair's wirelettuce.

Sensitive/Endemic Animals. The low patches of cactus and denser thickets of vegetation in this habitat provide retreats for the federally threatened island night lizard and foraging habitat for Federally endangered San Clemente loggerhead shrike. Other more common species include the San Clemente island fox, side-blotched lizard (*Uta stansburiana*), northern mockingbird (*Mimus polyglottos*), San Clemente house finch, and white-crowned sparrow (*Zonotrichia leucophrys*) (Navy 2008).

Range of Variation. Most southern island areas are dominated by coastal cholla rather than the other common succulent on SCI, coast prickly pear.

Vegetation Monitoring Plots. 1, 4, 11, 12, 13, 21, 23, 24, 27, 29, 35, 38, 43, 44, 51, 54, 66, 76, 78, 79, 80, 88, 91, 92, 96, 102, 103, 107, 108. At elevations below 1,300 feet (400 m), average percent cover of cactus decreased since 1992–1993 (16.9% cactus cover per plot in 1992–1993, 11.6% cover in the latest samplings; t-test = 1.602, p-value = 0.117). The decrease in cactus cover is especially steep in three plots, located below 300 feet (90 m), that have seen an average decline of 15% (range of 11–21%).

At elevations below 800 feet (240 m), shrub cover has not changed appreciably (15.3% shrub cover per plot in 1992–1993, 13.3% in the latest samplings; t-test = 0.297, p-value = 0.769). However, shrub cover increased at elevations above 800 feet (4.9% shrub cover per plot in 1992–1993, 11.6% in the latest samplings; t-test = -1.725, p-value = 0.099).

Range of Species Richness Based on Plot. 13–58 species (average = 34.1 species per plot per sampling).

Summary of Current Status and Long-Term Trends. This plant community is most likely unnaturally abundant due to impacts of feral goats and associated erosion. Additionally, this vegetation community benefitted from the loss of plant cover that formerly captured fog and retained soil moisture.

Current Management

The status and trends of coast prickly pear habitat is monitored by the LCTA program.

Assessment of Resource Management

- The removal of goats has caused a decline of this habitat in favor of other habitat types, particularly shrublands.
- Although the status and trends of coast prickly pear habitat is monitored through LCTA plots, additional plots may be needed to fully document the continued trends of this habitat.
- Since the removal of feral goats in 1992, the vegetation communities of SCI have been recovering remarkably well. Natural resources personnel should allow the natural progression of habitats to continue with the periodic control of erosion and non-native species.

Management Strategy

Objective: *Foster, within this alliance and coast prickly pear patches on upper slopes and the plateau, the expansion of native perennials over coast prickly pear and coastal cholla to promote the use of these areas for endemic and sensitive species.*

I. Use established vegetation trend monitoring plots to support development of a reference condition for the Coast Prickly Pear Alliance.

- ***A.*** Assess the current representation of this vegetation type in the LCTA plot inventory, and if needed, identify new sites for monitoring to capture a representative sampling of this habitat.

II. Foster the expansion shrub species to improve the ratio of shrubs to coast prickly pear.

- ***A.*** On the terrace flats, establish or augment existing shrub patches.
- ***B.*** On the terrace faces, manage shrub recovery primarily by controlling fire intensity so that shrubs and herbaceous perennials may compete with coast prickly pear and coastal cholla thickets.

III. Continue to implement BMPs and projects to control erosion in areas above the Coast Prickly Pear Alliance.

- ***A.*** Control erosion.
- ***B.*** Evaluate the effects of abandoned and existing roads on continuing erosion and its impacts to the marine environment.

C. Prioritize abandoned roads for restoration if not needed for military purposes.

IV. Prevent excessively hot, frequent, and/or large fires that may delay or inhibit the recovery of woody plants.

Coastal Cholla Alliance (*Cylindropuntia prolifera*)

Associations	Acres
Coastal Cholla/Wild Oat Association	2565.4
Coastal Cholla-Golden Spined Cereus Association	31.8
Coastal Cholla-Island Morning-Glory Association	707.5
Coastal Cholla-Coast Prickly Pear Association	2036.7

Status Summary. This alliance is characterized by coastal cholla (Photo 3-31), most pronounced on the southern island slopes and terraces. It grades into dominance over the coast prickly pear as it progresses southward. This alliance represents about 15% (5,340 acres [2,161 ha]) of the island vegetation.

Clumps of coastal cholla vary greatly in density, found in a matrix of grassland, annual herbs, coast prickly pear, or shrubs, such as California sagebrush, cliff spurge, or California brittlebush. Other associated species are coastal wishbone bush, lemonade berry, silver bird's-foot trefoil, and everlastings.

Photo 3-31. View of the Coastal Cholla Alliance on San Clemente Island (Plot #75 in 2010).

As with areas characterized by abundant coastal cholla cactus, there is a poor understanding of the original nature and extent of this community and how it has been influenced by goat grazing and fire. Some hypotheses about how this alliance spread include: (1) cactus pieces clinging to goats, and (2) artificial suppression of competing shrubs and herbs due to goat grazing and fire. The current range of species composition is extremely broad. Important rare species within this mapping unit all occur on hot, well-drained slopes, including cliff spurge, San Clemente Island indian paintbrush, Santa Cruz Island rockcress, bright green dudleya, San Clemente Island bird's-foot trefoil, and island apple-blossom. San Clemente Island bush-mallow also occurs on the plateaus of this mapping unit (Navy 2008).

The diversity of this alliance is represented by the herbaceous matrix between the cactus patches and depends on microsite conditions and seasonal rainfall patterns.

This community can tolerate fire, although not to the degree of similar habitats such as Diegan coastal sage scrub; excessive and frequent fires may even be detrimental.

Seeds of the shrub species are self- or wind-dispersed, with the exception of lemonade berry which requires birds for dispersal.

Soils. The soils of this alliance are similar to those of the Coast Prickly Pear Alliance described in the previous section.

Sensitive Plants. Aphanisma, island sagebrush, San Clemente Island indian paintbrush, Island apple-blossom, Channel Island tree poppy (if still on island), bright green dudleya, island poppy, Nevin's gilia, southern island hazardia, big berry toyon, San Clemente Island bird's-foot trefoil, Guadalupe Island lupine, San Clemente Island bush-mallow, Blair's wirelettuce, Santa Cruz Island rockcress.

Sensitive/Endemic Animals. Shrubs associated with this type, while sparse, harbor insects that serve as a food source for wildlife (California sagebrush and California brittlebush) or are a food source themselves (lemonade berry fruits). Dead coastal cholla stems are used as perches by the San Clemente loggerhead shrike and for nesting or roosting by other species. Its fruits are a seasonal source of food for birds and the San Clemente island fox. With the exception of lemonade berry, most occasional shrubs occurring in the type are short-lived and considered successional (i.e., prevalent during a particular phase of a community's recovery from disturbance, but scarce in the mature community) in other areas (Navy 2008).

Range of Variations. This alliance dominates at the southern end of the island and grades into the Coast Prickly Pear Alliance toward the north.

Vegetation Monitoring Plots. 3, 14, 16, 22, 39, 40, 46, 52, 69, 70, 71, 73, 74, 75, 94N, 105, 110. There have been no observable changes in average percent cover of either cactuses or shrubs on these plots. There has, however, been a decrease in perennial grass cover at elevations above 600 feet (800 m) (11.1% in 1992–1993, 3.9% in the latest samplings; t-test = 2.348, p-value = 0.039). A small decrease (from 4.5% to 3.6%) on plots below 600 feet was not statistically significant.

Range of Species Richness Based on Plots. 4–51 species (average = 29.4 species per plot per sampling).

Summary of Current Status and Long-Term Trends. This plant community is most likely unnaturally abundant, due to impacts from the grazing of non-native goats and associated erosion. Additionally, this vegetation community benefitted from the loss of plant cover that formerly captured fog and retained soil moisture.

Current Management

The status and trends of coastal cholla habitat is monitored by the LCTA program.

Assessment of Resource Management

- The removal of goats has caused a decline of this habitat in favor of other habitat types.

- Although the status and trends of coastal cholla habitat is monitored through LCTA plots, additional plots may be needed to fully document the continued trends of this habitat.
- Since the removal of feral goats in 1992, vegetation communities of SCI have been recovering remarkably well. Natural resources personnel should continue to monitor the natural progression of habitats with the periodic control of erosion and non-native species.

Management Strategy

Objective: *Foster the recovery and abundance of endemic and sensitive species over coastal cholla to promote the use of these areas for endemic and sensitive wildlife.*

I. Use established vegetation trend monitoring plots to support development of a reference condition for the Coastal Cholla Alliance.

- ***A.*** Assess the current representation of this vegetation type in the LCTA plot inventory, and if needed, identify new sites for monitoring to capture a representative sampling of this habitat.

II. Foster the expansion of shrub species over coastal cholla.

- ***A.*** On the terrace flats, establish or augment existing shrub patches.
- ***B.*** On the terrace faces, manage shrub recovery primarily by controlling fire intensity so that shrubs and herbaceous perennials may compete with coast prickly pear and coastal cholla thickets.

III. Continue to implement BMPs and projects to control erosion in areas above the Coastal Cholla Prickly Pear Alliance.

- ***A.*** Control erosion.
- ***B.*** Evaluate the effects of abandoned and existing roads on continuing erosion and its impacts to the marine environment.
- ***C.*** Prioritize abandoned roads for restoration if not needed for military purposes.

IV. Prevent excessively hot, frequent, and/or large fires that may delay or inhibit the recovery of woody plants.

Coast Prickly Pear-California Sagebrush Alliance

This alliance (Photo 3-32) occurs on approximately 174 acres (70 ha) of SCI where both coast prickly pear and California sagebrush are equally dominant. This alliance occurs in three canyons at the south end of the island (Box Canyon, Horse Canyon, and Chukit Canyon) at elevations from the coast up to 1,000 feet (300 m).

Associations	Acres
Coast Prickly Pear-California Sagebrush-Island Ragweed Association	173.7

Soils. The alliance occurs on ustalf cobbly silt loams intermingled with rock outcrops.

Sensitive Plants. Aphanisma, San Clemente Island indian paintbrush, island big-pod ceanothus, Nevin's woolly sunflower, island apple-blossom, bright green dudleya, San Clemente Island buckwheat, island poppy, San Clemente Island bedstraw, showy island snapdragon, southern island hazardia, big berry toyon, San Clemente Island bird's-foot trefoil, Guadalupe Island lupine, San Clemente Island bush-mallow, Blair's wirelettuce.

Photo 3-32. A mixed stand of coast prickly pear and California sagebrush on San Clemente Island. Although this photo was taken on a plot not mapped as this alliance (Plot #44 in 2010), the mix of species would be typical of the Coast Prickly Pear-California Sagebrush Alliance elsewhere on the island.

Sensitive/Endemic Animals. Similar to the Prickly Pear Alliance, the low patches of cactus and denser thickets of vegetation provide protective cover for the island night lizard and foraging habitat for San Clemente loggerhead shrike. Other species likely to use this alliance are the San Clemente island fox and bird species.

Range of Variation. Unknown.

Vegetation Monitoring Plots. There are currently no monitoring plots within this alliance.

Range of Species Richness. Unknown.

Summary of Current Status and Long-Term Trends. Coast prickly pear is most likely unnaturally abundant, due to impacts of feral goats and associated erosion. Long-term status and trends of this alliance are not available since there are no LCTA plots located in this habitat.

Current Management

There is currently no direct management for this alliance. However, this habitat benefits indirectly from erosion control projects and fire management.

Assessment of Resource Management

- Establish LCTA plots to monitor the trends of this alliance as the island recovers from overgrazing of non-native herbivores.
- Since the removal of feral goats in 1992, vegetation communities of SCI have been recovering remarkably well. Natural resources personnel should continue to monitor the natural progression of habitats with the periodic control of erosion and non-native species.

Management Strategy

Objective: *Favor sagebrush recovery over coast prickly pear in areas supporting endemic and sensitive species, allowing sagebrush to outcompete coast prickly pear while managing fire spread potential into sensitive canyon environments.*

I. Use established vegetation trend monitoring plots to support development of a reference condition for the Coastal Cholla Alliance.

II. Foster the expansion of shrub species over coast prickly pear.

- ***A.*** On the terrace flats, establish or augment existing shrub patches.
- ***B.*** On the terrace faces, manage shrub recovery primarily by controlling fire intensity so that shrubs and herbaceous perennials may compete with coast prickly pear.

III. Continue to implement BMPs and projects to control erosion in areas above the Coast Prickly Pear-California Sagebrush Alliance.

- ***A.*** Control erosion.
- ***B.*** Evaluate the effects of abandoned and existing roads on continuing erosion and its impacts to the marine environment.
- ***C.*** Prioritize abandoned roads for restoration if not needed for military purposes.

IV. Prevent excessively hot, frequent, and/or large fires that may delay or inhibit the recovery of woody plants.

V. Monitor this alliance for non-native plant species and undertake control efforts, as needed, to maintain native vegetation.

3.7.1.13 Coastal Marshes

Coastal marshes were not included in the 2011 vegetation mapping.

Status Summary. Small coastal salt marshes occur in the vicinity of the mouths of Horse Beach and Chenetti Canyons in SHOBA (Photo 3-33). Marshes are estimated to occupy less than 0.1% of the island area (19 acres [8 ha]), based on mapping from 1977 aerial imagery. A survey of wetlands on SCI by Bitterroot Restoration (2002) delineated 0.64 acres (0.25 ha) of salt marsh on SCI as jurisdictional wetlands.

Another type of saline habitat, alkali marshes, occurs behind rock berms along the western shore (Photo 3-33). These marshes occupy less than 1% of the island area.

Photo 3-33. (Left) Coastal salt marsh plot (Plot #58 in 2003), and (Right) Alkali marsh plot (Plot #30 in 2008) on San Clemente Island.

Species typically found in coastal salt marsh on SCI include: woolly sea-blite (*Suaeda taxifolia*), alkali heath (*Frankenia grandiflora*), saltgrass, and saltbush. Parish's glasswort (*Arthrocnemum subterminalis*) is present in low-lying areas, such as along channels. In transitional areas, species, such as sand verbena, coast goldenbush, sand-spurrey (*Spergularia macrotheca*), and sea rocket (*Cakile maritima*) may also be present. The areas containing salt marsh vegetation (in Horse Beach and Chenetti Canyons) appear to be low saline areas with very limited, if any, tidal exchange. The composition of this plant association tends to grade into the dunes or California boxthorn communities and is more diverse at these interfaces.

Shrub structure is contributed by woolly sea-blite, Australian saltbush, coast goldenbush, and alkali heath.

Sensitive Plants. Aphanisma, San Clemente Island tarplant, Nevin's gilia.

Sensitive/Endemic Animals. San Clemente island fox.

Vegetation Monitoring Plots. 30, 58, 72. On Plot #72, island morning-glory increased in cover from 0% in 1992 (although it was within the four-meter belt) to 30% in 2000 (last time sampled). Plot #30 saw a similar increase in morning-glory cover over the same period (2% in 1992, 16% in 2000), but when the plot was last sampled in 2008, island morning-glory only appeared in the belt data.

Perennial grass cover, primarily saltgrass with some Bermuda grass, has remained fairly consistent on the three plots.

Range of Species Richness Based on Plot. 22–44 species (average = 29.9 species per plot per sampling).

Summary of Current Status and Long-Term Trends. There has been a decrease in the percent cover of sub-shrubs (average 25.7% cover in 1992–1993, 10.3% cover in most recent samplings) with no notable trends detected. The decrease in sub-shrubs is seen in both woolly sea-blite and Australian saltbush.

Current Management

The status and trends of coastal marshes are monitored by the LCTA program. This habitat also benefits indirectly from erosion control projects on SCI.

Assessment of Resource Management

- Pickleweed areas within coastal marshes are relatively scarce and inaccessible due to training activities. Therefore, it is difficult to accurately and consistently monitor the status and trends of coastal marsh on SCI. Additional LCTA plots may be needed to fully document the range of conditions within areas currently mapped as this alliance since some plots cannot be accessed during certain military training activities.

Management Strategy

Objective: *Maintain processes in existing coastal marshes that favor sediment deposition, access of saline water, and pickleweed establishment while facilitating the uninhibited use for military training.*

I. Use established vegetation trend monitoring plot to support development of a reference condition for the coastal marshes.

- ***A.*** Assess the current representation of these vegetation types in the LCTA plot inventory, and if needed, identify new sites for monitoring to capture a representative sampling of this habitat.
    - *1.* Use Light Detection and Ranging and/or Unmanned Air Vehicles to monitor and assess the current habitat.

II. Monitor these habitats for non-native species and undertake control efforts as needed to maintain ecosystem processes.

III. Monitor for composition shift to upland vegetation, which may result from upstream sedimentation.

3.7.1.14 Long-Term Vegetation Monitoring Program

To monitor the recovery of vegetation on the island after the eradication of non-native herbivores, the Navy implemented a long-term vegetation monitoring program by establishing a set of monitoring plots in 1992 and 1993.

The objectives of the monitoring program are to:

- Implement a sampling plan that will provide an objective, quantitative baseline description of island vegetative communities.
- Track plant community characteristics in relation to environmental and use gradients.
- Design and enact a sampling plan for documenting vegetation change with special emphasis on critical/sensitive areas and those clearly in dynamic states of transition. Provide a means to quantify how small a change could be detected at a given level of confidence given the number of plots established and a background year-to-year variation of x% for the sampled species.
- Provide a means of evaluating vegetation change with respect to management goals. Group species by their desirability and quantify increases and decreases with confidence intervals.
- Design a means of tracking the status of sensitive species.

Plot Placement

The island was stratified into the following units for sampling: unique soil texture-vegetation polygons, terrace flats, terrace faces, high-plateau grasslands, mid-elevation grasslands, and low-elevation grasslands. The following vegetation categories were added: cliff spurge phase of maritime sage scrub, ironwood woodlands, and oak woodlands. Areas dropped from sampling were coastal bluff scrub, areas too steep or inaccessible, and sites mapped as woodland but were devoid of trees.

Map 3-9 depicts the plot locations. While six of the original plots were discontinued for various reasons (e.g., one plot was leveled for a parking lot, another was destroyed by grading for a landfill area), eight new plots were established in 2002–2003, bringing the current plot inventory to 115 plots. Subsets of the plots have been re-sampled in 1994, 1996, 2000, 2002, 2003, 2006, 2008, and 2010 with an average of 41 plots sampled in each of those years. These surveys have produced a set of long-term data critical to future resources management on the island. Table 3-14 depicts the monitoring plot inventory and basic descriptive information for each plot. Figure 3-11 shows six examples of vegetation communities monitored by long-term vegetation plots.

Table 3-14. Vegetation monitoring plots by vegetation alliances (with the original ecosite mapping units as depicted in Table 3-12 provided in column three), with fire history data, elevation, and years sampled 1992–2010. Plot numbers ending in 'N' are replacement plots for plots whose original locations were lost for various reasons.

Plot #	Type[1]	Ecosite	Fire Frequency	Year of Last Fire	Eleva-tion	Years Plots Were Sampled										
						'92	'93	'94	'95	'96	'00	'02	'03	'06	'08	'10
Dune Mats																
Milkvetch Alliance																
37	R	Active sand dune	0	0	25'	x		x			x				x	
Silver Burr Ragweed Alliance (active)[3]																
32	I	Active sand dune	0	0	125'	x			x		x			x	x	
41	I	Active sand dune	0	0	225'	x						x		x	x	
82N	I	Active sand dune	0	0	225'							x		x	x	
83N	I	Active sand dune	0	0	175'							x		x		
Silver Burr Ragweed Alliance (stabilized)[3]																
2	I	Stabilized sand dune	0	0	275'	x		x			x			x		
42	RP	Stabilized sand dune	0	0	275'	x		x			x			x		
53	I	Stabilized sand dune	0	-	25'	x			x				x			
Grasslands																
Needlegrass Alliance																
7	I	High Plateau Clay Grasslands	1	1979	1075'	x						x		x		
10	R	High Plateau Fine Loamy Grasslands	2	1985	1675'	x			x		x			x		
25	I	High Plateau Fine Loamy Grasslands	2	1985	1575'	x				x			x	x		
61	I	High Plateau Clay Grasslands	1	1994	1125'	x						x	x		x	
85	I	High Plateau Fine Loamy Grasslands	1	1985	1525'		x					x				x
95	I	High Plateau Fine Loamy Grasslands	1	1985	1475'		x					x		x		
101	I	High Plateau Fine Loamy Grasslands	1	1994	1775'		x					x		x		
104	I	High Plateau Fine Loamy Grasslands	3	2000	1825'		x			x		x		x		
Wild Oats Alliance																
49	I	MDS Complex-Grassland Phase	0	-	575'	x						x				
60	I	High Plateau Clay Grasslands	0	-	775'	x				x		x	x		x	
64	I	MDS-Boxthorn/Grassland on clay	2	1994	475'	x				x			x	x	x	
98	I	High Plateau Clay Grasslands	0	-	925'		x				x			x		
113	I	High Plateau Clay Grasslands	1	2000	625'		x	x				x			x	
Ripgut Brome Alliance																
89	I	High Plateau Clay Grasslands	0	-	625'		x					x			x	x
93	I	High Plateau Clay Grasslands	1	1998	575'		x					x		x	x	x
97	I	High Plateau Clay Grasslands	1	1998	725'		x					x		x	x	
Red Brome Alliance																
36	I	High Plateau Clay Grasslands	0	-	725'	x				x		x			x	x
Shrublands																
Lemonade Berry Alliance																
62[2]	RP	Canyon Shrublands	1	1993	75'	x		x			x		x			
California Sagebrush Alliance																
15	I	High Plateau Fine Loamy Grasslands	3	1999	1375'	x						x		x		
17	I	High Plateau Fine Loamy Grasslands	3	2000	1375'	x				x	x		x		x	
28	T	MDS Complex-Grassland Phase	2	1994	1425'	x		x			x			x	x	

Table 3-14. Vegetation monitoring plots by vegetation alliances (with the original ecosite mapping units as depicted in Table 3-12 provided in column three), with fire history data, elevation, and years sampled 1992–2010. Plot numbers ending in 'N' are replacement plots for plots whose original locations were lost for various reasons. (Continued)

Plot #	Type[1]	Ecosite	Fire Frequency	Year of Last Fire	Eleva-tion	Years Plots Were Sampled '92	'93	'94	'95	'96	'00	'02	'03	'06	'08	'10
117	I	High Plateau Fine Loamy Grasslands	2	1985	1575'		x		x			x				x
Coyote Brush Alliance																
8	T	High Plateau Fine Loamy Grasslands	0	-	1425'	x		x	x		x			x		x
18	I	High Plateau Clay Grasslands	0	-	1225'	x				x	x			x		
65	I	High Plateau Fine Loamy Grasslands	1	1985	1575'	x				x			x			x
100	I	High Plateau Clay Grasslands	0	-	1225'		x		x			x			x	x
Coastal Cholla Alliance																
3	I	MDS-South Slopes (Pyramid Cove)	0	-	125'	x		x			x		x			
14	T	MDS Complex-Prickly Pear Phase	5	2009	975'	x			x			x				
16	I	MDS Complex-Grassland Phase	2	1993	575'	x			x			x				
22	I	MDS Complex-Grassland Phase	4	2008	825'	x			x		x				x	
39	I	MDS-South Slopes (Pyramid Cove)	1	1993	625'	x			x			x	x	x		
40	I	High Plateau Fine Loamy Grasslands	4	2009	1675'	x				x			x			x
46	I	MDS-South Slopes (Pyramid Cove)	0	-	75'	x				x			x			
52	RP	MDS-South Slopes (Pyramid Cove)	0	-	75'	x		x			x		x			
69	I	MDS-Boxthorn/Grassland on clay	2	1994	175'		x				x		x			
70	I	MDS Complex-Grassland Phase	6	2010	425'		x			x			x			
71	I	MDS Complex-Grassland Phase	5	2008	125'		x			x	x		x			
73	I	MDS Complex-Grassland Phase	3	1996	375'		x			x	x					
74	I	MDS Complex-Grassland Phase	1	1999	825'		x				x					
75	I	MDS Complex-Boxthorn Phase	2	1998	575'		x					x	x			x
94N	I	MDS Complex-Grassland Phase	1	1993	675'								x			x
105	I	High Plateau Fine Loamy Grasslands	5	1999	1475'		x				x				x	x
110	I	MDS Complex-Grassland Phase	5	1999	1525'		x					x			x	x
Boxthorn Alliance																
6	R	MDS-Boxthorn	0	-	75'	x					x		x	x	x	
9	I	MDS-Boxthorn	2	1996	275'	x			x		x		x			
26	I	MDS-Boxthorn	0	-	25'	x			x		x		x	x		
31	T	MDS-Boxthorn/Grassland on clay	0	-	275'	x		x			x		x	x		
34	I	MSS-northeast escarpment	0	-	75'	x		x			x				x	
50	I	MDS Complex-Boxthorn Phase	0	-	225'	x				x		x	x			
55	I	MDS-Boxthorn/Grassland on clay	1	1985	275'	x			x		x		x	x		
59	I	MDS Complex-Boxthorn Phase	1	1985	175'	x		x			x		x		x	
63	I	MDS-Boxthorn/Grassland on clay	2	1994	325'	x		x		x	x		x	x		
67	I	MDS-Boxthorn	0	-	75'		x					x	x			
68	I	MDS-Boxthorn	0	-	25'		x					x	x			
77	I	MDS-Boxthorn	0	-	75'		x	x			x	x	x			
81	I	MDS-Boxthorn	0	-	325'		x					x	x	x	x	x
84	I	MDS-Boxthorn	0	-	25'		x				x	x	x			
86N	I	MDS-Boxthorn/Grassland on clay	0	-	425'							x		x	x	x
87	I	MDS-Boxthorn	1	1998	75'		x				x		x			
90	I	MDS-Boxthorn	0	-	325'		x				x		x	x		
99	I	MDS-Boxthorn/Grassland on clay	0	-	575'		x					x			x	x

Table 3-14. Vegetation monitoring plots by vegetation alliances (with the original ecosite mapping units as depicted in Table 3-12 provided in column three), with fire history data, elevation, and years sampled 1992–2010. Plot numbers ending in 'N' are replacement plots for plots whose original locations were lost for various reasons. (Continued)

Plot #	Type[1]	Ecosite	Fire Frequency	Year of Last Fire	Eleva-tion	Years Plots Were Sampled										
						'92	'93	'94	'95	'96	'00	'02	'03	'06	'08	'10
111	I	MDS-Boxthorn	0	-	75'								x			
112	I	MDS-Boxthorn	0	-	75'								x	x	x	x
120	I	MDS-Boxthorn/Grassland on clay	0	-	225'							x	x	x	x	
121	I	MDS-Boxthorn	0	-	275'							x	x	x	x	
Prickly Pear Alliance																
1	I	High Plateau Fine Loamy Grasslands	0	-	1175'	x				x			x			x
4	I	High Plateau Fine Loamy Grasslands	1	1994	1575'	x				x			x	x		x
11	I	High Plateau Fine Loamy Grasslands	1	1994	1525'	x							x	x		
12	I	MDS Complex-Boxthorn Phase	0	-	575'	x				x			x			
13	T	MDS Complex-Prickly Pear Phase	2	1993	825'	x		x	x				x			x
21	I	MDS Complex-Prickly Pear Phase	4	2010	1125'	x			x			x		x		x
23	I	MDS Complex-Grassland Phase	5	2009	1575'	x				x			x		x	x
24	T	MDS Complex-Grassland Phase	1	1994	1375'	x		x				x		x		x
27	T	MDS Complex-Prickly Pear Phase	4	2010	925'	x		x		x			x		x	
29	T	MDS Complex-Prickly Pear Phase	0	-	525'	x		x				x	x		x	
35	I	MSS-northeast escarpment	0	-	275'	x				x		x				x
38	R	MDS-Boxthorn/Grassland on clay	0	-	275'	x						x			x	
43	I	High Plateau Clay Grasslands	0	-	475'	x				x		x		x	x	
44	R	MDS Complex-Prickly Pear Phase	0	-	875'	x		x				x	x			x
51	I	High Plateau Clay Grasslands	1	1994	725'	x			x			x	x			
54	I	MDS Complex-Grassland Phase	1	1994	775'	x			x			x				x
66	I	High Plateau Clay Grasslands	0	-	425'		x					x		x	x	
76	I	MDS Complex-Grassland Phase	1	1994	775'		x				x		x			x
78	I	MDS Complex-Grassland Phase	1	1994	725'		x					x	x			x
79	I	MDS Complex-Prickly Pear Phase	0	0	625'		x					x	x			
80	I	MDS Complex-Grassland Phase	1	1994	1275'		x				x		x			x
88	I	MDS Complex-Grassland Phase	1	1994	1675'		x						x			x
91	I	MDS Complex-Grassland Phase	1	1994	925'		x					x		x		x
92	I	MDS Complex-Grassland Phase	0	-	475'		x						x			
96	I	MSS-northeast escarpment	0	-	125'		x					x		x		
102	I	MDS Complex-Prickly Pear Phase	1	1994	1275'		x	x		x	x		x			x
103	RP	MDS Complex-Grassland Phase	0	-	825'		x	x	x			x		x		
106	I	MDS Complex-Prickly Pear Phase	1	1994	1025'		x									
107	I	MDS Complex-Prickly Pear Phase	4	2010	1025'		x	x				x		x	x	
108	I	MDS Complex-Prickly Pear Phase	3	2010	1175'		x			x	x			x		
Woodlands																
Island Oak Alliance																
5	I	Canyon Woodlands	1	1994	1575'	x			x	x	x	x	x	x		
Island Ironwood Alliance																
20[2]	I	Canyon Woodlands	1	1999	875'	x		x		x	x	x	x	x		
109[2]	I	Canyon Woodlands	0	-	575'		x			x	x	x	x			

Table 3-14. Vegetation monitoring plots by vegetation alliances (with the original ecosite mapping units as depicted in Table 3-12 provided in column three), with fire history data, elevation, and years sampled 1992–2010. Plot numbers ending in 'N' are replacement plots for plots whose original locations were lost for various reasons. (Continued)

Plot #	Type[1]	Ecosite	Fire Frequency	Year of Last Fire	Eleva-tion	Years Plots Were Sampled										
						'92	'93	'94	'95	'96	'00	'02	'03	'06	'08	'10
Catalina Island Cherry Alliance																
33[2]	I	Canyon Woodlands	2	1993	875'	x			x	x	x		x			
48[2]	I	Canyon Woodlands	0	-	725'	x		x	x	x	x	x				
56[2]	I	Canyon Woodlands	0	-	725'	x				x		x				x
57[2]	R	Canyon Woodlands	0	-	125'	x		x	x	x	x	x				
114[2]	I	Canyon Woodlands	1	1994	825'		x	x						x		
Toyon Alliance																
45	I	MSS-canyon walls and escarpments	1	1994	125'	x		x			x	x				
47[2]	I	MSS-canyon walls and escarpments	1–3	1993 (1996?)	125'	x				x			x			
Others																
Alkali Marsh																
30[4]	I	Alkali Marsh	0	-	25'	x		x			x				x	
Coastal Salt Marsh																
58[4]	I	Coastal Salt Marsh	0	-	25'	x				x			x			
72[4]	I	Coastal Salt Marsh	1	1996	25'		x				x					
					#Sampled each year:	*65*	*47*	*30*	*22*	*35*	*45*	*57*	*61*	*46*	*35*	*34*

[1]I = Inventory plot, R = Reference plot, RP = Rare plant plot, T = Transition plot

[2]These plots are located within stands of trees that were not mapped separately from the surrounding shrubland matrix in the 2011 vegetation map. They are classified in this table in accordance with what is known of the existing species composition.

[3]Although the 2011 vegetation map does not distinguish between active dunes and stabilized dunes, we have maintained that distinction here by designating two types of the Silver Burr Ragweed Alliance as either 'active' or 'stabilized'. This will allow for the two distinct types of dune habitats to be monitored separately rather than as a single type.

[4]These plots are located in small areas of distinctive vegetation and microhabitats that were too small to be mapped separately in the 2011 vegetation map. The original ecosite names have been carried forward here so that these unique plots can continue to be tracked as separate types.

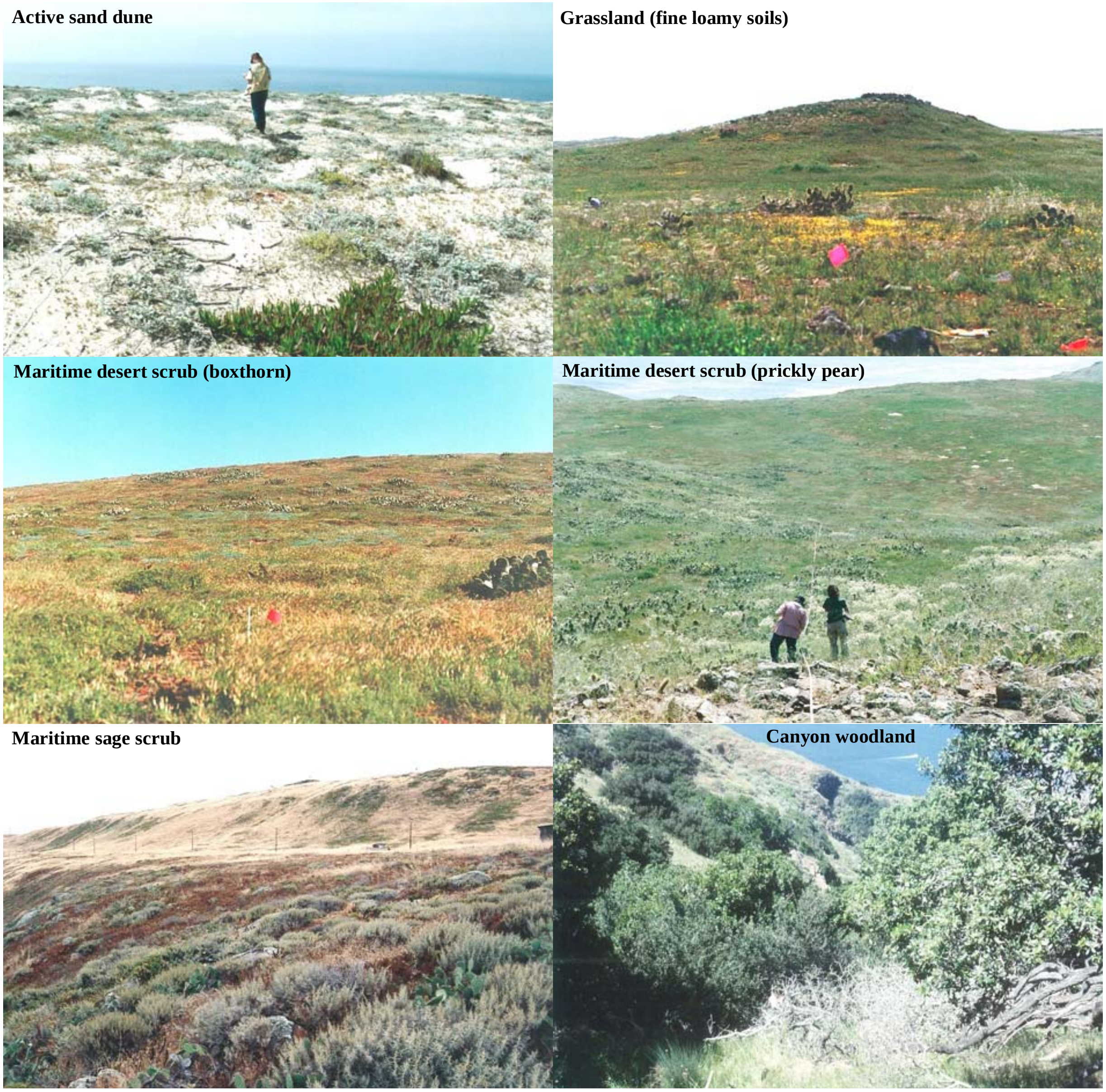


Figure 3-11. Examples of vegetation communities monitored by long-term vegetation plots.

In 2011, the IWS completed a new vegetation community map (See Section 3.7.1.4 Vegetation Map 2011 Update). Using this new vegetation map, the monitoring plots were re-categorized accordingly to allow for continued monitoring of the new vegetation alliances.

Plot Design and Sampling Methods

Plots are constructed of a permanently marked, 100-meter transect with a variable belt width. Four different types of plots with the same basic design were used to lay out the plots installed for this project:

- **Inventory Plots**: Located in a stratified random manner and are likely to represent typical conditions within each soil-vegetation category.

- **Reference Plots**: The are of a vegetation community with all characteristic species. Some of these plots were located randomly while others were placed subjectively because of the presence of key species.
- **Transition Plots**: Usually located in ecotonal areas, especially along the brows of canyons where encroachment of shrubs into grasslands is actively occurring.
- **Rare Plant Plots**: Placed specifically because of the presence of a sensitive species.

Each plot is evaluated for these various factors:

- **Cover Data** is recorded at each meter by lowering a 1/4-inch rod and noting what plant species, persistent litter, non-persistent litter (generally woody, a dead plant that is still rooted, or litter more than two inches deep), lichen, moss, bare ground, and rock came in contact with it.
- **Density.** Most woody perennials and all sensitive plant species are counted within a belt of 6.5 feet (2 m) to either side of the transect line (10 feet [3 m] in woodlands). Dead perennials are recorded if easily distinguished from live, drought-deciduous plants.
- **Frequency.** Certain perennials which are difficult to count as individuals due to dense growth patterns (e.g., California boxthorn, island morning-glory, coast prickly pear, and coastal cholla) are instead recorded as presence/absence data within each one-by-two-meter segment of the belt transect.
- **Seedlings** of woody perennials were recorded, as well as basal sprouting of trees.
- **Diameter at Breast Height** for the nearest tree to the tape at each meter in plots with trees.
- **All species present** measured within the 13-foot (4-m) belt from the transect line.
- **Annual species** rated for cover and density using a rating system used by the National Park Service on Santa Rosa Island.

Summary of Findings to Date

Over the course of the LCTA monitoring program (1992–2010), a number of changes have been observed that indicate that the island's habitats are recovering from the effects of overgrazing by feral herbivores. These changes are most evident in the shrub component of the island vegetation. For example, most shrub species have expanded their ranges and now occur on more monitoring plots than they did in 1992 (Figure 3-12). Furthermore, the total number of shrubs on the plots has more than doubled (Figure 3-12). Sensitive plant species have also expanded their distribution over the same period (Figure 3-13).

The observed increase in shrub cover and density demonstrate an elevational gradient with shrub cover and density both increasing on the higher elevation plots (Figure 3-14). This data, however, does not include the California boxthorn or island morning-glory, which are not counted in the belt data; these two species are treated separately below. The increase in percent cover on plots over 1,000 feet (300 m) is significant[2] (T-test: –2.329; p-value: 0.027), as are the increases in density at the 500- to 1,000-foot (150–300 m) (T-test: –1.437; p-value: 0.165) and >1,000-foot (300-m) elevations (T-test: –1.744; p-value: 0.096).

2. For the purposes of identifying potential trends of interest to land managers, a threshold p-value of 0.2 has been applied for these t-tests. Given the inherent variability of this type of data, a lower p-value threshold (e.g., 0.05) could potentially allow a developing trend to go unnoticed for years, making any possible adjustments to land management strategies difficult to implement in a timely fashion.

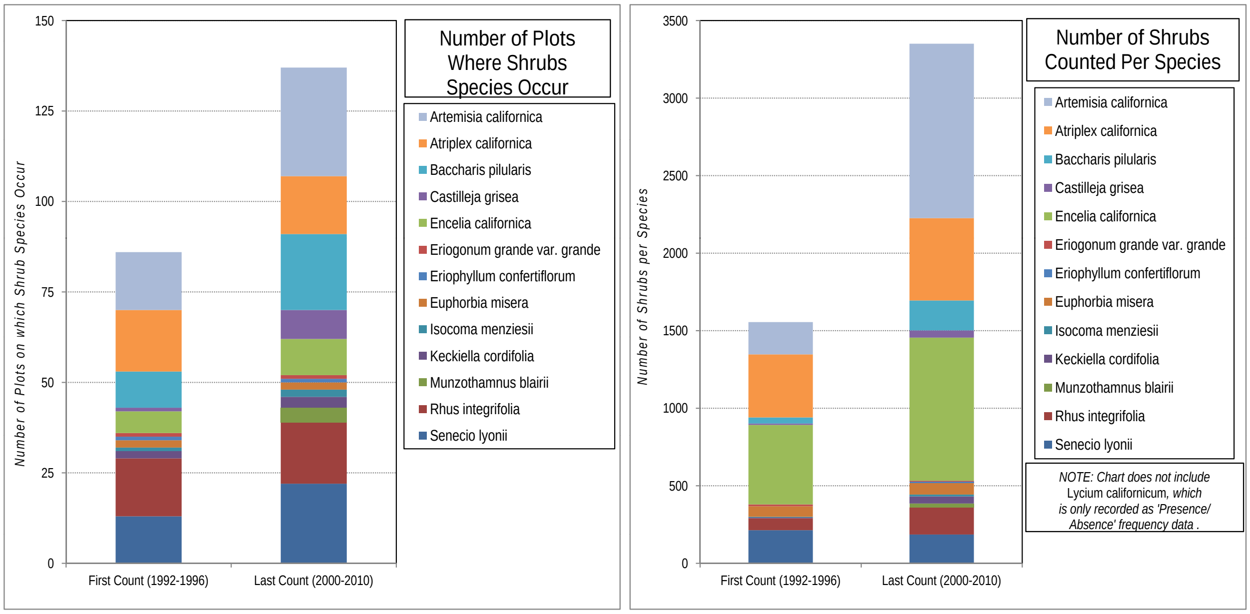


Figure 3-12. Comparison of shrub distribution and abundance in 1992–1996 and 2000–2010. (LEFT) Total number of monitoring plots on which shrub species are recorded. (RIGHT) Number of shrub individuals counted on monitoring plots.

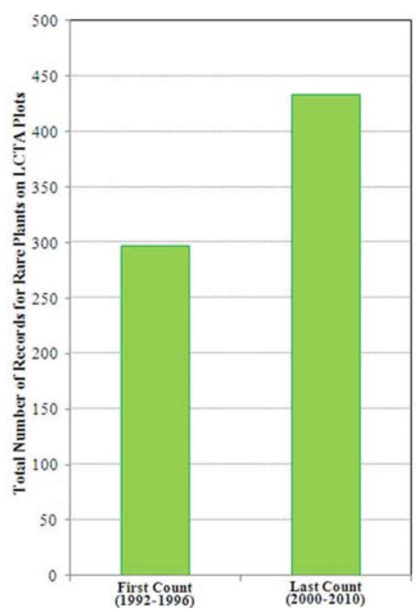


Figure 3-13. Total number of records for sensitive plant species on monitoring plots in 1992–1996 and 2000–2010.

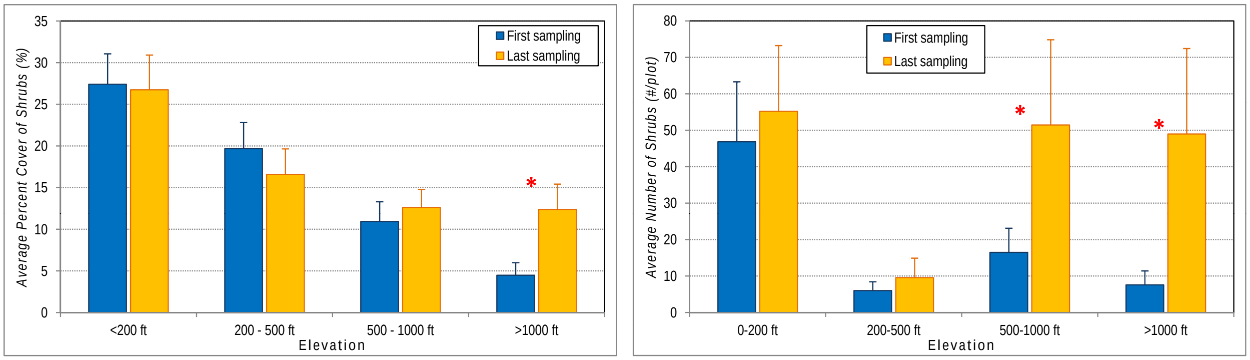


*Figure 3-14. Changes in overall shrub cover (left) and density (right) on vegetation monitoring plots by elevation (density numbers do not include data on California boxthorn or morning-glory, which are only recorded as presence/absence data; these two species are treated separately below). *Indicates means significantly different at p=0.2 or less.*

California boxthorn, although it has remained fairly stable in regard to frequency of occurrence (i.e., the average percentage per plot of belt transect segments occupied by the species) at all elevations, has declined in average percent cover at the upper range of the species (Figure 3-15). This seems to indicate that while the species is just as wide-spread as it was when plots were established, the plant canopies themselves appear to contract over time (thus being encountered less in the line-point cover data). If such a trend were to continue, it could have ramifications for faunal species, such as the San Clemente sage sparrow, which depend upon California boxthorn for habitat.

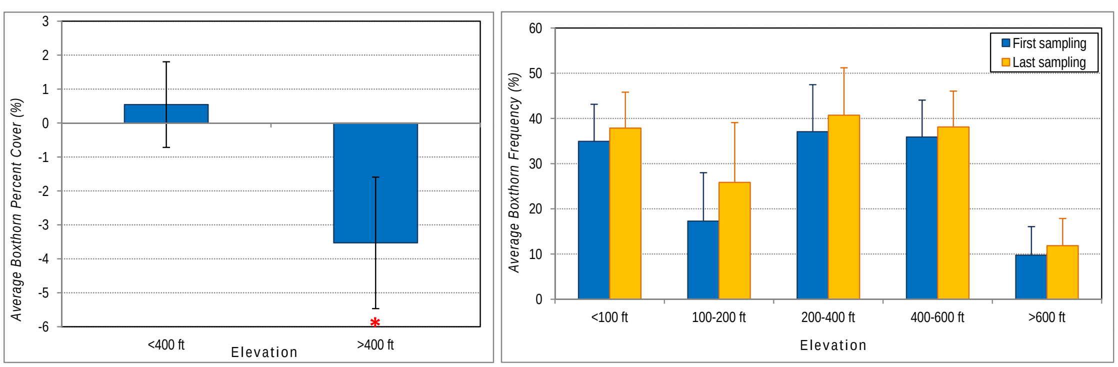


*Figure 3-15. Observed changes in percent cover (left) and frequency of occurrence (right) of California boxthorn on vegetation monitoring plots from the first sampling (plot establishment) to the most recent samplings for each plot on which island morning-glory occurs. *Indicates means significantly different at p=0.2 or less.*

Island morning-glory increased in both cover and frequency at most elevation levels, sometimes significantly (Figure 3-16; t-test p-values for the starred comparisons all 0.05 or less). This is especially the case at mid- to upper-elevations of 500–1,400 feet (150–425 m).

Whereas shrubs tend to increase, especially at higher elevations, coast prickly pear remains almost unchanged over the same period in both percent cover and frequency (Figure 3-17). This is so, regardless of elevation.

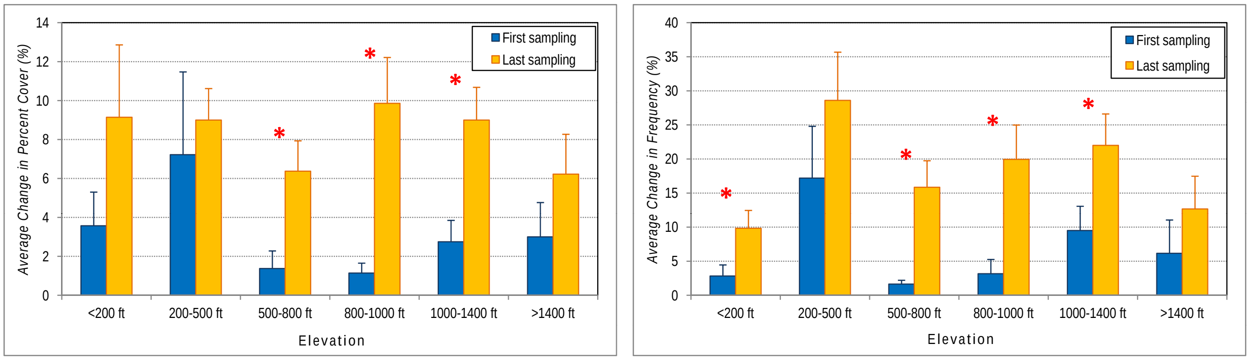


*Figure 3-16. Observed changes in percent cover (left) and frequency of occurrence (right) of island morning-glory on vegetation monitoring plots from the first sampling (plot establishment) to the most recent samplings for each plot on which island morning-glory occurs. *Indicates means significantly different at p=0.2 or less.*

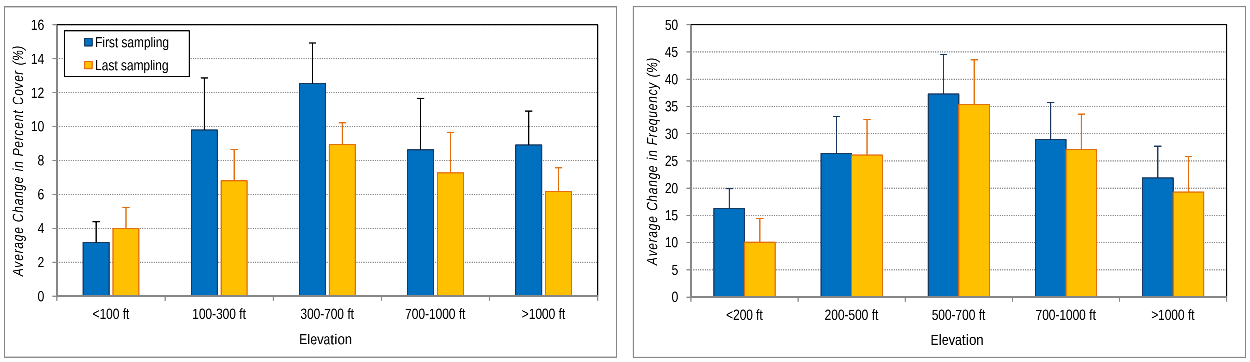


Figure 3-17. Observed changes in percent cover (left) and frequency of occurrence (right) of coast prickly pear on vegetation monitoring plots from the first sampling (plot establishment) to the most recent samplings for each plot on which coast prickly pear occurs.

Current Management

A subset of LCTA plots are surveyed an average of every two or three years, including a core set of plots sampled each time, and remaining plots sampled on a rotating basis or as needed to address island management or fire recovery concerns.

Assessment of Resource Management

- Since the establishment of the LCTA program in 1992, data collection has provided important information regarding the health and recovery of island habitats.
- The LCTA Program should evaluate all plots and vegetation habitats and alliances to ensure all vegetation communities on the island are fully represented in the program.

Management Strategy

Objective: *Detect the extent and spatial scale of trends in critical ecosystem structural and functional attributes that contribute to the island's important role as a migratory stopover, a breeding/nesting ground for wildlife, and for supporting endemic and rare species.*

I. Continue to monitor island trends through the LCTA program.

A. Survey a sub-set of plots every two to three years.

B. Assess the allotment of plots among the newly mapped vegetation alliances and establish new plots, where needed, to properly monitor island vegetation communities.

C. Enhance the belt count data collection procedures to capture more demographic information on woody perennials, especially in woodland plots.

3.7.2 Jurisdictional Waters and Wetlands

Wetlands provide many vital ecological functions and support a high diversity of resident and migratory wildlife species (EPA 2012). Wetlands are among the most impacted habitats in the world, primarily through development. Some important ecological functions include water quality enhancement, flood control, nutrient cycling, sediment capture, and groundwater recharge. Saltwater wetland habitats also provide important foraging habitat for birds and provide nurseries for many fish and aquatic invertebrates. Despite their relatively small area, more wildlife depend on riparian areas and wetlands than any other habitat.

All wetlands occurring on federal land are protected under EO 11990 "Protection of Wetlands" (24 May 1977, as amended). Federal agencies are directed to avoid, to the extent possible, the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands, wherever there is a practicable alternative. In addition, the White House Office on Environmental Policy, "Protecting America's Wetlands: A Fair, Flexible, and Effective Approach" (24 August 1993) promotes "no overall net loss of the Nation's remaining wetlands" and "the restoration of damaged wetland areas through voluntary, non-regulatory programs." This policy exists regardless of whether or not these wetlands are considered jurisdictional waters of the U.S. under the CWA. On SCI, some areas function as wetlands ecologically but exhibit only one or two of the three characteristics (i.e., hydrology, soil, or wetland plants) under USACE guidelines that qualify a wetland as a CWA jurisdictional wetlands or waters of the U.S.

Jurisdictional waters of the U.S. are regulated by the USACE under Section 404 of the CWA. When a project includes features that come within the definition of "waters of the U.S.," the developer (Navy) must obtain permits prior to initiating activities that will result in the dredging or filling of those waters. Section 404 of the CWA authorizes the Secretary of the Army, acting through the Chief of the USACE, to issue permits for individual projects (Individual Permits) or for general categories of activities with minimal impacts on waters of the U.S. (General Permits such as Nationwide Permits). The USACE decides whether to issue an Individual Permit based on an evaluation of the potential impacts, including cumulative impacts, of the proposed activity.

Wetland habitats on SCI are very limited. A wetland survey, focused on the upper plateau of the island, was conducted for the Navy by Bitterroot Restoration (2002); a survey for endangered or threatened branchiopods (fairy shrimp [*Branchinecta lindahli*]) was also conducted at this time (See Section 3.9.2.1 Terrestrial Invertebrates for more information on fairy shrimp). The wetland survey, conducted during 2001, a wet year on SCI, identified a total of 121 wetlands among the 568 potential wetlands and 932 drainages surveyed. The remaining potential wetlands (mostly ephemeral pools) were determined to be non-wetlands since they did not meet either the hydrophytic (wetland) vegetation or wetland hydrology criteria. Of the 121 wetlands identified, four were salt marshes and 117 were vernal pools. The total area of vernal pools delineated on SCI was 2.8 acres (1.1 ha), found in the VC-3 AVMA and overlapping TAR 15 (0.3 acre [0.1 ha]), AFP-6 in SHOBA (0.4 acre [0.2 ha]), and the Infantry Operations Area (2.1 acres [0.8 ha]). The total area of salt marshes delineated as wetlands on SCI was 0.64 acres (0.25 ha), located at the mouths of Horse Beach Canyon and Chenetti Canyon. These marshes appear to be low saline areas with very limited, if any, tidal exchange.

The majority of the wetlands and ephemeral pools on SCI are the result of anthropogenic activities, including both military operations and pre-military agricultural land uses. All of the drainages surveys were determined to be intermittent streams; none were perennial. Many of the drainages surveyed by Bitterroot Restoration (2002) were considered jurisdictional waters of the U.S.

Current Management

A formal delineation for waters of the U.S. is not required unless a project or activity is anticipated to fill or excavate a jurisdictional water. The preliminary survey of jurisdictional wetlands and waters conducted in 2002 could be updated if there is reason to believe it could prevent operational delays for military actions in the effort to avoid adverse impacts to these waters.

Assessment of Resource Management

- The 2001 wetland and vernal pools survey was an important undertaking by the Navy to understand the resource on SCI. Future projects should avoid and minimize impacts to these resources with available information.

Management Strategy

Objective: *Comply with Section 404 of the CWA, EO 11990, and the White House Office on Environmental Policy to avoid and minimize impacts to jurisdictional waters and wetlands on SCI.*

I. Maintain the ecosystem integrity of wetlands and jurisdictional waters on SCI.

- ***A.*** Control erosion of upland watersheds to avoid sedimentation in drainages and the ASBS.
- ***B.*** Control invasive plants from encroaching on wetland habitat.
- ***C.*** Ensure no net loss of size, function, and value of wetlands.
- ***D.*** Continue to comply with water quality regulations to prevent pollution of wetlands from military training activities.

II. Identify any special or unique flora and fauna associated with floodplains to identify the natural and beneficial functions provided by the habitat (EO 11988).

3.8 Marine Habitats

The marine habitat and depth categories presented in this INRMP are based on the classification system utilized by the CDFW Marine Life Protection Act Initiative (CDFW 2009a), developed to help the state of California implement the MLPA.

Marine habitats in the nearshore waters surrounding SCI include: intertidal, subtidal, deep water, and offshore rocks and islets. Marine habitat depth and substrate categories at SCI are listed in Table 3-15 and illustrated in Map 3-10. Table 3-16 shows marine habitat substrate categories according to the Coastal and Marine Ecological Classification Standard to "provide a language through which data regarding habitats can be communicated and managed" (McDougall et al. 2007).

Table 3-15. Marine Habitat Depth and Substrate Categories at SCI (Marine Life Protection Act consistency).

Habitat and Substrate Categories		**Depth in meters (m)**
Intertidal	Sandy beaches	Intertidal
	Rocky shores and Surfgrass	Intertidal
Subtidal	Soft bottom habitat	Intertidal to 30
	Eelgrass	Intertidal to 30
	Rocky habitat and Kelp forests	Intertidal to 30
Deep Water	Rocky habitat	30 to 100
		100 to 200
		>200
	Soft bottom habitat	30 to 100
		100 to 200
		>200
Offshore Rocks and Islets	Sea stacks and offshore rocks	Intertidal to 30
		30 to100
		100 to 200
		>200

3.8.1 Intertidal Habitats

Intertidal habitats are where land and sea converge, covered with water during high tide and exposed to air during low tide. Habitat may be rocky, sandy, or covered in mudflats; however, for this INRMP, only coastal strands and rocky intertidal are discussed.

3.8.1.1 Coastal Strand

Coastal strands are found near the northwestern end of the island at West Cove, Northwest Harbor (BUD/S and Graduation Beaches), and the southern end of the island at Horse Beach Cove and Pyramid Cove (Walcott 1897). Coastal strands on SCI are very limited and narrow, resulting in periodic tidal inundation. Over time there has been a loss of coastal strands on SCI (Photo 3-34).

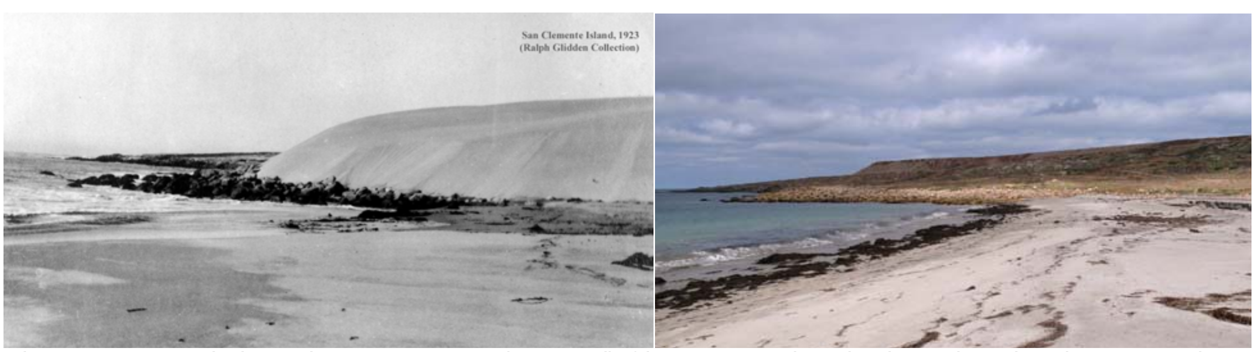
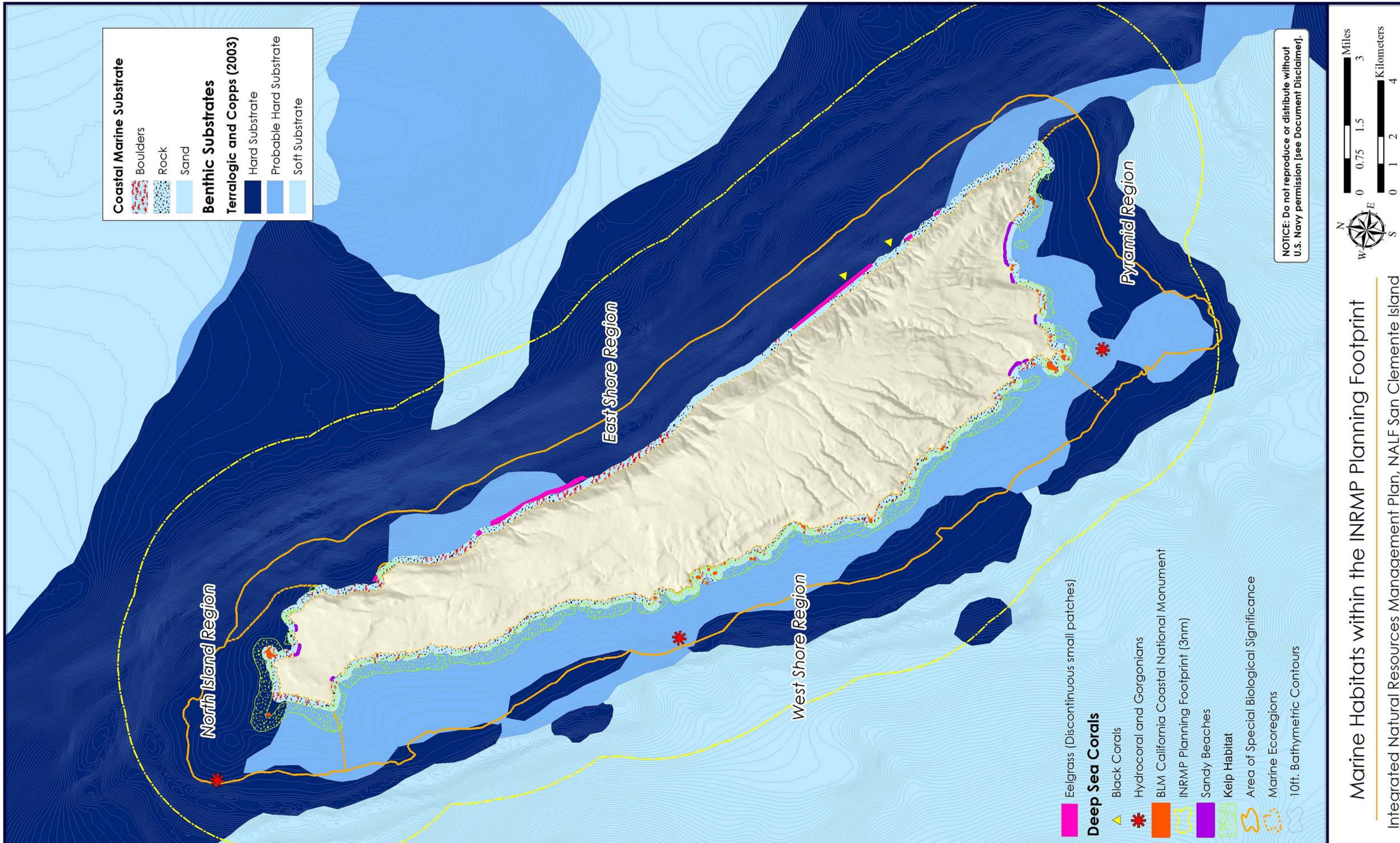


Photo 3-34. Sandy beach at West Cove in 1923 (left) compared to the beach today (Navy 2011).



Map 3-10. Marine habitats within the Integrated Natural Resources Management Plan planning footprint.

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Table 3-16. Coastal and Marine Ecological Classification Standard for waters in the San Clemente Island footprint (2012).

Habitat and Substrate Categories		Biogeographic setting	Aquatic Setting	Water Column Component	Geoform Component	Substrate Component	Biotic Component
Intertidal	Coastal Strands	Realm: Temperate Northern Pacific Province: Cold Temperate Northeast Pacific Ecoregion: Southern California Bight	System: Marine Subsystem: Nearshore Tidal Zone: N/A	N/A	Tectonic Setting: Convergent Active Continental Margin Physiographic Setting: Continental/Island Shelf Geoform Origin: Island	Substrate origin: Geologic Substrate Substrate class: Unconsolidated Mineral Substrate Substrate subclass: Fine Unconsolidated Substrate Substrate Group: Sand	N/A
	Rocky Shores and Surfgrass	Realm: Temperate Northern Pacific Province: Cold Temperate Northeast Pacific Ecoregion: Southern California Bight	System: Marine Subsystem: Nearshore Tidal Zone: Intertidal	Water Column Layer: Marine Nearshore Surface Layer Salinity Regime: *N/A Temperature Regime: Moderate Water	Tectonic Setting: Convergent Active Continental Margin Physiographic Setting: Continental/Island Shelf Geoform Origin: Island	Substrate origin: Geologic Substrate Substrate class: Rock Substrate Substrate subclass: Bedrock	Biotic setting: Benthic/Attached Biota Biotic class: Faunal Bed Biotic subclass: Attached Fauna
Subtidal	Soft Bottom	Realm: Temperate Northern Pacific Province: Cold Temperate Northeast Pacific Ecoregion: Southern California Bight	System: Marine Subsystem: Nearshore Tidal Zone: subtidal	Water Column Layer: Marine Nearshore Upper Water Column Salinity Regime: N/A Temperature Regime: Moderate Water	Tectonic Setting: Convergent Active Continental Margin Physiographic Setting: Continental/Island Shelf Geoform Origin: Island	Substrate origin: Geologic Substrate Substrate class: Unconsolidated Mineral Substrate Substrate subclass: Fine Unconsolidated Substrate Substrate Group: Sand/Mud	Biotic setting: Benthic/Attached Biota Biotic class: Faunal Bed Biotic subclass: Soft Sediment Fauna Biotic group: Large Deep-Burrowing Fauna Co-occurring element: Small Surface-Burrowing Fauna
	Eelgrass	Realm: Temperate Northern Pacific Province: Cold Temperate Northeast Pacific Ecoregion: Southern California Bight	System: Marine Subsystem: Nearshore Tidal Zone: subtidal	Water Column Layer: Marine Nearshore Upper Water Column Salinity Regime: N/A Temperature Regime: Moderate Water	Tectonic Setting: Convergent Active Continental Margin Physiographic Setting: Continental/Island Shelf Geoform Origin: Island	Substrate origin: Geologic Substrate Substrate class: Unconsolidated Mineral Substrate Substrate subclass: Fine Unconsolidated Substrate Substrate Group: Sand	Biotic setting: Benthic/Attached Biota Biotic class: Aquatic Vegetation Bed Biotic subclass: Aquatic Vascular Vegetation Biotic group: Seagrass Beds
	Rocky Reef and Kelp Forest	Realm: Temperate Northern Pacific Province: Cold Temperate Northeast Pacific Ecoregion: Southern California Bight	System: Marine Subsystem: Nearshore Tidal Zone: subtidal	Water Column Layer: Marine Nearshore Upper Water Column Salinity Regime: N/A Temperature Regime: Moderate Water	Tectonic Setting: Convergent Active Continental Margin Physiographic Setting: Continental/Island Shelf Geoform Origin: Island	Substrate origin: Geologic Substrate Substrate class: Rock Substrate Substrate subclass: Bedrock	Biotic setting: Benthic/Attached Biota Biotic class: Aquatic Vegetation Bed Biotic subclass: Benthic Macroalgae Biotic group: Canopy-Forming Algal Bed

N/A = not applicable

Table 3-16. Coastal and Marine Ecological Classification Standard for waters in the San Clemente Island footprint (2012) (Continued).

Habitat and Substrate Categories		**Biogeographic setting**	**Aquatic Setting**	**Water Column Component**	**Geoform Component**	**Substrate Component**	**Biotic Component**
Deep Water	Soft Bottom Habitat	Realm: Temperate Northern Pacific Province: Cold Temperate Northeast Pacific Ecoregion: Southern California Bight	System: Marine Subsystem: Nearshore Tidal Zone: N/A	Water Column Layer: Marine Nearshore Upper Water Column Salinity Regime: N/A Temperature Regime: Cool Water	Tectonic Setting: Convergent Active Continental Margin Physiographic Setting: Continental/Island Shelf Geoform Origin: Island	Substrate origin: Geologic Substrate Substrate class: Unconsolidated Mineral Substrate Substrate subclass: Fine Unconsolidated Substrate Substrate Group: Sand/Mud	Biotic setting: Benthic/Attached Biota Biotic class: Faunal Bed Biotic subclass: Soft Sediment Fauna Biotic group: Large Deep-Burrowing Fauna co-occurring element: Small Surface-Burrowing Fauna
	Rocky Habitat	Realm: Temperate Northern Pacific Province: Cold Temperate Northeast Pacific Ecoregion: Southern California Bight	System: Marine Subsystem: Nearshore Tidal Zone: N/A	Water Column Layer: Marine Nearshore Upper Water Column Salinity Regime: N/A Temperature Regime: Cool Water	Tectonic Setting: Convergent Active Continental Margin Physiographic Setting: Continental/Island Shelf Geoform Origin: Island	Substrate origin: Geologic Substrate Substrate class: Rock Substrate Substrate subclass: Bedrock	Biotic setting: Benthic/Attached Biota Biotic class: Faunal Bed Biotic subclass: Attached Fauna
Offshore Rocks and Islets	Sea stacks and offshore rocks	Realm: Temperate Northern Pacific Province: Cold Temperate Northeast Pacific Ecoregion: Southern California Bight	System: Marine Subsystem: Nearshore Tidal Zone: intertidal/ subtidal	Water Column Layer: Marine Nearshore Upper Water Column Salinity Regime: N/A Temperature Regime: Moderate Water	Tectonic Setting: Convergent Active Continental Margin Physiographic Setting: Continental/Island Shelf Geoform Origin: Island	Substrate origin: Geologic Substrate Substrate class: Rock Substrate Substrate subclass: Bedrock	Biotic setting: Benthic/Attached Biota Biotic class: Faunal Bed Biotic subclass: Attached Fauna

N/A = not applicable

Organisms inhabiting coastal strands adapted to surviving in a variable environment subject to regular wave disturbance and cycles of erosion and deposition. Plants and animals never show a uniform distribution, but occur in patches, and the abundance and species composition of populations change with vertical height on the shore and with horizontal distance along it (Little 2000).

A variety of invertebrates live in the sand and in the wrack and other detritus on the sand surface. Snails, bivalves, crustaceans, insects, isopods, amphipods, and polychaetes are among the organisms that inhabit coastal strands, and several serve as food sources for vertebrates, including the federally threatened western snowy plover. Shorebirds, seabirds, and pinnipeds utilize coastal strands for resting and/or rearing young.

Perhaps the most important physical factor on coastal strands is wave action and its effect on sand particle size. The importance of sand particle size, to organism distribution and abundance, is its effect on water retention and the ability of an organism to burrow. Fine sand tends to hold water above the tide level due to capillary action, while coarse sand and gravel allow water to drain away quickly as the tide retreats. Wave-induced substrate movement is another important factor in sandy beaches. As waves pass over, particles are picked up, churned in the water, and redeposited. Particles are continually redistributed, creating a very dynamic, unstable environment.

Generally, the coastal strands on the north and west shores are composed of larger grained material in comparison to protected beaches in the southern Pyramid Marine Ecoregion. High depositional beaches, such as those at West Cove and the cove at BUD/S Camp and Grad Beach in the Western Shore and North Island Marine Ecoregion respectively, face northwest into prevailing winds and swell. Consequently, they receive substantial quantities of marine debris and macrophyte wrack, primarily comprised of giant kelp (*Macrocystis pyrifera*).

No formal quantitative studies have documented fauna or flora on SCI's coastal strands. Coastal strands are known to be used during the winter by the federally threatened western snowy plover. Qualitative surveys have been performed at SCI in support of an ASBS evaluation sampled at Northwest Harbor, West Cove, and Pyramid Beach, along the north, western and southern shores, respectively (Merkel and Associates 2007). Organisms typically present on mainland coastal beaches were present at SCI, including beach hoppers (*Megalorchestia* spp., *Orchestoidea* spp.), mole crabs (*Emerita analoga* and *Blepharipoda occidentalis*), and bloodworms (*Euzonus mucronata*), kelp flies (*Coelopidae*), isopods (*Excirolana chiltoni*), and amphipods (*Megalorchestia* spp.). Bivalves (e.g., *Donax gouldi* or *Tivela stultorum*) were not observed, including evidence of their presence (i.e., shells); however, it should be noted that no serious effort was made to survey the entire sandy beach for these organisms during the ASBS biological survey (Merkel and Associates 2007). These species are similar to those documented at other California Channel Islands (Engle 2006). In addition, it is not known if any of the beaches are utilized by California grunion (*Leuresthes tenuis*) for spawning habitat (Merkel and Associates 2007), but grunion are known to spawn on sandy beaches on other Channel Islands (Engle and Miller 2005).

Current Management

Coastal strands are an important habitat for both natural resources and military operations. There is very little sandy beach available on SCI. Coastal strands are managed indirectly by precluding access by the public. Military access occurs on all coastal strands year round for training purposes. SCI staff have unlimited access to west beach.

Assessment of Resource Management

- There is little direct management of coastal strand habitat on SCI. Access to beaches south of SHOBA is restricted, which further limits the ability to manage this resource and other natural resources using it.
- Erosion of existing coastal strand habitat is a concern, particularly near West Cove, where the natural sand replenishment process has been affected by the construction of the airfield and in areas with frequent Landing Craft Air Cushion landings.
- Although SCI beaches currently provide valuable wintering habitat to plovers, their increasing narrowness may jeopardize their future value for plovers.

Management Strategy

Objective: *Conserve the components and functional requirements of coastal strand habitat to enhance ecosystem sustainability.*

I. Enhance upland portions of West Cove Beach in accordance with the BO on SCI Military Operations and Fire Management Plan (USFWS 2008a) Term and Condition 8-1. If needed to maintain suitable habitat for western snowy plover, West Cove Beach can be improved by restoring sand replenishment with dredged sand as materials become available.

II. Avoid shoreline construction that results in a loss of coastal strand habitat. Loss of this habitat could also reduce beach training capabilities.

III. Investigate alternative methods to monitor resources utilizing coastal strand habitats south of SHOBA where restrictions prohibit access by natural resource managers.

3.8.1.2 Rocky Intertidal and Surfgrass

Rocky intertidal is the portion of a rocky coastline periodically covered or exposed by daily tidal changes (Photo 3-35). This habitat is unique among marine environments in that its inhabitants are regularly exposed to air and must adapt to extremes of temperature and desiccation, as well as physical disturbance from waves and tidal action.

The complex interaction of physical and biological factors in this community results in vertical zonation of rocky intertidal species. A species is generally not found throughout rocky intertidal, only within a particular zone, a certain distance from tide lines. The upper limit of a species zone is determined by physical factors and the lower limit is determined by biological factors, such as competition and predation.

- **Splash Zone.** The top of the shore from about mean high water to the highest area wet by splash is characterized by a presence of lichens, blue-green algae, green algae, patches of brown encrusting algae (*Ralfsia* spp.), and sparse populations of barnacles (*Chthamalus* spp.). The nearly terrestrial isopod, *Ligia occidentalis,* is often abundant in the highest areas, especially among cobbles.

Photo 3-35. Rocky intertidal zone on SCI (Tierra Data Inc. 2009).

- **Upper Intertidal.** The shore from about mean high water to around mean higher water is often referred to as the barnacle zone. Acorn barnacles (e.g., *Chthamalus* spp., *Balanus glandula*) occur in dense populations as well as the thatched barnacle *(Tetraclita rubescens*). Periwinkle snails, numerous species of limpets, chitons, turban snails, and the lined shore crab (*Pachygrapsus crassipes*) impose several constraints on algal populations. As a result of grazing, a good deal of open space is usually present.
- **Middle Intertidal.** This zone is also known as the mussel zone, generally both submerged and exposed at least once each day. It extends from about mean higher low water to about mean lower low water. The majority of this zone is dominated by lush marine algae and a broad host of invertebrate species, including owl limpets (*Lottia gigantea*) and black abalone. Mussels are most abundant in this zone and often form mixed aggregations. Dense aggregations of the cloning anemone (*Anthopleura elegantissima*) may cover large areas of rock. Two types of fucoid algae (*Silvetia* spp.) typically dominate this area, as well as a diverse assemblage of red algae (*Chondracanthus* spp., *Porphyra* spp., *Priontis* spp., among others).
- **Lower Intertidal.** This zone extends from about mean lower water to the lowest tide mark, mostly submerged. Algae and seagrass species are generally most conspicuous. Sea urchins, sea anemones, polychaete worms, and snails are among many small animals abiding among seaweeds. Most intertidal fish live in this zone, including gobies, clingfishes, pricklebacks, and sculpins.

Most intertidal organisms are unable to burrow into rocks to escape the stress of a continually changing environment. Non-sessile animals, those not attached to rock, are able to adjust to more suitable habitat when the tide goes out, or continuously live in moist areas. Others, like mussels, have a protective covering, which closes to hold in water. Additionally, some chitons and seaweeds can tolerate significant water loss, recovering quickly when tides return.

Nutrient-rich, shallow water allows high primary production of algae, plants, and plankton. The high concentration of primary production, algal wrack, and detritus brought in by waves provide inhabitants with a rich food supply. In fact, space and not food, is the limiting factor for populations in this zone. Nearly all space along the rocky coast is occupied, and when space is available it is quickly colonized. Some species attach themselves to other alga or animals when there is no rock available.

Surfgrass (*Phyllospadix* spp.) (Photo 3-36) is a highly productive component of intertidal habitat, supporting many species of alga (Stewart and Myers 1980), providing shelter for many fish and invertebrates, such as the California spiny lobster (*Panulirus interruptus*) (Engle 1979). Surfgrass has an effective anchoring system to withstand tidal currents and moderate wave action. As with most intertidal species, surfgrass is susceptible to dessication and heat stress during low mid-day tides (Raimondi et al. 1999). It is also sensitive to sewage (Littler and Murray 1975) and oiling (Foster et al. 1988).

Photo 3-36. Surf grass (green mass on the right of the photo) in the shallow subtidal habitat of San Clemente Island (Tierra Data Inc. 2008).

The following provides a description of the substrate located in the rocky intertidal zone for all marine ecoregions at SCI (Merkel and Associates 2007).

- **North Island Ecoregion Substrate.** The substrate at all locations sampled consisted of boulder or bedrock.
- **West Shore Ecoregion Substrate.** The majority of the substrate sampled consisted of boulder or bedrock; however, a few locations had either a small percentage of cobble or sand at some elevations.
- **Pyramid Ecoregion Substrate.** The substrate at both intertidal locations sampled consisted of boulder or bedrock.
- **East Shore Ecoregion Substrate.** The substrate at the NOTS Pier location was 100% rock or boulder at all three tidal elevations; however, cobble was the most common substrate at the Stone Station (East Reference) location.

Four rocky intertidal monitoring sites were established in November 2009 following the Multi-Agency Rocky Intertidal Network (MARINe) protocols to document the existing baseline conditions of intertidal biota. The four sites are located in tandem to previously developed kelp forest monitoring sites co-located within each of the four ecoregions of the island (Map 3-11). Monitoring sites were established at Boy Scout Camp, West Cove, Eel Point, and Horse Beach Cove. Individual sites incorporate a diverse array of physical shoreline types that lead to a variable distribution and abundance of selected key species and assemblages. Established monitoring sites at each of the four locations were surveyed in the winter (January) and spring (May) of 2010. Currently, surveys occur bi-annually in the spring and fall (J. Bredvik, pers. com.).[3]

In 2005 and 2006, the Navy conducted quantitative intertidal and subtidal biological surveys as a part of its ASBS exception process to document the existing condition and dominant assemblages located in BUD/S, the airfield, SHOBA, NOTS Pier, and a reference location on the island. A total of ten sites were chosen for sampling around SCI, and these included five locations representative of areas that receive stormwater discharges associated with Navy operational activities, such as airfield operations, training ranges, and underwater detonation operations. There were also five locations to represent areas that receive stormwater runoff not associated with military activities. All marine habitats surveyed had a diverse and healthy community, and there was no indication of direct impacts associated with military activities.

Current Management

Rocky intertidal trends and condition is currently captured in four permanent rocky intertidal monitoring sites. These sites track the status and trends of key species assemblages, including the federally endangered black abalone. This monitoring also supports ASBS monitoring requirements to track species assemblages in the rocky intertidal.

Additionally, SCI has supported intertidal research performed by the Partnership for Interdisciplinary Studies of Coastal Oceans. These surveys were in support of ASBS monitoring requirements. The Partnership for Interdisciplinary Studies of Coastal Oceans initiated a long-term monitoring program to measure diversity and abundance of rocky intertidal communities along the western coast of temperate North America.

The Navy is currently in the developmental stages of creating a database for all current and historical SCI rocky intertidal information. This database will be used for management considerations and shared with MARINe. Black abalone population management decisions will be aided by including the most current, available SCI black abalone data in the MARINe database. The database will allow for trend analysis of black abalone and rocky intertidal organisms around SCI, as well as comparisons of the SCI population with other Channel Islands and mainland sites.

Assessment of Resource Management

- The Navy has completed rocky intertidal monitoring within the past few years, which led to the compilation of important baseline information.
- Monitoring is completed biannually and will aid in tracking the status and trends of the intertidal community around SCI, including the federally endangered black abalone. The monitoring also supports compliance with ASBS monitoring requirements.

3. Data from these surveys are available at http://www.marine.gov/index.htm and http://www.eeb.ucsc.edu/pacificrockyintertidal/contact/index.html.

- Evaluation of rocky intertidal habitat at SCI is important in understanding health of the community and anticipating potential threats.
- There is currently no direct management of surfgrass at SCI. Future rocky intertidal monitoring should include monitoring the status of surfgrass.
- Continued monitoring of intertidal sites and database development will contribute important information to the MARINe database, intended to track the black abalone throughout its range as well as the rocky intertidal community as a whole.

Management Strategy

Objective: *Conserve rocky intertidal communities to sustain an ecological community that improves the ecosystem's resiliency to natural and anthropogenic effects.*

I. Develop a database to integrate current and historical rocky intertidal monitoring data.

A. Share data with the MARINe database.

B. Update database with new survey data on a regular basis.

II. Avoid degradation of rocky intertidal habitat, including surfgrass.

III. Conduct rocky intertidal surveys every spring and fall at established monitoring sites.

A. Monitor the status of surfgrass during biannual rocky intertidal monitoring.

B. Track the status and trends of the black abalone.

IV. Participate with regional planning initiatives to track the status and trends of intertidal communities.

A. Comply with regional efforts to support the exemption for wastewater discharge at SCI.

V. Support evaluation of the occurrence and potential implications of climate change and sea level rise on rocky intertidal habitats at SCI.

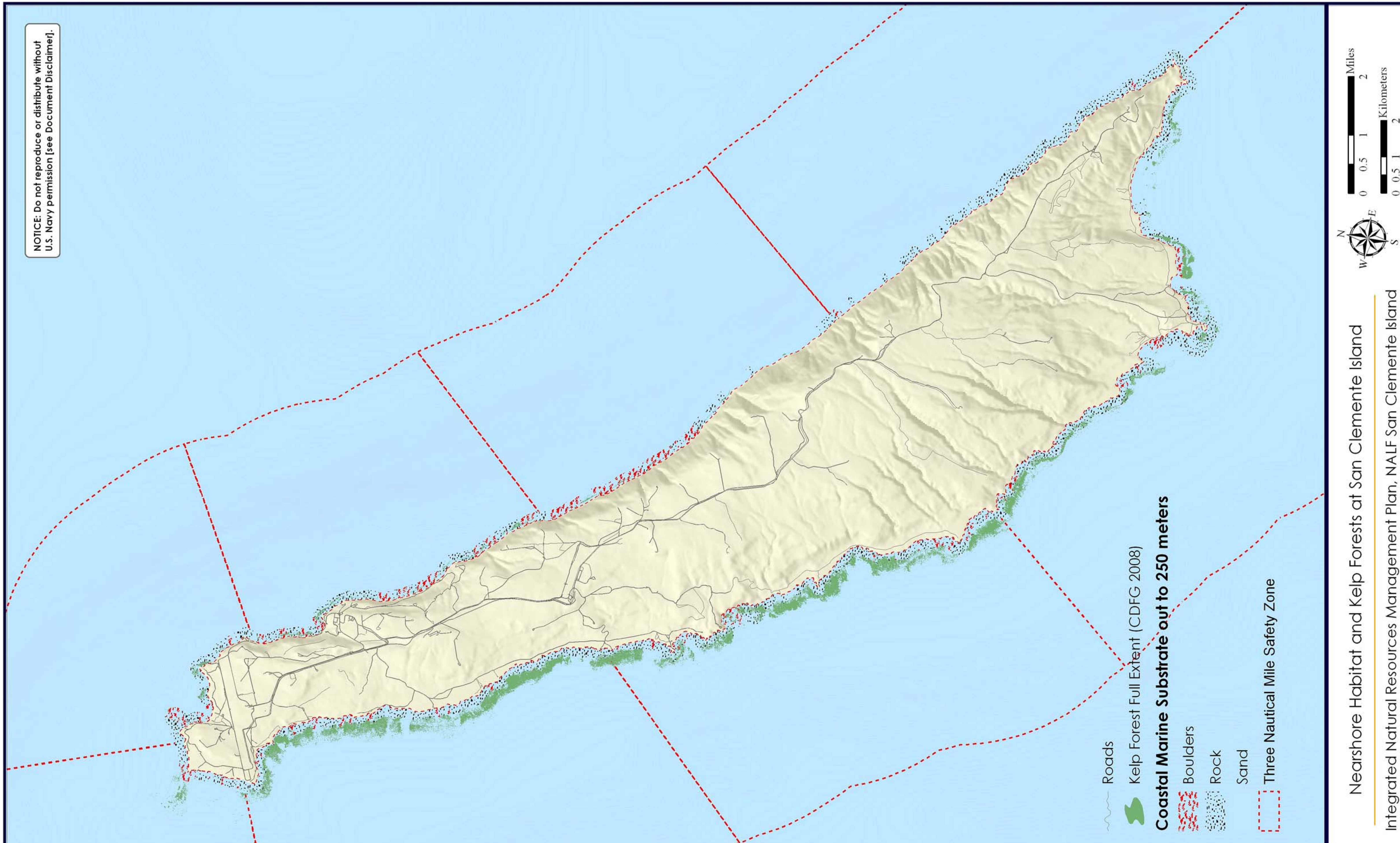
3.8.2 Subtidal Habitats

Subtidal habitats are located below the low tide mark and are permanently flooded by tidal water. In southern California, rocky, sandy, and muddy substrates occur in the coastal subtidal environment. The SCB contains several subtidal habitats, including soft bottom habitat, seagrass beds, rocky habitat and kelp forests. Physical factors influencing life in this zone include: type of substrate, depth, turbulence, temperature, salinity, and light.

3.8.2.1 Soft Bottom

Soft bottom habitat is characterized by unstable, unvegetated sediment. Environmental characteristics, such as sediment grain size and dissolved oxygen, will affect the condition of this habitat and the type of organisms that utilize it. These substrates shift in response to currents, winds, waves, tides, and activities by humans and other organisms.

In shallow sandy bottom habitats, the epifauna (attached or motile species that inhabit rock or sediment surfaces) is dominated by suspension feeders. Shallow waters allow epifaunal suspension feeders to avoid predation by residing in the harsh physical environment characterized by strong wave action. Since few plants and animals are able to attach themselves to soft bottom habitat, this community contains many infaunal (species that live in rock or soft sediments) species that can burrow or dig into the sediment.



Map 3-11. Nearshore habitat and kelp surrounding San Clemente Island.

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The main primary producers in unvegetated soft bottom communities are diatoms and microscopic alga growing on sand or mud particles. Due to the almost complete absence of plants and algae, detritus is a very important food for many soft bottom inhabitants (Castro and Huber 1997). This dead organic matter, and the decomposers living on it, is brought in by currents from more productive coastal communities; it is also generated by the bottom dwellers themselves. The detritus is used by microscopic species that live among sediment particles. In muddy areas, larger benthic invertebrates also feed on detritus; mostly burrowing deposit feeders, such as trumpet and bamboo worms, some sea urchins, sand dollars, echiuran worms, peanut worms, sea cucumbers, and ghost shrimps.

Along the sandy bottom, where oxygen is more concentrated, filter feeders actively filter the water to obtain the detritus and plankton drifting in the water column. Some of these feeders include: razor clams, quahog, cockles, soft-shelled clams, parchment worms, and terebellid worms. Many of these invertebrates serve as food for predatory invertebrates and bottom-dwelling fishes, such as rays, skates, halibuts, flounders, soles, and turbots. The presence of predators in sandy bottom is important; they remove individuals and cause sediment disturbance that subsequently allows recolonization by different types of organisms. This results in a range of successional stages, enhancing biodiversity in space and time.

Soft bottom habitat on SCI is primarily located in the East Shore and Pyramid Ecoregions; a small portion is present in the North Island Ecoregion at Northwest Harbor, which is the location of BUD/S Camp underwater detonation training.

The ASBS biological surveys, conducted in 2005 and 2006, determined distribution and abundance of invertebrates and algae in subtidal habitats at two isobaths (-12 and -40 feet [-4 and -12 m] Mean Lower Low Water) (Merkel and Associates 2007). Results indicated a high degree of biological variability within an ecoregion, primarily due to differences in substrate type and coverage (e.g., cobble, boulder, sand).

Current Management

Subtidal soft bottom habitat is not directly managed within the SCI footprint. However, all activities with the potential to affect deep soft bottom habitat are reviewed under NEPA and if required, an Essential Fish Habitat (EFH) Assessment and consultation under the MSA are conducted. If required, applicable mitigation measures and conservation recommendations are implemented. Additionally, nearshore waters of SCI are designated as an ASBS, which provides direct benefits to water quality and indirect benefits to nearshore benthic habitats. Therefore, the Navy's active compliance with the requirements of the ASBS designation benefits the subtidal soft bottom habitat and species that use this habitat.

In Fiscal Year 2013, the Navy mapped the habitats located in Safety Zones G and Wilson Cove, two “control” areas adjacent to the two Safety Zones (West Cove and south of Wilson Cove), and two additional areas in Safety Zone A and Pyramid Cove. This mapping could potentially capture subtidal soft bottom habitat. Additionally, SCUBA surveys for rocky reef and kelp forest systems have the potential to capture fish and invertebrate utilization of nearby soft bottom habitats. Both of these mapping and survey efforts support of the goals of the MLPA. Other mapping and monitoring efforts in support of the MLPA will provide a clearer picture the variety of habitats existing in the nearshore of SCI including subtidal soft bottom habitat.

Assessment of Management

- Management of the ASBS indirectly supports the health of subtidal soft bottom habitat in the SCI footprint. Continued compliance with ASBS requirements will contribute to maintaining ecosystem function.
- Habitat mapping in Safety Zones G and Wilson Cove has the potential to map subtidal soft bottom habitat, increasing the knowledge of the habitat in nearshore waters of SCI.
- SCUBA surveys of marine fauna utilizing subtidal soft bottom habitat will increase the knowledge base of this ecosystem's function.

Management Strategy

Objective: *Conserve the function of unvegetated soft bottom habitat to increase ecosystem resilience.*

I. Conserve subtidal soft bottom habitat through the continued use of the NEPA and MSA process.

II. Continue to comply with ASBS requirements.

III. Partner with state and federal agencies, if feasible, to investigate and gather data of subtidal soft bottom habitat to promote adaptive management.

- ***A.*** Support the utilization of scientifically recognized monitoring protocols to survey deep soft bottom habitat

Eelgrass

Eelgrass (*Zostera* spp.) is widely distributed in temperate and cold Pacific Ocean waters and can form extensive underwater beds. Eelgrass is sometimes exposed at low tide, and also has been found as deep as 100 feet (30 m). Eelgrass beds rank among the most productive communities in the ocean. Eelgrass roots and stems help stabilize soft bottoms; leaves reduce wave action and currents. This reduces turbulence, causing greater and finer sediment deposition, thus affecting colonization by other organisms. While primary productivity is high in this community, few species eat eelgrass. It is used primarily as a nursery for many fishes, which attach eggs to leaves and consume invertebrates living in the beds. Many animals feed on the large amounts of detritus produced by decomposition of eelgrass. These include some polychaete worms, clams, and sea cucumbers. Dense eelgrass beds also offer shelter to many animals that do not feed on vegetation or detritus.

Eelgrass beds play an important role in nutrient regeneration and recycling, water quality, primary production, and carbon sequestration. As perennial structures, eelgrass beds are one of the few marine habitats that store carbon for relatively long periods. This carbon can be bound into sediments or transported to the deep ocean and play an important role in long-term carbon sequestration (Phillips and Meñez 1988).

Eelgrass policy is guided by the California Eelgrass Mitigation Policy, approved in 1991 by NMFS, USFWS, and CDFW. The Policy is currently in revision. The Policy is endorsed by the USACE and the California Coastal Commission. The USACE uses it as a regional guidance to conserve eelgrass under the CWA Section 404. The policy helped standardize the resource agencies' response to projects, such as dredging, pile-driving, in-water military training and operations, and research and development work. Also, under California state code (California Code of Regulations Title 14 § 165-165.5) no eelgrass or surfgrass may be cut or disturbed.

Eelgrass is reported incidentally from Wilson Cove (M. Perdue, pers. com. 2002). Dr. Jack Engle, Marine Science Institute, University of California at Santa Barbara, has conducted periodic subtidal and intertidal surveys at SCI since the 1980s. He notes relatively deep eelgrass beds at depths of up to about 65 feet (20 m) off SCI's eastern escarpment between about White Rock and Bryce Canyon (J. Engle, pers. com. 2002).

Coyer et al. (2008) conducted genetics work on eelgrass in the SCB, including five locations on SCI. Island populations of common eelgrass (*Zostera marina*) were found to be clonal and characterized by low genotypic diversity compared with populations along the mainland Baja California coast (Coyer et al. 2008). As a result, Coyer et al. (2008) concluded that the pristine environmental conditions of offshore islands do not guarantee maximum genetic diversity.

Current Management

Eelgrass habitat is protected by Section 404 of the CWA, the MSA as EFH, the Fish and Wildlife Coordination Act, the California Coastal Act, and Title 14 of the California Code of Regulations. According to these laws and regulations, any activities that may potentially impact eelgrass habitat must mitigate for those impacts. Mitigation measures for eelgrass habitat around the island are guided by the NMFS California Eelgrass Mitigation Policy. This Policy also describes avoidance and minimization measures to use to minimize impacts to eelgrass and methods for developing distribution maps.

Eelgrass surveys were completed in 2003 and 2005 at NOTS pier and in 2007 at Northwest Harbor, Eagle Canyon, and near Pyramid Head. Surveys to map the abundance, distribution, and health of eelgrass island-wide are planned for Fiscal Year 2014. These surveys are planned to occur every five years to monitor any changes and military impacts of existing habitat.

Assessment of Resource Management

- Unavoidable impacts to eelgrass habitat are appropriately mitigated, using a statewide strategy detailed in the California Eelgrass Mitigation Policy.
- The installation supports NMFS through their use of the California Eelgrass Mitigation Policy to manage and map eelgrass in nearshore waters around SCI. The standardization of methods across the state allows managers to properly evaluate eelgrass habitat.
- Eelgrass surveys at SCI have been project and site-specific. A baseline of eelgrass habitat around the island has not been determined. Island-wide eelgrass mapping must be completed to properly conserve and protect this habitat, in addition to complying with the CWA, MSA, Fish and Wildlife Coordination Act, and state law.
- Eelgrass surveys planned for Fiscal Year 2014 will map all eelgrass habitat around SCI. Mapping of this sensitive and protected habitat is imperative to properly plan and, to the extent feasible, avoid during military training exercises. Maps will also be used to inform future NEPA documents for facilities and operational expansion.

Management Strategy

Objective: *Retain the range, quality, and diversity of vegetated soft bottom habitat to maintain ecosystem integrity and function.*

I. Conserve and manage eelgrass through guidance detailed in the California Eelgrass Mitigation Policy to comply with California state law, the CWA, Fish and Wildlife Coordination Act, and MSA.

- **A.** Allow no net loss of eelgrass beds in terms of area and biological values.
- **B.** Conduct eelgrass surveys around the island, using SCUBA diving and side-scan and single beam sonar technologies, to measure the abundance, distribution, and health of the community.

II. To the extent feasible, avoid construction and military activities near eelgrass beds.

III. Support eelgrass mapping to reduce operational conflicts.

IV. Encourage outside agencies and research institutions to conduct surveys of eelgrass habitat around the island.

V. Evaluate the usage of eelgrass beds on SCI by fishes and invertebrates.

3.8.2.2 Rocky Habitat and Kelp Forests

Hard bottom portions of the continental shelf are usually submerged extensions of rocky shores. These communities are generally rich and productive; their most obvious feature is the abundance of seaweeds. Unlike surfgrass and eelgrass, which have true roots and can absorb nutrients from the sediments, seaweeds must depend on nutrients dissolved in the water. One of the main problems for seaweeds in this environment is finding a place to attach. There is intense competition for living space on rocks. Seaweeds must compete for space not only with each other, but also with a variety of sessile animals, such as sponges, hydroids, sea anemones, soft corals, bryozoans, some polychaetes, barnacles, and sea squirts. Different seaweeds adapt to different temperature, light, and grazing regimes. They also vary in their life history strategies. Some species grow fast only for a short time, while others grow slowly and live longer. Kelp attaches to rocky substrates at subtidal depths, forming the distinctive kelp forests familiar to southern California. They extend from seafloor to surface and form a vertically structured habitat that is the fundamental element to many important ecosystems in southern California).

Giant kelp forests (Photo 3-37) create a unique habitat that provides refuge, forage, and nursery areas for nearly 800 animal and plant species (Leet et al. 2001). Typically, giant kelp is found in abundance in wave-exposed areas of nutrient-rich, cool water that is 20 to 120 feet (6 to 35 m) deep. The kelp attaches to rocky substrate through a root-like structure called a holdfast. Kelp forests provide large quantities of drift kelp (detached kelp) to adjacent habitats; drift kelp provides an important resource to soft and rocky benthos, deep channel basins, sandy beaches, rocky shores, and coastal lagoons (Rodriguez 2003).

Grazers, especially sea urchins, can play a large role in the abundance and distribution of kelp. In a healthy kelp forest, sea urchins feed on drift kelp and the understory of seaweeds and algae instead of on the attached kelp. However, during times of ecosystem stress, such as El Niño and major storm events, the ratio of drift kelp supply to urchin abundance can trigger the behavioral change to destructive grazing (Ebeling et al. 1985; Harrold and Reed 1985; Tegner and Dayton 1987; Dayton et al. 1992). Increasing urchin abundance can also cause stress on the ecosystem to change grazing behavior. Potential reasons for increased abundance of urchins include reduced predation, increased recruitment, or immigration of adults in grazing fronts. Research by Cowen (1983) indicates that predation by California sheephead (*Semicossyphus pulcher*) on the red sea urchin (*Strongylocentrotus franciscanus*) may be a critical interaction in maintaining community structure.

Photo 3-37. Kelp forest off the shore of SCI and representative fauna of rocky subtidal and kelp forest habitats. Clockwise from left: sheephead, blood star, pink abalone, gorgonians, kelp rock fish, spotted kelpfish, blue-banded goby (photos by Tierra Data Inc. 2008–2009).

SCI has a steep bottom profile, restricting kelp forests to a narrow band adjacent to the shore (See Map 3-11). The distribution and abundance of giant kelp vary greatly on opposing sides of the island, presumably due to differences in depth, nutrients, water movement, and light penetration (water transparency).

SCI is also home to unusual forms of elk kelp (*Pelagophycus porra*) that establish in relatively deep water between 6–165 feet (20–50 m). The elk kelp on the exposed west side of SCI is similar to the mainland coastal form that is tall and attaches to rocky substrates, while on the east side of SCI the elk kelp is relatively short and attaches to soft bottom sand (J. Engle, pers. com.). It is not known if these represent two distinct species of elk kelp or merely different forms of the same species (Miller and Dorr 1994). Forests of elk kelp have been known to occur in northern SCI in waters off of West Cove, Bird Rock, Dolphin Bay, and Wilson Cove Canyon; in eastern SCI in deep water between Twin Dams and Pyramid Head; and western SCI between about Kinkipar Canyon and China Canyon (J. Engle, pers. com.).

In 2002 CINP was retained by Naval Facilities Engineering Command Southwest to survey the underwater environment and conduct kelp forest monitoring and habitat classification around SCI (CINP 2004a, 2004b). As a result, four areas suitable for permanent monitoring sites were identified, one in each of the four ecoregions of the island. By June 2003, permanent transects were established in each of the four ecoregions at Northwest Harbor, Boy Scout Camp, Eel Point, and Horse Beach Cove.

Current Management

The status and trends of rocky reefs and kelp forests in nearshore waters of SCI are tracked through the surveys of the kelp forest monitoring sites. Baseline surveys were conducted in 2003 and 2004 by CINP (2004a, 2004b). The Navy contracted TDI to survey the sites again in 2008 and 2009 (TDI 2010). Monitoring of these sites has not occurred since 2009; however, surveys of the newly implemented NSZs will be conducted in Fiscal Year 2012 and 2013, which will examine status and trends of rocky reefs and kelp forests in nearshore waters of SCI.

The Navy will create a database for all current and historical SCI kelp forest information in Fiscal Year 2014. This database will be shared with the MARINe database and be used to inform Navy management decisions.

Assessment of Resource Management

- Monitoring of kelp forest sites occurred four times since establishment in 2003. Additional surveys must be completed to generate conclusions on the status and trends of this habitat in waters around SCI. NSZ surveys in Fiscal Year 2012 and 2013 will add important data to help attain this goal. However, monitoring should occur on a regular basis to properly monitor the status of kelp forests around SCI.
- The installation should encourage outside agencies and academic institutions to survey long-term kelp forest monitoring sites, due to budget constraints and other natural resource priorities of the SCI NRO.
- The database planned for Fiscal Year 2014 will increase the efficiency and accuracy of reporting on kelp forest habitat around SCI. Integration of the installation's database with the MARINe database will allow managers to compare sites around SCI to other Channel Islands and mainland sites, which will aid management decisions.

Management Strategy

Objective: *Conserve rocky reef and kelp forest habitat to support a diverse, dynamic, and abundant ecological community that improve the ecosystems resiliency to natural and anthropogenic effects.*

I. Develop a database to integrate current and historical kelp forest monitoring data.

  A. Update database with new survey data on a regular basis.

II. Conduct NSZ surveys to monitor the status and trends of long-term kelp forest sites around the island.

III. Participate in regional planning and monitoring of kelp forest communities.

IV. Encourage outside agencies and academic institutions to investigate recruitment, disturbance, and species diversity that help to assess regional trends.

  A. Support kelp mapping surveys to examine trends in surface coverage and primary production.

V. Evaluate the ecosystem function and health of SCI rocky reefs and kelp forests.

3.8.3 Deep Water Habitats

SCI is located on the continental slope (conventionally defined from shore to 660 feet [200 m]). The continental slope is a gently sloping submerged continental margin that extends seaward to the steeply sloping continental slope. On the east side of SCI, the continental slope is very narrow and drops off rather quickly into the deep sea. Conversely, on the west side of the island, the continental slope has a more gradual slope. The predominant habitat consists of sandy and muddy sediments (Allen 2006).

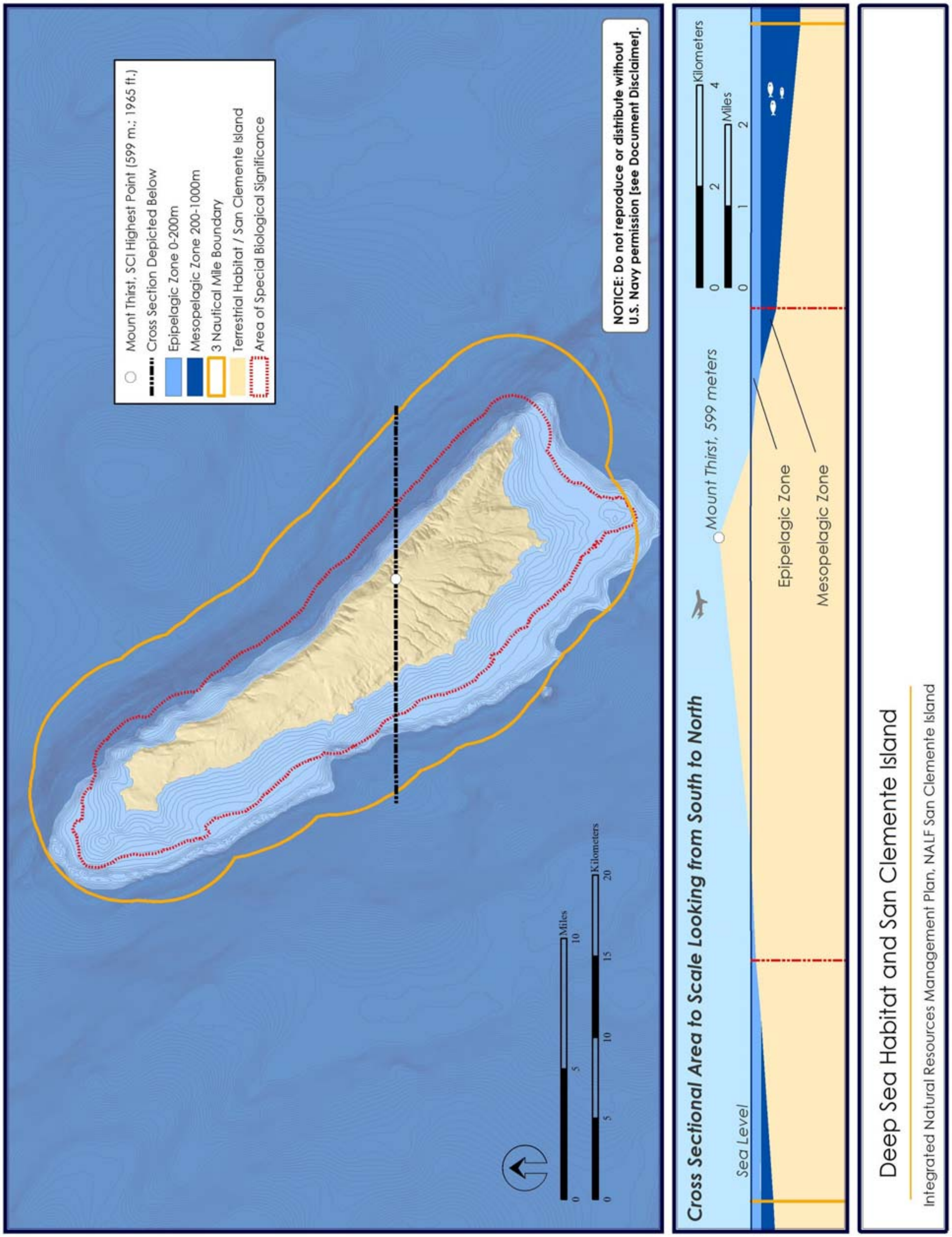
The deep sea can be divided into two primary areas: pelagic (associated with the open water) and benthic (associated with the bottom of the ocean). Deep water around SCI can further be divided into the epipelagic, mesopelagic, and bathypelagic zones. The epipelagic zone (Map 3-12) (down to 660 feet [200 m]) is the sunlit area of the water where nearly all primary production in the ocean occurs. In the mesopelagic zone (660 to 3,300 feet [200 to 1,000 m]), some light is able to penetrate but not enough for photosynthesis; species in this zone make vertical migrations at night to feed on the nutrient rich surface layers. The bathypelagic zone (3,300 to 13,000 feet [1,000 to 4,000 m]) is completely dark with most species surviving on detritus in sediment (polychaetes, arthropods, mollusks, and echinoderms) (Dailey et al. 1993). Information on deep water habitats (100 feet [>30 m]) is limited due to the expense and difficulty of conducting surveys.

3.8.3.1 Rocky Habitat

Hard substrates occur to depths of 1,600 feet (500 m) in the SCB (Dailey et al. 1993). The ocean floor surrounding SCI is typically characterized as a high relief rocky habitat that is interspersed with sand channels (Allen 2006). Erosion by wave action from the northwest, during past periods of lower sea level, has exposed erosion-resistant marine sedimentary and volcanic rocks, which through differential erosion, have developed layering and fracture features. SCI is on the uplifted southern side of the SCI fault (Vedder et al. 1986) and is composed of this erosion-resistant volcanic rock, which is the same age as those at Tanner and Cortes Banks. Side-scan sonar data around SCI indicate that the majority of the sea floor shallower than 200 feet (60 m) is hard substrate (Butler et al. 2006).

Thompson et al. (1993) estimated that 3% of the sea floor in the SCB between 80 and 215 feet (25 and 65 m) is rocky substrate. Using this assumption, the total amount of deep rocky habitat in southern California was estimated at 750 acres (752 ha) (Butler et al. 2006). However, multibeam sonar techniques used to measure white abalone (*Haliotis sorenseni*) habitat (deep rocky substrate) at SCI revealed 2,200 acres (889 ha) at depths of 100 to 200 feet (30 to 60 m) at several sites on the west side of the island (Butler et al. 2006).

Although there are no specific studies describing deep rocky habitat around SCI, the San Miguel Island platform (shelf) on the lower slope-sill (950 to 2,050 feet [290 to 625 m]) in the SCB was described. The island platform was composed of rocky outcrop and small cobbles, boulders, and slabs (Dailey et al. 1993). Some of the outcrops had vertical ledges of more than 7 feet (2 m) (Parr and Shrake 1989). The bottom was dominated (more than 80%) by a low growing turf, anemones, amphipods, polychaetes, and ectoprocts. Larger species included sponges, gorgonians (*Stenellia* sp.), feather stars (*Florometra* sp.), and anemones (e.g., *Stomphia* sp.). A high degree of commensalism was evident among the large sponges, which provided structure and habitat for a variety of animals, such as crinoids, shrimp, and ophiuroids. In contrast to hard substrate assemblages in shallower water (345 to 700 feet [105 to 213 m]), cup corals, anemones, brachiopods, and lithodid and galatheid crabs were much less prevalent.



Map 3-12. Deep sea habitat and San Clemente Island.

California hydrocoral (*Stylaster californicus*) (Photo 3-38) is not a true coral, but a member of the Class Hydrozoa that inhabits certain sea stacks at SCI. California hydrocoral has more wide-spread assemblages at SCI than any other Channel Island (J. Engle, pers. com.) It forms branching colonies up to 30 cm (12 in) high and 60 cm (24 in) wide and can be found in a variety of colors ranging from pink to dark blue. The species prefers low turbidity and high current waters and depth ranges of five to 98 m (16 to 322 feet). The growth rate is slow, requiring over 20 years to grow to 30 cm. In general, hard corals, such as this, are rare in colder temperate waters. This species can be found on the west side of SCI and Santa Catalina Island (J. Engle, pers. com.). Its rarity makes it much sought after by recreational SCUBA divers. However, divers are not allowed to touch or take this species since it is protected by the state of California. This species is sensitive to changes in sea surface temperatures and can decline significantly during El Niño events.

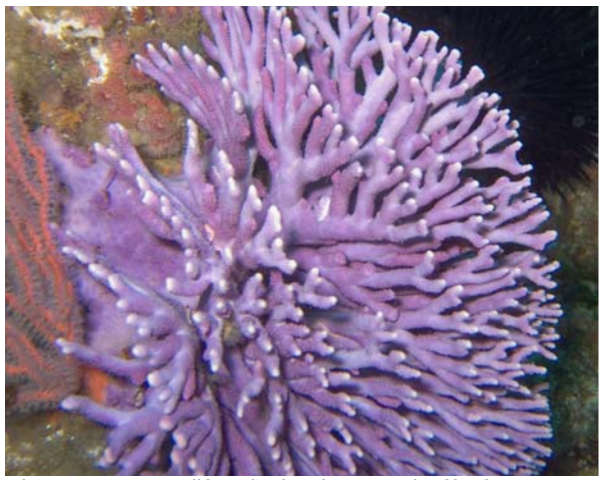


Photo 3-38. California hydrocoral off of San Clemente Island (Tierra Data Inc. 2009).

Current Management

Management of deep water rocky habitat is primarily achieved by regulations implemented by CDFW to limit consumptive marine resource use from activities such as commercial and recreational fishing. Fishing regulations seek to manage populations at sustainable levels through area and seasonal closures; gear limitations; and size, catch, and possession limitations.

Deep rocky habitat was surveyed and mapped in 2004 and 2012 in an effort to quantify the amount of suitable deep rocky habitat available for white abalone in waters around SCI. The Navy partnered with NMFS and California State University at Monterey Bay to conduct the surveys off the west shore of SCI from Castle Rock south to China Point. Surveys consisted of remotely operated vehicles following transect lines; however, these lines did not encompass the entire length of the west shore.

Minimization and mitigation efforts have been developed within the SOCAL EIS (Navy 2008) in support of the EFH Assessment. Minimization and mitigation measures that protect deep water rocky habitat include avoiding protected and/or sensitive habitats, including Habitat Areas of Particular Concern, and prohibiting detonations within 0.5 nm (1 km) of any artificial reef, shipwreck, or live hard-bottom community; within 1.6 nm (3 km) of shoreline; or within 3.2 nm (6 km) of an estuarine inlet.

Assessment of Resource Management

- Important baseline data was gathered through surveys to map deep rocky habitat suitable for white abalone in waters around SCI.
- Future surveys should attempt to survey additional deep rocky habitat around the island and describe the species' assemblage of the habitat.
- Mitigation measures are a proactive method for the protection of deep rocky habitat surrounding SCI. However, the effectiveness of these mitigation measures has not been evaluated.

Management Strategy

Objective: *Assess and conserve the attributes of deep rocky substrate to maintain the diversity of communities and promote the conservation of sensitive species warranting Navy stewardship.*

I. Complete an island-wide mapping effort of all deep water rocky habitat.

II. Follow mitigation measures detailed in the EFH Assessment in Navy activities in the SOCAL Range Complex.

  A. Evaluate the effectiveness of the current mitigation measures on the deep rocky habitat around SCI.

III. Develop more efficient technologies and strategies to map deep water habitat.

3.8.3.2 Soft Bottom

Extensive areas (over 54,000 nm [100,000 km^2]) of deep benthic habitats (>100 feet [30 m]) exist in the SCB (Dailey et al. 1993) and are the dominant habitat of the shelf and upper slope (Allen 2006). In general, organism abundance is high and diversity is low in nearshore sandy bottom habitats; in the offshore habitats, abundance decreases and diversity increases with depth. The nearshore area of SCI, where deep soft sandy bottom occurs, is from approximately 100 to 3,000 feet (30 to 900 m) of water depth and includes portions of the island shelf.

The greatest differences in species composition and diversity among deep soft substrate benthic assemblages of the region occur over water depth. This most likely reflects decreasing sediment grain size, increasing organic content, and decreasing dissolved oxygen concentrations that occur over depth. The largest change in species composition occurs at midslope, about 1,640 feet (500 m) (Dailey et al. 1993). Differences in benthic assemblages in the SCB also exist between nearshore and offshore sites of similar depth. These differences appear to be related to increased productivity, waves, currents, and decreased contribution of terrestrial detrital sediment on the offshore areas. Species will often inhabit both nearshore and offshore shelf areas, however, abundance will change between these areas. Species adapted to fine sediments occur more frequently on the mainland and species that prefer coarse sediments and rock occur more frequently on the island shelves (Wicksten 1980).

Nearshore and offshore basins are inhabited by quite different species assemblages. Nearshore basins have the highest sedimentation rates and can experience episodic anoxia that limits the development of a diverse basin fauna. Enchinoderms often dominate benthic communities in southern California. All the deep soft substrate benthic assemblages of the region, except those on the nearshore basin floors, are dominated by enchinoderms, usually ophiuroids and echinoids (Dailey et al. 1993).

Macrofaunal species diversity and biomass decrease over depth from shelf to basins, but megafaunal diversity and biomass increase over depth to their maximum values on the slopes (Dailey et al. 1993).

Current Management

Deep unvegetated soft bottom habitat is not directly managed within the SCI footprint. However, all activities with the potential to affect deep soft bottom habitat are reviewed under NEPA and if required, an EFH Assessment and consultation under the MSA are conducted. If required, applicable mitigation measures and conservation recommendations are implemented. Additionally, nearshore waters of SCI are designated as an ASBS, which provides direct benefits to water quality and indirect benefits to nearshore benthic habitats. Therefore, the Navy's active compliance with the requirements of the ASBS designation benefits deep unvegetated soft bottom habitat and species that use this habitat.

In Fiscal Year 2013, the Navy, in support of the goals of the MLPA, mapped the habitats located in Safety Zones G and Wilson Cove, two “control” areas adjacent to the two Safety Zones (West Cove and south of Wilson Cove), and two additional areas in Safety Zone A and Pyramid Cove. Mapping and other monitoring efforts in support of the MLPA will provide a clearer picture the variety of habitats existing in the nearshore of SCI including deep soft bottom habitat. The habitat mapping and remotely-operated vehicle video monitoring will also potentially capture data indicating fish utilization of specific habitats in these areas.

Assessment of Management

- Management of the ASBS indirectly supports the health of deep soft bottom habitat in the SCI footprint. Continued compliance with ASBS requirements will contribute to maintaining ecosystem function.
- Habitat mapping in Safety Zones G and Wilson Cove has the potential to map deep soft bottom habitat, increasing the knowledge of the habitat in nearshore waters of SCI.

Management Strategy

Objective: *Conserve the attributes of deep soft bottom habitat to maintain ecosystem function.*

I. Conserve deep soft bottom habitat through the continued use of the NEPA and MSA process.

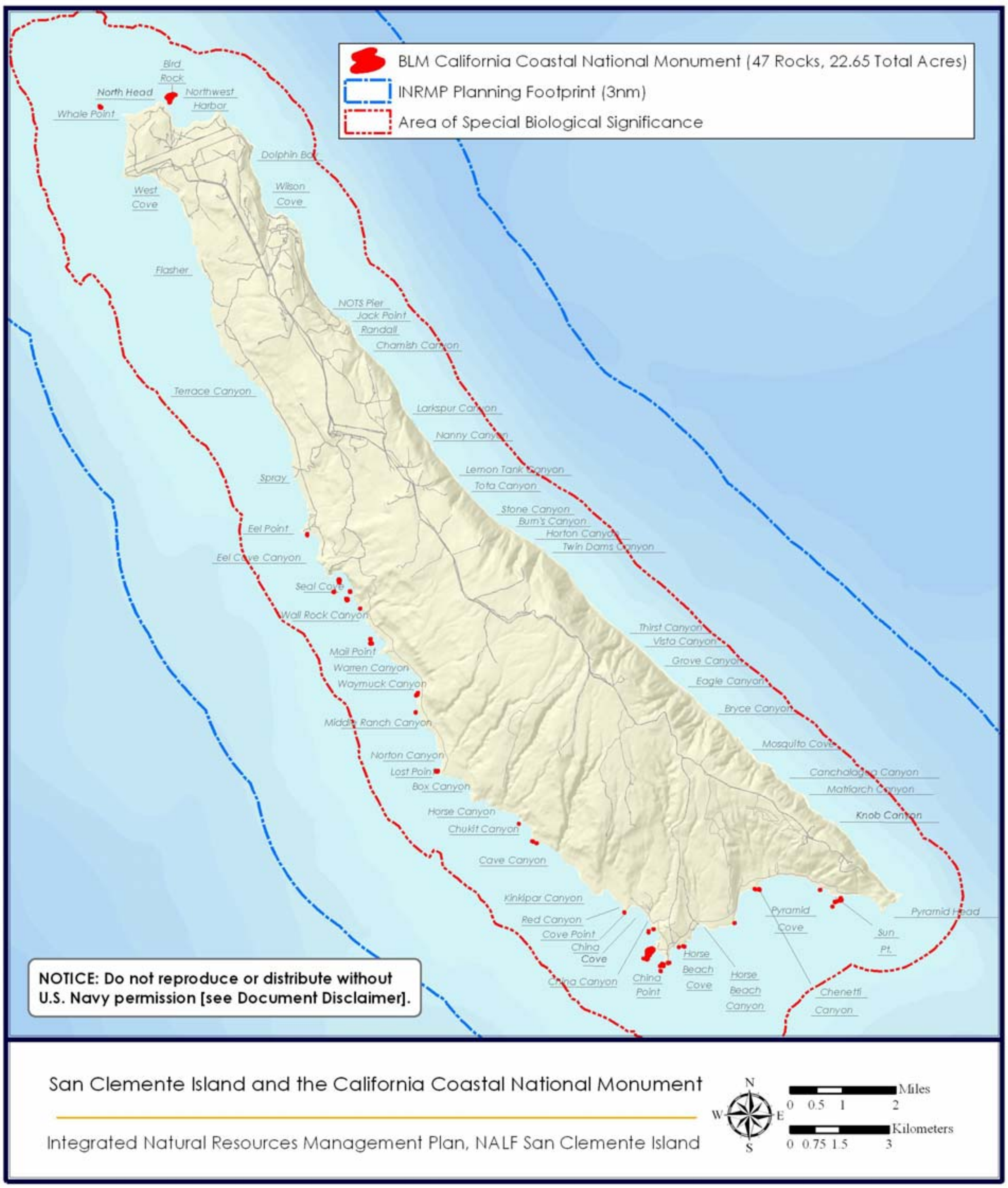
II. Continue to comply with ASBS requirements.

III. Partner with state and federal agencies, if feasible, to investigate and gather data of deep soft bottom habitat to promote adaptive management.

  A. Support the utilization of scientifically recognized monitoring protocols to survey deep soft bottom habitat

3.8.4 Offshore Rocks and Islets

SCI has 47 low-elevation offshore rocks (Map 3-13). The majority of the offshore rocks are small in size (Photo 3-39), 38 of which have areas significantly less than one-third of an acre (Bureau of Land Management [BLM] 2005). The largest two rocks are off China Point (7.65 acres [3 ha]) and Bird Rock (5.05 acres [2 ha]) (BLM 2005). Most of these rocks are composed of exposed bare surfaces, washed by active seas and intense salt spray. Several islands are large enough to have soil and low growing xerophytic and salt-tolerant vegetation, including native stunted coastal cholla and non-native crystalline iceplant, among others.



Map 3-13. Locations of offshore rocks within the California Coastal National Monument at San Clemente Island.

Photo 3-39. Offshore rocks in Seal Cove (Navy 2012).

The offshore rocks and sea stacks are unique habitats that provide protected breeding and resting sites for thousands of migrating seabirds (Photo 3-40) and pinnipeds. The western gull, Brandt's cormorant (*Phalacrocorax penicillatus*), Scripps's murrelet (*Synthliboramphus scrippsi*), Guadalupe murrelet (*Synthliboramphus hypoleucus*), ashy storm-petrel (*Oceanodroma homochroa*), and black oystercatcher (*Haematopus bachmani*) are known to regularly breed on the offshore rocks of SCI (Carter et al. 2009). Many of the rocks are important feeding sites for black oystercatchers and a suite of wintering and migrating shorebirds (Mad River Biologists 2002). Seabird monitoring on offshore rocks is ongoing. Aerial pinniped surveys of SCI and its offshore rocks are conducted every three years.

Photo 3-40. Seabirds roosting on an offshore rock (Navy).

Offshore rocks, which are "above mean high tide [and] within 12 nm of the shoreline" of SCI, are protected under the California Coastal National Monument (CCNM) Resource Management Plan (BLM 2005). CCNM was established by Presidential Proclamation No. 7264 and tasks the BLM with the ultimate responsibility for ensuring protection of offshore rocks. The management goals of the CCNM are to:

- Protect the geologic formations, which provide habitat for biological resources;
- Protect scenic and cultural values;

- Promote research opportunities;
- Provide educational information to the public; and
- Coordinate planning and management with numerous jurisdictions and stake holders.

Offshore rocks support intertidal and subtidal communities similar to those previously described in Section 3.8.1 Intertidal Habitats and Section 3.8.2 Subtidal Habitats. Considering the isolation and physical factors affecting offshore rocks in the nearshore waters of SCI, the associated biological communities are essentially islands within themselves. Invertebrates, including bivalves (mussels, scallops, etc.), echinoderms (seastars and urchins), and other invertebrate families, benefit from the continual inundation of cool productive water to promote growth. Some invertebrate species, primarily mussels and scallops, grow in high densities, and to a larger size, due to the lack of predators from spatial isolation. Fish congregate near offshore rocks and structures to take advantage of associated food items and protection from predation. Subsequently, offshore rocks contribute to the richness of both terrestrial and marine systems on multiple trophic levels and play an important role in sensitive island populations.

Current Management

The CCNM Resource Management Plan Record of Decision was signed September 2005. The purpose of the CCNM Resources Management Plan (BLM 2005) is to establish guidance, objectives, policies, and management actions for the public lands of the CCNM administered by the U.S. Department of the Interior's BLM. The CCNM Resources Management Plan attempts to resolve a wide range of natural resource and land use issues within the CCNM area in a comprehensive manner. The document addresses and integrates, where possible, the numerous related management issues of the various current and potential future coastal partners who are included in the planning effort. Vegetation and wildlife objectives listed in the Resources Management Plan include: to maintain the natural quality and integrity of native vegetation on the CCNM; restore the quality and integrity of native vegetation and wildlife habitat where it has been determined to be impaired as a result of human activities, or non-native invasive species; and maintain habitat for native populations of seabirds, pinnipeds, and intertidal species throughout the monument.

The Navy and the BLM entered into a Memorandum of Understanding (MOU) (BLM MOU No. CA-939-08-02). The MOU established an interim agreement whereby the Navy will serve as a Steward for portions of the CCNM off the shoreline of SCI administered by NBC. The authority for the Navy to enter into such an MOU is derived from EO 13352 (06 August 2004) *Facilitation of Cooperative Conservation*, which requires the Secretaries of Defense and Interior to carry out activities of their respective agencies that relate to the environment and the natural resources in a manner that facilitates cooperative conservation. In the MOU, the Navy agrees to designate a contact person to serve as the Navy liaison with CCNM, cooperate in defining monitoring and research needs, develop a strategy to implement protection, monitoring, and research needs consistent with the Naval Base Point Loma INRMP, avoid and minimize negative impacts as practicable and consistent with the Navy mission, provide BLM with reasonable access, and report to BLM annually on know impacts to CCNM and Navy activities and/or actions.

Aerial photographic surveys were taken from 1991 to 2009 (excluding 2004) and boat and ground surveys were taken from 1991 to 1996 (excluding 1992 and 1993) to assess the habitat use and the breeding status of the Xantus's (Scripps's/Guadalupe) murrelet, ashy storm-petrel, and black storm-petrel (*Oceanodroma melania*) (Carter et al. 2009). Boat and land surveys were taken in 1991 to 1996 (excluding 1992 and 1993) to assess the breeding population size and distribution of the Brandt's cormorant (*Phalacrocorax penicillatus*), double-crested cormorant (*Phalacrocorax auritus*), pelagic cormorant (*Phalacrocorax pelagicus*), western gull, and black oystercatcher (Carter et al. 2010). Additional surveys in 2008 for the Xantus's (Scripps's/Guadalupe) murrelet assessed the population size of breeding colonies and genetics throughout its range (Carter et al. 2009). Annual aerial photographic surveys will continue for cormorant and gull colonies while surveys for murrelets and ashy storm-petrels will occur at a frequency that provides sufficient data to monitor trends, devise effective management and document the results of management.

Assessment of Resource Management

- While the Navy has completed important seabird surveys on the offshore rocks, the Navy should consider incorporating applicable management strategies, as feasible, from the CCNM Resource Management Plan (BLM 2005) into current and future natural resources projects.
- Surveys capturing seabirds nesting and resting on offshore rocks adjacent to SCI have provided important information on the presence, size, and trends of seabird populations around the island. Seabird surveys are ongoing and necessary to gain a better understanding of seabird populations, both for species as a whole as well as for regional populations.
- Current and planned future seabird monitoring meets the CCNM Resource Management Plan "management action" standards (MA-WLD-2) for inventory/surveys of seabirds.
- The Navy has reconfigured specific range areas to successfully avoid impacts to Castle Rock, part of the CCNM on the northern end of the island.
- The Navy's current management does not meet the CCNM Resource Management Plan's recommended action of assessing the status of invasive wildlife on CCNM offshore rocks. Future studies should be conducted to evaluate the presence of non-native species on offshore rocks.

Management Strategy

Objective: *Maintain the integrity of offshore rocks adjacent to SCI to support a viable community with natural abundance and composition of native vegetation and wildlife.*

I. Continue to support the MOU between the U.S. Navy and the Bureau of Land Management regarding the management of offshore rocks at SCI within the California Coastal National Monument.

- ***A.*** Continue to monitor seabird populations utilizing offshore rocks, with an emphasis on breeding seabird species.
- ***B.*** Survey this community for use by plants and animals, with an emphasis on endemics and non-native invasive species.
- ***C.*** Monitor and control invasive plant species, as practical and necessary.
- ***D.*** Avoid and minimize negative impacts to offshore rocks as practicable.
- ***E.*** Provide BLM staff with reasonable access.
- ***F.*** Include BLM staff in annual INRMP stakeholder meetings to assess partnership and CCNM management as addressed within the INRMP.

II. Survey for use by cats and rats and expand predator management, if needed.

3.9 Plant, Fish, and Wildlife Populations

This section describes the ecological function of the plant, fish, and wildlife populations within the various terrestrial, coastal, and marine habitats previously discussed in this chapter.

3.9.1 Flora

See Section 3.7.1 Vegetation and Land Cover Types for a description of the flora and associated habitats on SCI.

3.9.1.1 Rare Plant Populations and Endemics

The isolation of SCI has resulted in the presence of numerous rare and/or endemic plant species (See Section 3.2 Ecological Isolation and Consequences for Island Communities).

Island-wide rare plant surveys were conducted by the Santa Barbara Botanical Garden in 1996–1997 and again in 2003–2006 (Junak and Wilken 1998; Junak 2006). Additional surveys are conducted periodically for management and/or monitoring purposes. Junak (2006) identified more than 1,700 individual populations of sensitive plants. However, these surveys did not attempt to comprehensively survey the entire island or revisit all previously discovered populations. Therefore, previously known populations not in areas specifically covered by Junak and Wilken (1998) and Junak (2006) are presumed extant (still in existence). Distribution maps in this INRMP show historical populations, as well as populations identified in Junak and Wilken (1998) and Junak (2006).

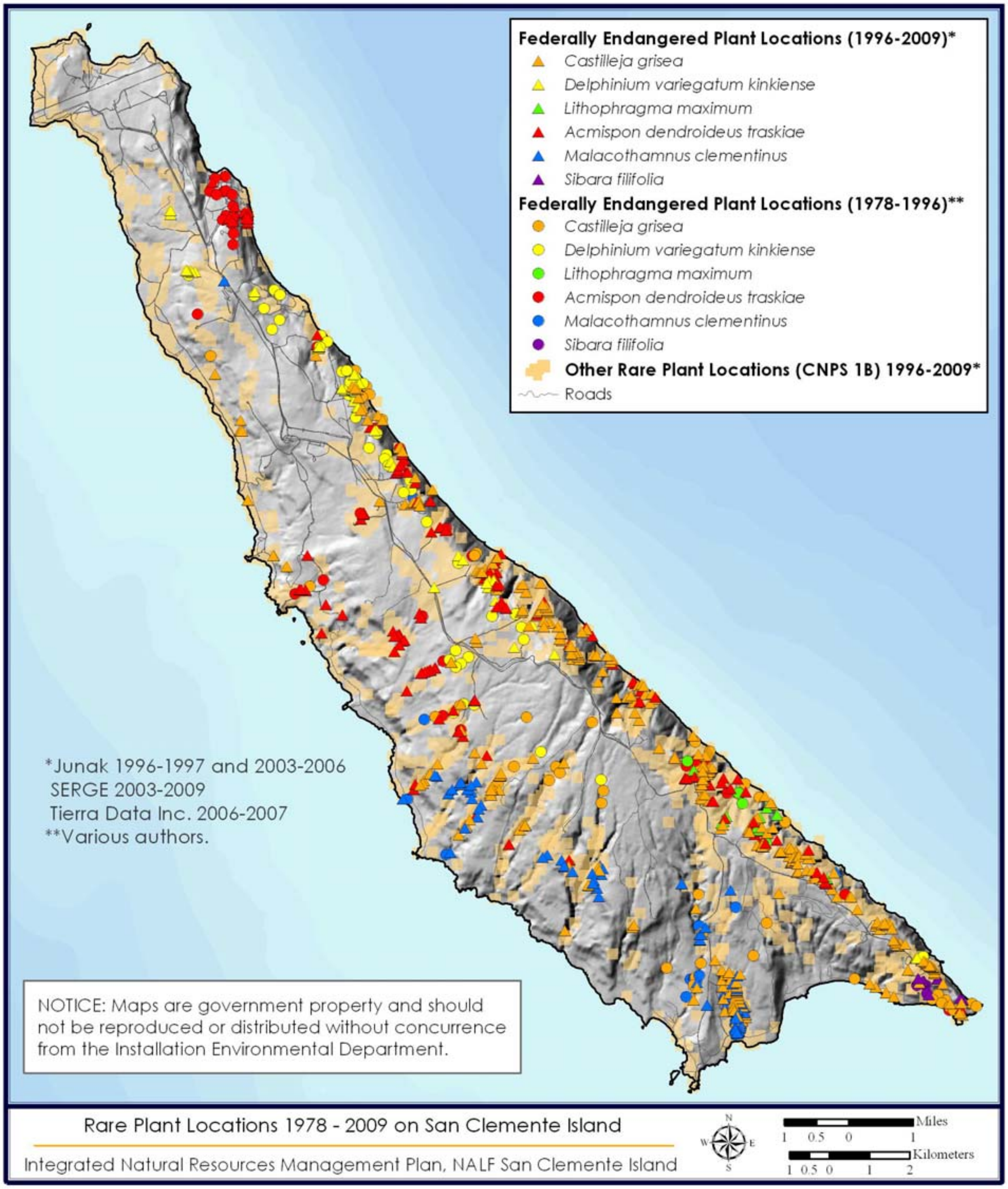
To supplement island-wide surveys, rare plant surveys of SWATs 1 and 2 (including TARs 1–4) and TARs 5, 6, 9–18, 21, and 22 (including a 328-foot [100-m] buffer around all perimeters) were conducted in 2005 and are included in the GIS analysis for the SOCAL EIS (Navy 2008).

Focused rare plant surveys in the AVMC, including the AVMAs, AMPs, AFPs, and IOA, were initiated in 2006 and completed in 2007 by TDI under contract with the Navy (TDI 2008b). In 2006, 1,992 acres (800 ha) were surveyed within the AVMC; additional surveys performed in 2007 brought the total area surveyed to 3,547 acres (1,435 ha). Surveys identified more than 33 sensitive species, of which there were 36,000 rare plants. A majority of the rare plant locations were found along the edge of the eastern escarpment and downslope beyond the limits of the survey area. Three of the four federally-listed species were present in very low numbers within the IOA; these species are generally abundant outside of the IOA and occur along much of the length of the island.

There are six plant species on SCI that are listed as endangered by USFWS (Map 3-14): San Clemente Island lotus (Section 3.9.3.1), San Clemente Island indian paintbrush (Section 3.9.3.2), San Clemente Island larkspur (Section 3.9.3.3), San Clemente Island woodland star (Section 3.9.3.4), San Clemente Island bush-mallow (Section 3.9.3.5), and Santa Cruz Island rockcress (Section 3.9.3.6).

The island-wide distribution of rare plants is shown in Map 3-14. In total, there are 42 species found on SCI that are endemic to SCI or the Channel Islands (Table 3-17).

1



2 *Map 3-14. Rare plant locations (1978–2009) on San Clemente Island.*

Table 3-17. Endemic plant species and Species of Concern on San Clemente Island. Plants are listed in taxonomic order according to The Jepson Manual 2nd Edition (Baldwin et al. 2012) .

Scientific Name	***Common Name***	***USFWS, CDFW Status***	***CNPS Status***	***Global Rank & State Rank***
SCI ENDEMICS				
Acmispon argophyllus var. *adsurgens*	San Clemente Island bird's-foot trefoil	SE	1B.1	G5T1, S1.1
Acmispon dendroideus var. *traskiae*	San Clemente Island lotus	FE, SE	1B.1	G4T2, S2.1
Astragalus nevinii	San Clemente Island milkvetch		1B.2	G2, S2.2
Brodiaea kinkiensis	San Clemente Island brodiaea		1B.2	G2, S2.2
Camissoniopsis guadalupensis subsp. *clementina*	San Clemente Island evening primrose		1B.2	G2T2, S2.2
Castilleja grisea	San Clemente Island indian paintbrush	FE, SE	1B.2	G2, S2.2
Delphinium variegatum subsp. *kinkiense*	San Clemente Island larkspur	FE, SE	1B.1	G4T1, S1.1
Delphinium variegatum subsp. *thornei*	Thorne's royal larkspur		1B.1	G4T1, S1.1
Eriogonum giganteum var. *formosum*	San Clemente Island buckwheat		1B.2	G2T2, S2.2
Galium catalinense subsp. *acrispum*	San Clemente Island bedstraw	SE	1B.2	G4T2, S2.2
Lithophragma maximum	San Clemente Island woodland-star	FE, SE	1B.1	G1, S1.1
Malacothamnus clementinus	San Clemente Island bush-mallow	FE, SE	1B.1	G1G3, S1S3.2
Munzothamnus blairii	Blair's wirelettuce		1B.2	G2, S2.2
Triteleia clementina	San Clemente Island triteleia		1B.2	G1, S1.2
CHANNEL ISLAND ENDEMICS				
Artemisia nesiotica	island sagebrush		4.3	G3, S3.3
Astragalus miguelensis	San Miguel Island milkvetch		4.3	G3, S3.3?
Calystegia macrostegia subsp. *amplissima*	island morning-glory		4.3	G4G5T3, S3.3
Ceanothus megacarpus var. *insularis*	island big-pod ceanothus		4.3	G5T3, S3.3
Constancea nevinii	Nevin's woolly sunflower	FC2	1B.3	G2, S2.3
Cryptantha traskiae	Trask's cryptantha		1B.2	G2, S2.2
Deinandra clementina	island tarplant		4.3	G3, S3.3
Dendromecon harfordii var. *rhamnoides*	Channel Island tree poppy		1B.1	G4T1, S1.1
Dissanthelium californicum	California dissanthelium		1B.2	G1, S1.2
Dudleya virens subsp. *virens*	bright green dudleya	FC2	1B.2	G2T1, S1.2
Eriogonum grande var. *grande*	island buckwheat		4.2	G3T3, S3.2
Eschscholzia ramosa	island poppy		4.3	G3, S3.3
Gambelia speciosa	showy island snapdragon		1B.2	G2, S2.2
Gilia nevinii	Nevin's gilia		4.3	G3, S3.2
Hazardia cana	San Clemente Island hazardia		1B.2	G2, S2.2
Jepsonia malvifolia	island jepsonia	FC2	4.2	G3, S3.3
Malva assurgentiflora	island mallow (malva rose)		1B.1	G2T2, S2.1
Leptosiphon pygmaeus subsp. *pygmaeus*	pygmy leptosiphon		1B.2	G4T1, S1.2
Lomatium insulare	San Nicolas Island lomatium		1B.2	G2, S2.1
Lupinus guadalupensis	Guadalupe Island lupine	FC2	1B.2	G2, S2.2
Lyonothamnus floribundus subsp. *asplenifolius*	Santa Cruz ironwood	FC2	1B.2	G2T2, S2.2
Malacothrix foliosa subsp. *foliosa*	leafy malacothrix		4.2	G4T3, S3.2
Mimulus aurantiacus var. *parviflorus*	island bush monkeyflower		4.3	G3Q, S3.3
Phacelia floribunda	San Clemente Island phacelia		1B.2	G2, S1.1
Quercus tomentella	island oak		4.2	G3, S3.2
Rhamnus pirifolia	island redberry		4.2	G3, S3.2
Scrophularia villosa	Santa Catalina figwort		1B.2	G2, S2.2
Sibara filifolia	Santa Cruz Island rockcress	FE	1B.1	G1, S1.1
Trifolium palmeri	Palmer's clover		4.2	G5T3, S3.2
OTHER NATIVES				
Aphanisma blitoides	aphanisma		1B.2	G2, S1.1
Crossosoma californicum	island apple-blossom		1B.2	G3, S3.2

Table 3-17. Endemic plant species and Species of Concern on San Clemente Island. Plants are listed in taxonomic order according to The Jepson Manual 2nd Edition (Baldwin et al. 2012) (Continued).

Scientific Name	**Common Name**	**USFWS, CDFW Status**	**CNPS Status**	**Global Rank & State Rank**
Lepidium virginicum subsp. *menziesii*	Robinson's pepper-grass		1B.2	G5T2?, S2.2
Lycium brevipes var. *hassei*	Santa Catalina Island desert thorn		1B.1	G1Q, S1.1
Microseris douglasii subsp. *platycarpha*	small-flowered microseris		4.2	G4T3, S3.2

USFWS and CDFW Codes: FC2=Former Category 2, FE=federally endangered, SE=state endangered;

CNPS Codes: 1A=Presumed extinct in California, 1B=Rare or endangered in California and elsewhere, 2=Rare or endangered in California, more common elsewhere, 4=plants of limited distribution;

Global and state California Natural Diversity Database Rank: GH=All sites are historical, has not been seen in 20 years, but suitable habitat still exists, G1=Less than 6 viable element occurrences or less than 1,000 individuals or less than 2,000 acres, G2=6–20 element occurrences or 1,000–3,000 individuals or 2,000–10,000 acres, G3=21–100 element occurrences or 3,000–10,000 individuals or 10,000–50,000 acres, G4=Apparently secure but some factor exists to cause some concern, G5=Population or stand demonstrably secure; T-rank=reflects the global status of the subspecies using same definitions as the G-rank; S-rank=the status within California using same definitions as G-rank with the addition of threat categories: 0.1=very threatened, 0.2=threatened, 0.3=no current threats known.

Several plant species formerly located on the island are presumed extinct or extirpated (Table 3-18) or have a greatly reduced presence on SCI (Table 3-19).

Table 3-18. Native taxa thought extirpated from San Clemente Island (Ross et al. 1997; S. Junak, pers. com. 2000).

Native Taxa Thought Extirpated from San Clemente Island	
Anemopsis californica	*Batis maritime*
Dendromecon harfordii var. rhamnoides	*Lomatium insulare*
Lycium brevipes var. *hassei*	*Malacothrix incana*
Mimulus floribundus	*Senecio flaccidus* var. *douglassii*

Table 3-19. Native species reduced to very low numbers (Ross et al. 1997; S. Junak, pers. com. 2000).

Native Species Reduced to Very Low Numbers		
Adenostoma fasciculatum	*Gnaphalium palustre*	*Phalaris lemmonii*
Allophyllum glutinosum	*Grindelia* sp.	*Polycarpon depressum*
Aphanes occidentalis	*Heliotropium curassavicum*	*Pseudognaphalium stramineum*
Astragalus didymocarpus	*Hesperevax sparsiflora*	*Psilocarphus brevissimus*
Athysanus pusillus	*Hornungia procumbens*	*Quercus chrysolepis*
Brickellia californica	*Lepidium latipes*	*Rhus ovate*
Callitriche longipedunculata	*Lepidium virginicum* subsp.*menziesii*	*Ribes malvaceum*
Camissoniopsis micrantha	*Lonicera hispidula*	*Ruppia maritima*
Ceonothus megacarpus	*Lupinus hirsutissimus*	*Salicornia pacifica*
Cistanthe maritime	*Lycium brevipes*	*Salix gooddingii*
Collinsia heterophylla	*Madia sativa*	*Salvia columbariae*
Convolvulus simulans	*Malosma laurina*	*Salvia mellifera*
Cressa truxillensis	*Malvella leprosa*	*Sambucus nigra* subsp. *caerulea*
Cuscuta occidentalis	*Mentzelia micrantha*	*Sesuvium verrucosum*
Deschampsia danthonioides	*Microseris elegans*	*Silene laciniata*
Descurainia pinnata	*Minuartia douglasii*	*Stellaria nitens*
Eleocharis macrostachya	*Monolepis nuttalliana*	*Stuckenia pectinatus*
Elymus condensatus	*Nama stenocarpum*	*Symphyotrichum subulatum ligulatus*
Emmenanthe penduliflora	*Orobanche fasciculata*	*Trifolium fucatum* var. *gambeii*
Epilobium brachycarpum	*Papaver heterophyllum*	*Tropidocarpum gracile*
Eremalche exilis	*Pellaea mucronata*	*Verbena bracteata*
Eriastrum filifolium	*Phacelia distans*	*Woodwardia fimbriata*
Euphorbia spathulata	*Phacelia floribunda*	*Yabea microcarpa*
Festuca octoflora	*Phacelia lyonii*	*Zeltnera davyi*

3.9.1.2 Genetic Studies

Genetic factors play an important role for continued survival of populations. Genetic variation has been shown to increase survival and reproduction of individuals in populations of many species (fitness), which, therefore, lead to an increase in population growth. Additionally, genetic variation helps to avoid inbreeding that can often cause reduced survival and reproduction.

Dr. Kaius Helenurm and other researchers at the University of South Dakota conducted genetic studies (Dodd and Helenurm 2000, 2002; Helenurm et al. 2005; Helenurm pers. com. 2012) to determine the genetic variation of endangered and sensitive species at SCI (Table 3-20). The project's overall goals included quantifying genetic diversity, assessing the importance of genetic factors for population growth, and developing species specific recovery strategies based on all available data. Potential implications of genetic variability for management are:

- More variable populations are more valuable to the species as a whole and, therefore, may require greater protection.
- If populations of a species possess different alleles, it may be beneficial to protect as many populations as possible.
- More variable populations can provide good sources for reintroduction of a species.
- Genetic variation can be a good indicator of the efficacy of current management strategies.

Table 3-20. Genetic variability of sensitive plant species on San Clemente Island (Helenurm pers. com. 2012).

Species	Genetic Variation Within the Species	Genetic Variation Within Populations	Genetic Variation Among Populations
Acmispon argophyllus var. *adsurgens*	Very Low	Very Low	NA
Acmispon dendroideus var. *traskiae*	Low	Low	NA
Astragalus nevinii	High	Low	Low
Camissoniopsis guadalupensis subsp. *clementina*	Medium	Low	Very High
Castilleja grisea	Medium	Medium	Medium
Coreopsis gigantea	Very Low	Very Low	NA
Crossosoma californicum	Very Low	Very Low	Medium
Cryptantha traskiae	Low	Very low	Very Low
Delphinium variegatum subsp. *kinkiense*	Medium	Medium	Very Low
Delphinium variegatum subsp. *thornei*	Medium	Medium	Very Low
Eriogonum giganteum var. *formosum*	Low	Low	Medium
Eriogonum grande var. *grande*	Low	Low	Medium
Galium catalinense subsp. *acrispum*	Medium	Medium	Medium
Jepsonia malvifolia	Very High	High	Medium
Lavatera assurgentiflora subsp. *glabra*	Low	Low	Medium
Lithophragma maximum	Very Low	Very Low	Very High
Lyonothamnus floribundus subsp. *asplenifolius*	Low	Low	High
Malacothamnus clementinus	Low	Low	High
Phacelia floribunda	Very Low	Low	High
Quercus tomentella	Low	Low	High
Rhamnus pirifolia	Medium	Medium	Medium
Scrophularia villosa	Low	Low	Very High
Sibara filifolia	Very low	Very Low	Medium
Triteleia clementina	Low	Low	High

3.9.1.3 Cryptogams

The lichen flora (Photo 3-41) of SCI has been poorly studied, with only one historical publication (Hasse 1903) dedicated exclusively to it. Hasse recorded 22 species on the basis of collections by Blanche Trask. Bowler et al. (2006) reported on collections made by Bill Weber of the University of Colorado Natural History Museum in April 1966, together with several other collections made by the authors from the early 1990s. Their total collection contained 130 species in 69 genera. A later collection by Bratt 1999 added 57 previously unreported species, including several rare species. See Appendix C for a complete list of identified lichens on SCI. One notable discovery was the woven-spore lichen (*Texosporium sancti-jacobi*), found on two adjacent locations in Chenetti Canyon. This species had never been recorded on any of the Channel Islands, and is only the fourth recorded location in California. An additional comment by Bratt (1999) suggested that there may be a number of remaining unreported species in deep, difficult to access canyons on the southwest side of SCI; access to this area is severely restricted due to military training and safety concerns. However, according to Bratt (1999), “younger and more agile lichenologists will find much area left to explore…and many more specimens to be identified.”

Photo 3-41. Lichen-covered rock on San Clemente Island (Tierra Data Inc. 2010).

Lichens come in two types: corticolous, which use plant stems as a substrate, and saxicolous, which use rock surfaces as a substrate. Since much of SCI and other Channel Islands were severely grazed from the late 19th through the 20th centuries, much of the woody flora was decimated by grazing. The extent of impact (and possible extirpation) on corticolous lichens is not known since grazing was well underway by the time botanists arrived to survey plant species distribution and abundance in the early 20th century.

According to Bowler et al. (1996), the most intact and developed lichen community is located in the maritime scrub formation. Eel Point is cited as “an outstanding example of this community with comparable sites occurring in northwestern Baja California, Mexico.” The lichen flora of Eel Point is similar to coastal northwestern Baja than to similar stretches of maritime scrub on mainland California.

3.9.1.4 Macroalgae

Giant Kelp. Giant kelp provides much of the structure and biomass of central and southern California kelp forests (Foster and Schiel 1985). Giant kelp flourish in wave-exposed areas of nutrient-rich cool water, ranging from 20 to 120 feet (7 to 60 m) deep, 50° to 60°F (10° to 15°C), and bottom light intensities above 1% that of the surface (Leet et al. 2001). The kelp will attach to rocky substrate by means of a holdfast. Kelp fronds, which are composed of a stem-like stipe and numerous leaf-like blades, originate from the holdfast, eventually growing to the surface and forming a "kelp forest" (Leet et al. 2001). A gas-filled bladder (pneumatocyst) at the base of each blade helps keep the frond buoyant in the water column. Giant kelp can reach lengths of up to 196 feet (60 m) and the fronds can grow up to 24 inches per day (60 cm per day) (Leet et al. 2001).Giant kelp forests are especially well developed along the Pacific coast of North America from central California to Baja California. Giant kelp in the northern hemisphere ranges from Ano Nuevo Island in central California to Punta Asuncion-Punta San Hipolito in Baja California, Mexico (Foster and Schiel 1985).

Giant kelp is a perennial alga that undergoes natural seasonal change in abundance and distribution, due to biological interactions (such as diseases or over-grazing by sea-urchins), pollution, storms, and oceanographic conditions, such as El Niño and La Niña (Leet et al. 2001). Warmer, nutrient-stressed El Niño conditions can deter growth and development of a canopy. During these conditions, there is less canopy coverage on the sea surface and more sunlight can penetrate to the understory macrophytes, which can grow in spite of lower nutrients. In contrast, during the cold, nutrient-rich La Niña conditions, giant kelp grow an extensive, shady canopy that can inhibit growth for some of the understory.

Bull Kelp. Although bull kelp (*Nereocystis luetkeana*) has the same ecological role as giant kelp, the morphology is quite different. Bull kelp has a smaller, although similar, holdfast to attach to rocky substrate and only contains one pneumatocyst, situated on the end of the hollow stipe for flotation. Bull kelp is also more elastic under stress, enabling it to stretch more than 38% of its length before breaking (Leet et al. 2001). Thus, following heavy winter storms, bull kelp can become more abundant and sometimes replace much of the giant kelp in southern California (Leet et al. 2001). It flourishes in wave-exposed areas of nutrient-rich cool water 10 to 70 feet (3 to 20 m) deep and 40° to 60°F (4° to 15°C) (Leet et al. 2001). Bull kelp is an annual alga and can reach maximum growth rates of up to 5 inches (13 cm) per day under optimal environmental conditions of high light, nutrients, and water clarity.

Bull kelp is primarily found adjacent to exposed shorelines along the Pacific coast of North America, ranging from Unalaska Island, Alaska to Point Conception, California. Very little information is available concerning the percentage of bull kelp within the giant kelp forests of southern California. In this region bull kelp is generally restricted to areas that are unsuitable for giant kelp, including the inshore area, the surge zone, and the outer edges of the giant kelp beds (Leet et al. 2001).

Algal Assemblages Associated with Kelp Forests. There are abundant algal assemblages associated with the understory of floating kelp forests. Stipitate (understory canopy) kelps generally extend a few meters above the sea floor and form important subsurface canopies; in southern California these species include stalked kelp (*Pterygophora californica)*, southern sea palm (*Eisenia arborea*), and several species of broadleaf kelp (*Laminaria* spp.) (Navy 2005). Stalked kelp and southern sea palm form dense canopies 3 to 6 feet (1 to 2 m) above the canopy floor, while blades of broadleaf kelp lie across the surface of the reef (Graham et al. 2008). Beneath these kelp layers is a diverse group of red, green, and brown foliose, turfing, and encrusting algae (Breda and Foster 1985; Harrold et al. 1988; Graham 2004). The foliose and turfing algae provide key habitat and energy resources to epifaunal species that, in turn, can be important food sources for higher trophic levels, including fishes (Hobson and Chess 1986; Coyer 1987; Holbrook et al. 1997).

3.9.2 Fauna

3.9.2.1 Terrestrial Invertebrates

Insects

Insects play ecologically crucial roles in the ecosystem. They are: important food items for many birds, small mammals, and lizards; are essential for decomposition and soil formation processes; and are vital to the reproduction of many island plant species as pollinators.


Grey hairstreak butterfly (TDI 2010).

Island faunas generally exhibit low diversity when compared with nearby mainland faunas of similar size (Miller 1984). However, insects represent the largest and most diverse group of organisms among the Channel Islands, although knowledge of the diversity and distribution of insects on these islands is poorly understood (Menke 1985; Miller 1985). Insects are found throughout all habitats, most of which have not been adequately inventoried on SCI.

Insects of the Channel Islands are also typically found on the mainland; however, the Channel Islands harbor endemic species and subspecies as well. Insect assemblages differ between the northern and southern Channel Islands. The southern islands support a higher number of California endemics and have the greatest affinity with insects of more arid climates, such as southern coastal and foothill habitats and environs of the Mojave and Colorado deserts (Powell and Hogue 1979).

Several studies were published systematically examining the insect faunas of the Channel Islands. However, only specific groups of insects were examined (e.g., wasps of the family Sphecidae, bees, mealybugs, lepidopterans, and orthopterans). In all groups surveyed, SCI contains lower diversity when compared to other Channel Islands (Rentz and Weissman 1981; Rust et al. 1985; Powell 1994). A summation of the five specific, well-studied groups demonstrate that species diversity increases as an area of the island increases, a result supporting the theory of island biogeography (MacArthur and Wilson 1967).

A review in 2010 of published literature and on-line museum databases was completed to assemble a list of arthropod fauna for SCI; this yielded a list of approximately 376 species (TDI 2011c). General insect surveys on SCI conducted in 2010 expanded the island-wide species list to approximately 536 species (TDI 2011c; See Appendix C). Considering that the 2010 surveys were conducted at just nine locations across the island, the total number of insect species present on SCI would likely continue to expand as surveys at other locations are conducted.

Fairy Shrimp. Bitterroot Restoration (2002) conducted a preliminary survey of wetlands and drainages throughout SCI. Areas with potential to support federally-listed branchiopods (fairy shrimp) were surveyed for presence in accordance with USFWS protocol. These small crustaceans can be important food sources for migrating birds and other wildlife. Wet and dry season sampling for fairy shrimp were conducted in February and October 2001, respectively (Bitterroot Restoration 2002). Fairy shrimp or their cysts (eggs) can be transported between pools by birds, foot traffic, overland drainage, and off-road wheeled and tracked vehicles. Wet season sampling found that the common versatile fairy shrimp (*Branchinecta lindahli*) was present in 66% (368 pools) of sampled pools. Dry season results found fairy shrimp cysts in of 420 pools[4] sampled. The federally endangered San Diego fairy shrimp (*Branchinecta sandiegonensis*) was not found in any of the vernal pools or wetlands during the wet or dry season sampling; therefore, this species is not likely to occur on SCI.

Land Snails. The Channel Islands are home to 23 different species of snails, one of the richest clusters of land snails in the western United States. SCI has the largest snail population of the Channel Islands, including eight extant and two extinct species (Cohen 1980; USFWS 1984).

Endemism. Endemism among island invertebrate fauna is quite common (Chatzimanolis et al. 2010). There are over 100 insect species endemic to the Channel Islands, of which 43 occur on SCI (Table 3-21), including 27 endemic to SCI (USFWS 1984; Miller 1985; Navy 2002). Three endemic invertebrates located on SCI are listed as California special status species (CDFW 2011; Table 3-21).

Table 3-21. Endemic and sensitive invertebrates of San Clemente Island.

Scientific Name	Common Name	USFWS, CDFW Status	Global, State CNDDB Rank
EXTINCT/EXTIRPATED			
MOLLUSCA			
Micrarionta agnesae	land Snail		
Micrarionta feralis	land Snail		
SCI ENDEMICS			
COLEOPTERA			
Amara clementina	ground beetle		
Amara insularis	ground beetle		
Attalus transmarinus	soft-wing flower beetle		
Celia clementina	ground beetle		
Cleonus basalis	snout beetle		
Coenonycha clementina	San Clemente Island coenonycha beetle	FSC, CNDDB	G1?, S1?
Colaspidea subvittata	leaf beetle		
Dasytes clemente	soft-wing flower beetle		
Melanophthalma insularis	minute brown scavenger beetle		
Pterostichus gliscans	ground beetle		
Sciopithes insularis	root weevil		
DIPTERA			
Efferia clementi	robber fly		
Mythicomyia discreta	fly		
HOMOPTERA			
Heliococcus clemente	mealybug		

4. Cysts were found in 80 pools in which fairy shrimp had not been found during wet season sampling the preceding February; dry season sampling in some pools in which shrimp had been found during the wet season did not reveal cysts.

Table 3-21. Endemic and sensitive invertebrates of San Clemente Island.

Scientific Name	***Common Name***	***USFWS, CDFW Status***	***Global, State CNDDB Rank***
HYMENOPTERA			
Ammophila azteca clemente	thread-waisted wasp		
Bembix americana dugi	sphecid wasp		
Camponotus sp. nr. clarithorax	carpenter ant		
Camponotus sp. nr. semitestaceus	carpenter ant		
Pheidole clementensis	harvester ant		
LEPIDOPTERA			
Agonopterix toega	Grass miner moth		
Argyrotaenia fraciscana insulana	moth		
Pero nr. giganteus	moth		
Pterotaea crinigera	moth		
Scrobipalpula n. sp.	moth		
Scrobipalpula n. sp. *nr. chiquitella*	moth		
ORTHOPTERA			
Cnemotettix pulvillifer	silk-spinning cricket		
OTHER ARTHROPODS			
Lutica clemntea	ground spider		
Protolphus cockerelli	harvestman		
Tigolene clementius	millipede		
MOLLUSCA			
Micrarionta gabbi	Gabb's snail	FSC, CNDDB	G1, S1
Micrarionta intercisa	land snail		
Micrarionta redimita	land snail		
CHANNEL ISLAND ENDEMICS			
COLEOPTERA			
Apsena grossa	beetle		
Coelus pacificus	Channel Islands dune beetle	FSC	G?, S?
Coniontis lata	darkling beetle		
Eleodes laticollis apprimus	darkling beetle		
Eusattus robustus	beetle		
Trichochorus pedalus	beetle		
Xarifa insularis	beetle		
LEPIDOPTERA			
Cerostoma lyonothamnae	moth		
Coleotechnites n. sp.	moth		
Stigmella n. sp.	moth		
Ypsolopha lyonothamnae	moth		
Zosteropoda clementei	moth		
HYMENOPTERA			
Aphaenogaster patruelis	spine-waisted ant		
Camponotus bakeri	carpenter ant		
Palmodes insularis	thread-waisted wasp		
OTHER ARTHROPODSS			
Ixodes peromysci	shield tick		
MOLLUSCA			
Sterkia clementina	SCI blunt-top snail	CNDDB	G1, S1
Vertigo californica longa	snail		
Vertigo californica catalinaria	snail		

USFWS and CDFW Codes: FSC=federal Species of Concern; CNDDB=California Natural Diversity Database “special animals” (2011)

Global and state California Natural Diversity Database Rank: G1=Less than 6 viable element occurrences or less than 1,000 individuals or less than 2,000 acres, S-rank=the status within California, using same definitions as G-rank.

Current Management

While no direct management actions are currently taken for terrestrial invertebrates, management and enhancement actions undertaken to promote the recovery of island vegetation and control erosion will enhance habitat for invertebrate species on SCI.

Assessment of Resource Management

- While a number of terrestrial invertebrate surveys have been conducted on SCI, no systematic, island-wide inventory of island terrestrial invertebrates has been conducted. A comprehensive invertebrate survey must be completed to begin to understand the role of terrestrial invertebrates on SCI.

Management Strategy

Objective: *Identify and conserve terrestrial invertebrate abundance and biodiversity as a source of food for insectivorous wildlife and pollination for island flora.*

I. Assess the status and trends of endemic terrestrial invertebrate species on SCI.

    A. Conduct periodic invertebrate surveys, including in habitats under-represented in previous surveys (i.e., canyon woodlands), to expand knowledge of island invertebrate diversity and abundance.

Each INRMP shall maintain a relevant and updated baseline list of plant and animal species located at each installation for all pertinent taxonomic and regionally important groups (DoDINST 4715.03).

3.9.2.2 Marine Invertebrates

It is estimated that more than 5,000 marine invertebrate species can be found in the SCB (Dailey et al. 1993). The variety of depths and bottom conditions around SCI provide habitat for a large number of those (Photo 3-42), including 51 mollusk species, 17 arthropod species, ten species of cnidaria, five species of porifora, five species of polychaetes, and four echinoderm species, with many more undoubtedly occurring around the island.

Marine invertebrates play a significant role in ecosystems as important prey items for fish, mammals, birds, and other invertebrates and also for nutrient cycling. Most marine invertebrates are filter feeders eating detritus, though some species eat primarily vegetation or other invertebrates. Relatively little is known about the ecology of marine invertebrates.

Historically, SCI has been a popular location for harvesting many marine invertebrates, including abalone and lobsters. While lobster fishing remains popular throughout the nearshore waters of California, there is currently a moratorium in southern California on abalone harvesting. For more information on the ecological role of sea urchins in kelp forests, see Section 3.9.3 Federally Threatened and Endangered Species.

Abalone

There are six species of abalone in southern California waters: white abalone, black abalone, red abalone (*Haliotis rufescens*), pink abalone (*Haliotis corrugata*), green abalone (*Haliotis fulgens*), and flat abalone (*Haliotis walallenis*) (Table 3-22). These species occur in coastal waters from the intertidal zone to 197 feet (60 m) in depth. Abalone are found in rock habitat; most species are associated with kelp forests. Different species may be found occupying the same coastal area, but will occur at different depths.

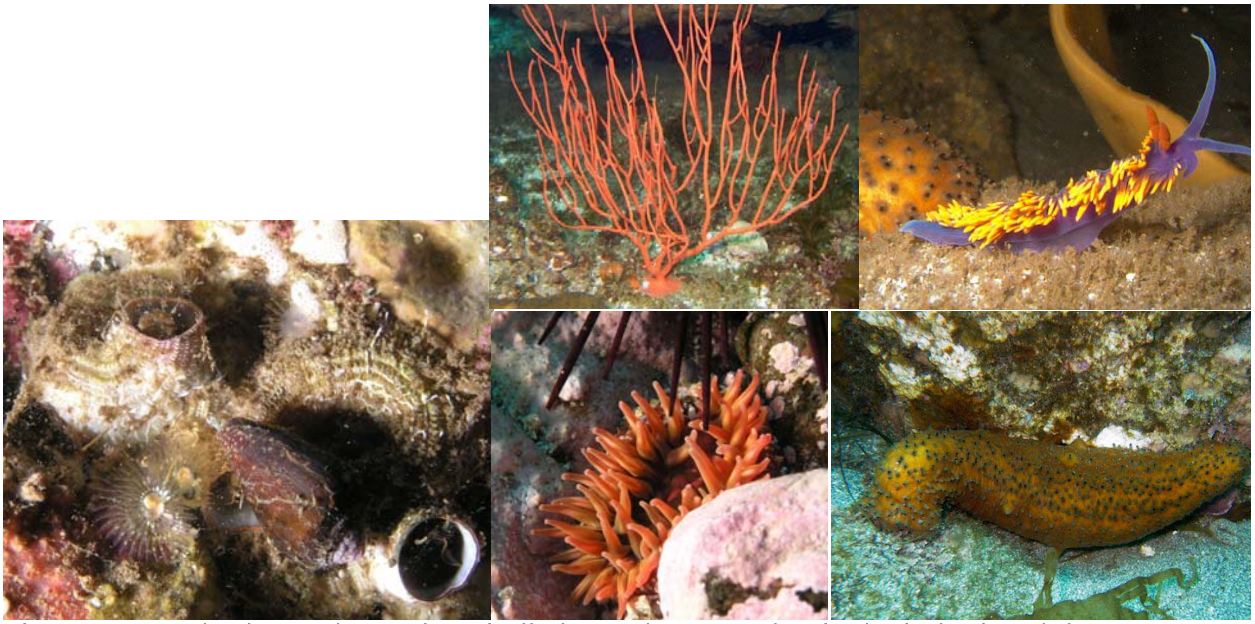


Photo 3-42. Marine invertebrates found off of San Clemente Island. Clockwise from left: an assemblage of invertebrates, red gorgonian, Spanish dancer nudibrach, warty sea cucumber, and stubby rose anemone (Tierra Data Inc. 2008–2009).

Abalone have separate sexes and are broadcast spawners, releasing millions of eggs or sperm into the water column during a spawning event. When populations drop below the minimum spawning density, individuals are often too far apart to ensure successful reproduction. Therefore, a minimum density of spawners is essential for maintaining the populations. Abalone larvae settle and metamorphose into juvenile abalone primarily on crustose coralline algae (Saito 1981; Shepherd and Turner 1985; Kitting and Morse 1997), which is a source of food during this life stage (Garland et al. 1985).

Table 3-22. Abalone biological information summary (California Department of Fish and Wildlife 2005).

Species	***Current Range***	***Depth***	***Spawning Season***	***Foods***
red abalone	southern Oregon to Baja California, Mexico (considered absent from southern California mainland)	intertidal to 24 m	southern California: year-round	bull kelp, giant kelp, *Laminaria, Egregia, Pterygophora, Ulva*
pink abalone	Point Conception to Baja California, Mexico	lower intertidal to 60 m	March - November	*Plocamium, Eisenia, Macrocystis, Dictyopteris*
green abalone	Point Conception to Baja California, Mexico	low tide line to 18 m	early summer to early fall	*Gelidium, Pterocladia, Plocamium, Gigartina,* red algae, bull kelp, giant kelp
black abalone	San Francisco Bay to Baja California, Mexico	intertidal	late spring and summer	giant kelp, *Egregia*
white abalone	Point Conception to Baja California, Mexico	25–60 m	late winter to early spring	*Laminaria, Agarum, fimbriatum*
flat abalone	Oregon to San Diego, California	6–21 m	not known	not known

Post-larval and juvenile abalone feed mainly on bacteria, benthic diatoms, and single-celled algae that form surface films on rocky substrate (Daume et al. 1999; Leighton 1974). Juvenile abalone eventually switch to feeding on brown, red, and green algae (Leighton 1959; Cox 1962). Adult abalone feed primarily on brown algae, often in the form of unattached, drifting kelp. However, when drifting kelp is scarce, they will feed on benthic diatom films (CDFW 2005).

Predation is a major cause of mortality in abalone populations. Vulnerability to predation is the highest during early life stages. Common predators of abalone are sea stars, rock crabs of the genus *Cancer* (Cox 1962), octopuses (Pilson and Taylor 1961), California sheephead (Cox 1962), cabezon (*Scorpaenichthys marmoratus*) (O'Connell 1953), kelp bass (*Paralabrax clathratus*), and sea otters (*Enhydra lutris*).

Commercial harvest of all abalone species in California is prohibited and recreational harvest is closed year-round south of San Francisco Bay. Currently, the white and black abalone are the only abalone species listed under the ESA. For more information on the white and black abalone, see Section 3.9.3.11 White Abalone and Section 3.9.3.12 Black Abalone.

California Spiny Lobster

The majority of the California spiny lobster (Photo 3-43) population is found between Point Conception and Magdalena Bay, Baja California (Leet et al. 2001). Adult lobsters can usually be found in rocky areas from the intertidal zone to depths of 240 feet (73 m) or more (Leet et al. 2001). Spiny lobsters mate from November through May, where the male will attach a putty-like packet of sperm, called a spermatophore, to the underside of the female's carapace. Females will release their eggs to be fertilized primarily in May and June.

Photo 3-43. California spiny lobster from San Clemente Island (Tierra Data Inc. 2009).

Adult lobster may forage in the sandy bottom at night. In daylight spiny lobster are usually found in a crevice or hole. Adult lobster are omnivorous and sometimes carnivorous; they consume algae and a wide variety of marine invertebrates, such as snails, mussels, sea urchins, and clams as well as fish (Leet et al. 2001). Lobsters are consumed by cabezon, sheephead, kelp bass, octopuses, California moray eels (*Gymnothorax mordax*), horn sharks (*Heterodontus francisci*), leopard sharks (*Triakis semifasciata*), rockfishes, and giant sea bass (*Stereolepis gigas*) (Leet et al. 2001).

A large portion of the spiny lobster population will make an annual offshore-onshore migration induced by changes in water temperatures (Leet et al. 2001). During winter, lobsters are found offshore at depths of 50 feet (15 m) and deeper. In late March through May, lobsters move into warmer onshore waters less than 30 feet (9 m) in depth. Lobster fishing season runs from early October to mid-March with a peak of take occurring in October. The CDFW currently monitors the stock and sets and enforces fishing regulations.

Sea Urchins

Sea urchins are locally abundant, subtidal herbivores that play an important ecological role in the structure of kelp forests. They are omnivorous, eating primarily foliose algae (Leet et al. 2001). In southern California, the preferred food item is giant kelp. For more information on the ecological role of sea urchins in kelp forests, see Section 3.8.2.2 Rocky Habitat and Kelp Forests.

Urchins may compete with abalone for both space and food (Leet et al. 2001). However, it is apparent that fisheries have altered this relationship. Several significant predators of sea urchins include: sea otters, spiny lobsters, sea stars, crabs, white sea urchins (*Lytechinus anamesus*), and California sheephead (Leet et al. 2001).

The commercial fishery for red sea urchins has been one of California's most valuable fisheries for more than a decade and caters mostly to the Japanese export market (Leet et al. 2001). The sea urchin fishery is relatively new, having been developed over the last 30 years, and prior to the 1970s, they were considered pests because they grazed on kelp. While the purple sea urchin (*Strongylocentrotus purpuratus*) has the potential to be harvested both commercially and recreationally, it is currently harvested in low numbers.

Zooplankton and Cephalopods

SCI is in a transition zone between subarctic, central, and equatorial zooplankton species; as a result, biomass fluctuations are accompanied by changes in species composition (CDFW 2002). Immediately north of the island, the zooplankton community is dominated by subarctic zooplankton species associated with the California current, while the offshore and southern regions of the island contain a higher diversity of organisms dominated by more central Pacific and subtropical species (Bernal and McGowen 1981).

As described in Section 3.1 Ecoregional Setting, oceanographic features and bottom topography south of Point Conception produce localized turbulence, mixing, and increased surface nutrients, which support aggregations of primary and secondary production, such as krill (Euphausiids) (Fiedler et al. 1998). North Pacific krill (*Euphausia pacifica*) is the main prey species for marine mammals in the open waters of the SCB (Brinton 1976, 1981). North Pacific krill is most abundant off shelf edges between 492 and 656 feet (150 and 200 m); during daylight hours, the species will complete a vertical migration at night to feed at the surface waters (Fiedler et al. 1998).

The California market squid (*Scomber japonicas*) is an extremely important commercially harvested pelagic squid species within the SCB (Zeiberg et al. 2006). During daylight, the squid occurs at depths between 1,640 and 2,625 feet (500 and 800 m) (Pacific Fishery Management Council 1998) and moves to the surface to feed at night. Typically, market squid within the SCB has two annual peak abundances, January to April, and November to early December, with the lowest abundance during the summer and autumn (Zeidberg et al. 2006). Other squids potentially occurring around SCI include the Humboldt squid (*Dosidicus gigas*), clubhook squid (*Moroteuthis robusta*), Boreal clubhook squid (*Onychoteuthis borealijaponica*), and flowervase jewel squid (*Histioteuthis hoylei*) (Young 1972; Roper et al. 1984).

Marine Benthic Invertebrates

Soft-bottom marine invertebrates live in or on the bottom sediments. Many species are infaunal, sedentary and live buried their entire life. Epifaunal species typically move freely on the surface of bottom sediments, usually burying themselves in sediment to feed or hide from predators. Species composition and abundance change with increasing water depth and changes in the presence of rocky substrate (Dailey et al. 1993).

SCI is located on the continental slope that provides a unique habitat and exhibits the most diverse macrobenthic assemblages of deep water regions, mainly due to the persistent upwelling and wide range of sediment types (Dailey et al. 1993). Assemblages inhabiting the upper slope extend to about 1,640 feet (500 m) and include polychaete worms (*Chloeia pinnata*, *Lumbrineris* spp.), ophiuroids (*Amphipholis squamata*, *Amphiodia urtica*), pelecypods (*Parvilucina tenuisculpta*), ostracods (*Euphilomedes* spp.), and amphipods (*Photis californica*) (Dailey et al. 1993). On the lower slope, with water depths of 1,640 to 4,921 feet (500 to 1,500 m), there is relatively low species abundance and diversity (Dailey et al. 1993). Assemblages mostly consist of randomly dispersed populations with dominant assemblages including amphipods (*Byblis* spp.), polychaetes (*Lumbrineris* spp., *Tharyx* spp., Paraonidae, *Phyllochaetopterus limicolus*), and ophiuroids (*Amphipholis squamata*, *Ophiura leptoctenia*) (Dailey et al. 1993).

Current Management

SCI has implemented four permanent rocky intertidal and kelp forest monitoring sites, designed to monitor the status and trends of marine species, including marine invertebrates, at the four main ecoregions of the island. These monitoring sites capture habitat of the federally endangered marine invertebrates, the black abalone, and other state managed invertebrates. Additionally, the Navy monitors the presence of deeper invertebrate species, such as white and pink abalone.

Minimization and mitigation measures were developed within the Navy's SOCAL EIS (2008) in support of the EFH Assessment. Minimization and mitigation measures protecting invertebrates include the exclusion of detonations: within 0.5 nm (1 km) of any artificial reef, shipwreck, or live hard-bottom community; within 1.6 nm (3 km) of shoreline; or within 3.2 nm (6 km) of an estuarine inlet.

The Navy has also supported surveys by CDFW to monitor pink abalone density, movement, growth, and mortality. These surveys occurred in June 2009 within waters adjacent to SCI. Additionally, surveys determined suitable locations for a series of permanent monitoring sites, which will track results of the CDFW translocation study for pink and green abalone as recommended in the Abalone Recovery Plan.

NSZs were developed and implemented to restrict public access during specific training exercises to ensure public safety. Access to Safety Zones G and Wilson Cove is prohibited at all times. NSZs were established for the public's safety; however, access restrictions prevent fishing activities and are thought to contribute ecological benefits similar to that of an MPA. Biological surveys will be conducted in NSZs, which will capture the status and abundance of marine invertebrates in Fiscal Year 2012 and 2013 to establish baseline information of these areas.

Assessment of Resource Management

- Current intertidal and kelp forest monitoring efforts help to track the status and trends of marine invertebrates in nearshore waters around SCI.
- Monitoring efforts capture important black and white abalone population information, which supports compliance with the ESA, and other state managed abalone populations.
- Support of surveys conducted by CDFW to monitor pink and green abalone populations is necessary to adequately track these species' recovery efforts.
- NSZs are thought to provide benefits similar to MPAs in the waters surrounding SCI, helping to preserve marine invertebrate populations. However, it is unknown if NSZs are properly enforced by the U.S. Coast Guard and poaching of marine invertebrates could exist.
- Monitoring completed in Fiscal Year 2012 and 2013 will establish baseline data of marine invertebrate species and abundance in NSZs. These data will be essential to monitor the status and trends of marine invertebrates in NSZs, as well as analyze the effects of the NSZ closures in Safety Zones G and Wilson Cove.
- Mitigation measures are proactive toward the protection of invertebrates that utilize nearshore waters surrounding SCI. However, the effectiveness of these mitigation measures has not been evaluated.

Management Strategy

Objective: *Preserve the diversity and function of invertebrates and their habitats to support ecosystem health.*

I. Follow mitigation measures detailed in the EFH Assessment on Navy activities in the SOCAL Range Complex.

  A. Evaluate the effectiveness of current mitigation measures on the population of marine invertebrates at SCI.

II. Protect invertebrate populations as a source of food for shorebirds and fishes.

  A. Properly monitor and engage the U.S. Coast Guard to enforce NSZ closures.

III. Continue to survey rocky intertidal and kelp forest monitoring sites on the island to capture the presence of marine invertebrate species.

  A. Continue to develop baseline information on marine invertebrate populations around SCI.

  B. Monitor the status and trends of sea urchin populations through intertidal and kelp forest monitoring.

IV. Support research investigations of marine invertebrate species and habitat associations.

Each INRMP shall maintain a relevant and updated baseline list of plant and animal species located at each installation for all pertinent taxonomic and regionally important groups (DoDINST 4715.03).

V. Investigate current SCI populations of invertebrate species of concern, including pink and green abalone.

VI. Locate and map populations of deep corals and related species, such as soft corals, sea fans, and black corals.

3.9.2.3 Marine Fishes

Of the 519 recognized California marine fish species there are at least 481 species, within the greater SCB south of Point Conception (Horn 1980; Cross and Allen 1993; Horn et al. 2006), the majority of which most likely have potential to occur off SCI. Geographical variation of both larval and adult fish distribution within the SCB is strongly related to depth preference, warm- or cold-water affinities of each particular fish species, and water mass influences associated with ocean circulation patterns described in Section 3.1 Ecoregional Setting (Cross and Allen 1993; Horn et al. 2006). Occasional climatic level shifts in ocean mass, resulting from El Niño and La Niña events, can directly influence either warm- or cold-water species composition during any given year.

Fish are categorized as coastal or oceanic species; within these two categories fish can be further described as pelagic (living in the water column), benthic (living on the ocean bottom), or demersal (associated with the ocean bottom, but are often found feeding in the water column). As discussed in Section 3.8.3 Deep Water Habitats, pelagic habitats are divided into the epipelagic, mesopelagic, and bathypelagic zones. Epipelagic fish include: small schooling planktivores, such as northern anchovy (*Engraulis mordax*), Pacific sardine (*Sardinops sagax*), and Pacific mackerel (*Scomber japonicus*); schooling predators, such as tunas; and large solitary predators, such as sharks and swordfish (Cross and Allen 1993). Epipelagic species account for approximately 40% of the total fish species reported and 50% of the families (Cross and Allen 1993; Horn et al. 2006), while mesopelagic and bathypelagic fish fauna comprise more than 120 species (Cross and Allen 1993). However, during their life cycles and over the period of a day, fish may occupy more than one habitat. At night, some benthic and midwater species rise to the surface, and other species inhabiting kelp forests may enter pelagic waters or move out over soft or rock substrates.

Hard and Soft Substrata Habitats

Rocky Intertidal Zone

There is a variety of fish fauna in the rocky intertidal that must adapt to small spaces and a constantly changing, extreme environment. Species can be either residents (i.e., small, cryptic species that show various specializations for intertidal life) or visitors (i.e., mainly large, subtidal species that reside as juveniles). The rocky intertidal zone represents a shoreward extension of subtidal rocky reefs. As a result, some species occur in both subtidal and intertidal habitats.

Intertidal fishes segregate at different tidal heights as seen among pricklebacks and gunnels (Horn and Riegle 1981; Jones 1981). Physical factors, such as tidal height, type of cover, wave exposure, and substratum influence habitat choice in fishes. In addition, habitat use by fish in the intertidal zone is strongly influenced by biotic interactions (Benson 2002). Abundance of different size classes varies across the intertidal zone for certain species. Larval fish tend to settle on substrate preferred by conspecific adults (Marliave 1977), but smaller individuals of clingfishes (Stepien 1990), sculpins (*Artedius* spp.) (Wells 1986), and pricklebacks (Horn and Riegle 1981) are more abundant higher in the intertidal zone, perhaps because larger fish tend to win intraspecific contests (Richkus 1981).

Some species of intertidal fishes show declines in abundance during the winter in California (Burgess 1978; Chandler and Lindquist 1981; Davis 2000), which may be caused by the migration of more mobile species to deeper waters. Wave turbulence increases during winter and stronger waves generally correlate with fewer intertidal fishes (Grossman 1982), such as sculpins, monkeyface prickleback (*Cebidichthys violaceus*), and rock prickleback (*Xiphister mucosus*) (Green 1971; Setran and Behrens 1993). In summer, there is an influx of transient species, both adults and juveniles, as the rocky intertidal zone takes on its seasonal role as a nursery (Moring 1986).

The most common fish collected from the rocky intertidal zone in southern California was the woolly sculpin (*Clinocottus analis*) followed by the opaleye (*Girella nigricans*) (Table 3-23) (Horn and Martin 2006). Most resident species of rocky intertidal species are relatively short-lived, mostly living to a maximum age of five to six years (Gibson 1969; Gibson and Yoshiyama 1999). Longer lived exceptions include some species of stichaeids (e.g., monkeyface prickleback and cabezon) (Marshall and Echeverria 1992; Grebel 2003).

Table 3-23. Most common fishes collected from the rocky intertidal in southern California (Horn and Martin 2006).

Common Name	**Species Name**	**% of Total**
woolly sculpin	*Clinocottus analis*	50%
opaleye	*Girella nigricans*	24%
spotted kelpfish	*Gibbonsia elegans*	7%
California clingfish	*Gobiesox rhessodon*	7%
reef finspot	*Paraclinus integripinnis*	5%
rockpool blenny	*Hypsoblennius gilberti*	4%
bald sculpin	*Clinocottus recalvus*	1%

Rocky and Kelp Habitats

Kelp bed and rocky-reef habitats have a higher diversity and abundance of fish species than most other California marine habitats. Off southern California, the reef fish assemblage includes three faunal elements (Stephens et al. 2006). One element consists of species from families that are distributed primarily in the tropics and subtropics, including chubs (Kyphosidae), grunts (Haemulidae), croakers (Sciaenidae), damselfishes (Pomacentridae), wrasses (Labridae), gobies (Gobiidae), blennies (Blenniidae), and basses (Serranidae) (Stephens et al. 2006). The second element consists of species that dominate north of Point Conception, particularly members of the rockfishes, surfperches (Embiotocidae), greenlings (Hexagrammidae), and sculpins (Cottidae) (Stephens et al. 2006). The last element consists of species derived from cool-temperate taxa, such as kelp rockfish (*Sebastes atrovirens*) and black perch (*Embiotoca jacksoni*) (Stephens et al. 2006). In addition to the primary elements, during warming periods more tropical members of some families expand into the SCB (Mearns 1988; Pondella and Allen 2001).

Common species in kelp and rocky-reef habitats of southern California include: salema (*Xenistius californiensis*), ocean whitefish (*Caulolatilus princeps*), garibaldi (*Hypsypops rubicundus*), California sheephead (Photo 3-44), giant sea bass, barred sandbass (*Paralabrax nebulifer*), kelp bass, and rock wrasse (*Halichoeres semicinctus*) (Stephens et al. 2006). Common cryptic species of southern California rocky subtidal reefs include: giant kelpfish (*Heterostichus rostratus*), spotted kelpfish (*Gibbonsia elegans*), blue-banded goby (*Lythrypnus dalli*), California clingfish (*Gobiesox rhessodon*), reef finspot (*Paraclinus integripinnis*), California moray, island kelpfish (*Alloclinus holderi*), and snubnose sculpin (*Orthonopias triacis*) (Stephens et al. 2006).

Photo 3-44. Kelp bass (left) and California sheephead (right), two fish species typical of subtidal habitats off San Clemente Island (Tierra Data Inc. 2009).

There are four permanent kelp forest monitoring sites located around SCI at Northwest Harbor, Boy Scout Camp, Eel Point, and Horse Beach Cove. These sites were established in 2002 and were sampled using diver transects in 2003 and 2004 to establish baseline data for kelp forest species. The established sites were again sampled by divers in 2008 and 2009 (Table 3-24). However, it must be noted that sand dwellers, rare and cryptic species, and some species that are hard to identify in the field lead to a biased representation of fish species observed during diver transects.

Coastal Resources Management (1998) counted conspicuous fish at depths of 10 and 40 feet (3 and 12 m) off Wilson Cove in June and August 1997. Although kelp was scarcely present at the 9-foot (3-m) transect, a majority of the 40-foot (12-m) transects were conducted within kelp forests. They counted 29 fish in the sampling areas, which totaled 4,305 square feet (400 square meters). Mean abundance of fish was 231 fish per acre (93 per ha) at 9 feet (3 m) and 608 per acre (234 per ha) at 40 feet (12 m) (Table 3-25).

Deep Rock Habitats

Fishes that associate with deep rocky habitat (i.e., species below SCUBA depths, typically greater than 100 feet [30 m]) are difficult and expensive to survey; therefore, very little is known of fish assemblages associated with this habitat type. However, it is commonly accepted that rockfishes dominate fish assemblages of deep rocky habitat. Yoklavich et al. (2002) identified 95% of all fishes surveyed at water depths of 100 to 330 feet (30 to 100 m) as rockfish and 64% of fishes at depths of 330 to 820 feet (100 to 250 m) as rockfish. In general, species diversity is highest off southern California and decreases to the north and south (Love and Yoklavich 2006). Rockfish diversity also increased in mixed habitats of complex rock and mud (Yoklavich et al. 2000) and generally with water depth (Yoklavich et al. 2002).

Table 3-24. Kelp forest species observed during rover diving surveys in 2003, 2004, 2008, and 2009.

Species	2003	2004	2008	2009
Bat ray	X	X	X	X
Black surfperch	X	X	X	X
Blackeye goby	X	X	X	X
Blacksmith	X	X	X	X
Blue rockfish	X	X	X	X
Blue-banded goby	X	X	X	X
Boccacio			X	X
Cabezon	X			
California moray eel			X	
California scorpionfish	X	X	X	
California sheephead	X	X	X	X
C-O turbot			X	
Garibaldi	X	X	X	X
Giant black seabass		X		X
Giant kelpfish	X	X	X	X
Gopher rockfish		X		X
Halfmoon		X	X	X
Island kelpfish	X	X	X	X
Jack mackerel	X		X	
Kelp bass	X	X	X	X
Kelp rockfish	X	X	X	X
Kelp surfperch	X	X	X	X
Northern anchovy			X	
Ocean whitefish		X	X	X
Olive rockfish	X			
Opaleye	X	X	X	X
Pacific sardine	X			
Painted greenling	X	X	X	X
Pile surfperch	X	X	X	X
Rainbow surfperch	X	X	X	X
Rock wrasse	X	X	X	X
Rubberlip surfperch	X			X
Senorita	X	X	X	X
Snubnose sculpin	X	X		X
Soupfin shark		X		
Striped surfperch	X	X	X	X
Treefish	X	X	X	X
Vermilion rockfish			X	
Zebra goby	X	X	X	X
Zebra perch				X

Sources: CINP 2004a, 2004b; TDI 2009

Table 3-25. Fish per hectare at two depths in Wilson Cove, San Clemente Island (Coastal Resource Management 1998).

	Depth	
Species	**9 feet (3 m)**	**40 feet (12 m)**
Blackeye goby	0	34.7
Black surfperch	11.6	0
California moray	0	11.6
Kelpfish spp.	11.6	34.7
Garibaldi	23.2	0
Blue-banded goby	0	81.0
Halfmoon	0	11.6
Senorita	11.6	0
Kelp bass	34.8	23.2
Rockfish spp.	0	23.2
California sheephead	0	23.2
Total	92.6	242.8

Fishes living on rock outcrops can be placed into one of three behavioral categories: mid-water aggregators, demersal aggregators, and demersal non-aggregators or solitary individuals (Love and Yoklavich 2006). Midwater aggregators (i.e., those loosely associated with rock structure) spend most of their time in large schools 100 feet (30 m]) or more above the seafloor. Demersal aggregators rarely ascend more than a few meters from the seafloor. Demersal non-aggregators usually occur on the seafloor, often in shelter, such as caves, crevices, and overhangs; these species are either solitary or found in a small group. Typical adult fish assemblages over rock substrata is shown in Table 3-26.

Table 3-26. Typical adult fish assemblages over rock substrata off southern California (Love and Yoklavich 2006).

Midshelf (100 to 330 feet [30 to 100 m])
Scorpanenidae: blue, bocaccio, California scorpionfish, canary, calico, chilipepper, copper, cowcod, flag, freckled, greenblotched, greenspotted, half-banded, honeycomb, olive, pygmy, rosy, speckled, squarespot, starry, vermilion, widow, whitespeckled Gobiidae: blackeye goby Labridae: senorita, sheephead Pomacentridae: blacksmith Serranidae: threadfin bass Embiotocidae: pile perch, sharpnose seapearch, white seaperch Hexagrammidae: lingcod, painted greenling
Deep Shelf (330 to 655 feet [100 to 200 m])
Scorpanenidae: bocaccio, bank, canary, chameleon, chilipepper, cowcod, dwarf-red, flag, halfbanded, greenblotched, greenspotted, Mexican, pink, pgymy, pinkrose, semaphore, shortbelly, speckled, swordspine, vermilion, whitespeckled, widow, yellowtail Hexagrammidae: lingcod
Slope (655 to 1,640 feet [200 to 500 m])
Scorpanenidae: Aurora, bank, blackgill, bocaccio, bronzespotted, chameleon, chilipepper, cowcod, greenblotched, pink, pinkrose, shortbelly, split-nose Cottidae: Threadfin sculpin Hexagrammidae: lingcod

Deep Soft Bottom Habitats

The soft bottom habitat is the dominant habitat of the shelf and upper slope (Allen 2006). This habitat comprises more than 50% (probably from 70% to more than 90%) of the California shelf area (Allen 2006). Of the 40 major species comprising the soft bottom fish community of the southern California shelf, 42% burrow into sediments, 38% are exposed to the bottom, 10% are in schools, and 10% are in crevices (Allen 1982). Species likely to burrow into sediments include flat fishes, benthic roundfishes, and eel-like fishes. Many species exposed in the open water either rely on spines or armor for protection or are difficult to find at night; species with spines include the spotted ratfish, combfishes, non-schooling rockfishes, thornyheads, and scorpionfishes. Schooling species include the Pacific hake (*Merluccius productus*), northern anchovy, and shortbelly rockfish (*Sebastes jordani*). Some species caught on a soft bottom habitat are mostly incidental including species of Scorpaenidae and Cottidae, as well as occasional Stichaeidae (pricklebacks) (Allen 2006).

Pelagic Habitats

Epipelagic Fishes

There are three main types of epipelagic fishes: holoepipelagic, meroepipelagic, and xenoepipelagic. Holoepipelagic fishes includes a group of species that are the permanent inhabitants of the oceanic epipelagic and occur there in all life history stages (Parin 1968). Species found in the upper epipelagic zone (above 65 to 100 feet [20 to 30 m]) include many pelagic sharks, such as the shortfin mako (*Isurus oxyrinchus*), basking shark (*Cetorhinus maximus*), and blue shark (*Prionace glauca*) (Allen and Cross 2006). Bony fishes are also included under this category, represented by tunas, striped marlin (*Tetrapturus audax*), swordfish (*Xiphias gladius*), pelagic stingray (*Pteroplatytrygon violacea*), and ocean sunfish (*Mola mola*) (Allen and Cross 2006).

The second major group of epipelagic fishes is referred to as meroepipelagic fishes and includes species spending only a portion of their life history in the epipelagic zone. This group is further categorized into brephoepipelagic (coastal adults that have pelagic juvenile stages) and epheboepiplagic (epipelagic adults that breed nearshore or in freshwater). Brephoepipelagic species of California include striped mullet (*Mugil cephalus*), lingcod (*Ophiodon elongatus*), cabezon, and bocaccio (*Sebastes paucispinis*) (Allen and Cross 2006). Epheboepiplagic species of California include mahi mahi (*Coryphaena hippurus*), whale shark (*Rhincodon typus*), ribbon halfbeak (*Euleptorhamphus viridis*), and smallhead flyingfish (*Cheilopogon pinnatibarbatus altipennis*) (Allen and Cross 2006).

The last major group of epipelagic fishes is the xenoepipelagic group and includes species the randomly enter the epipelagic realm from another habitat. Species in California from this group include yellowtail (*Seriola lalandi*), California barracuda (*Sphyraena argentea*), jack mackerel (*Trachurus symmetricus*), Pacific bonito (*Sarda chiliensis*), and Pacific sardine (Allen and Cross 2006). Coastal pelagic species that often occur very far offshore, particularly in upwelling areas, include anchovies, sardines, and some species of flying fishes (Allen and Cross 2006).

Benthic and Benthopelagic Fishes

The California slope and rise (1,800 to 6,500 feet [550 to 2,000 m]) is dominated by benthic and benthopelagic fishes (Table 3-27). The longspine thornyhead (*Sebastolobus altivelis*) is the most abundant benthic fish in the SCB and is uniformly distributed (Smith and Hamilton 1983). Black hagfish (*Eptatretus deani*) and smooth grenadier (*Nezumia liolepis*) are likely next in abundance (Neighbors and Wilson 2006).

Table 3-27. Common benthic and benthopelagic fishes below 1,640 to 1,970 feet (500 to 600 meters) on the California slope and in the Eastern North Pacific Ocean Basin (Neighbors and Wilson 2006).

Common Name	Species Name	Principle Depth Range Off California (m)
Black hagfish	*Eptatretus deani*	107–2,743
Lognose cat shark	*Apristurus kampae*	367–1,888
Filetail cat shark	*Parmaturus xaniurus*	327–936
Combtooth dogfish	*Centroscyllium nigrum*	400–1,143
Pacific sleeper shark*	*Somniosus pacificus*	1,044–2,000
Deep-sea skate	*Bathyraja abyssicola*	644–2,910
Black skate	*Bathyraja trachura*	565–1,993
California slickhead*	*Alepocephalus tenebrosus*	327–1,253
Threadfin slickhead	*Talismania bifurcata*	584–2,000
Highfin lizardfish	*Bathysaurus mollis*	1,680–4,900
Paperbone cuskeel	*Lamprogrammus niger*	797–2,000
Pudgy cuskeel	*Spectrunculus grandis*	800–4,255
Pacific hake*	*Merluccius productus*	181–1,205
Pacific flatnose	*Antimora microlepis*	335–3,048
Pacific grenadier	*Coryphaenoides acrolepis*	600–2,500
Giant grenadier	*Albatrossia pectoralis*	565–2,170
Bluntnose grenadier	*Nezumia kensmithi*	500–???
Smooth grenadier	*Nezumia liolepis*	681–2,825
California grenadier	*Nezumia stelgidolepis*	285–800
Blob sculpin	*Psychrolutes phrictus*	800–2,800
Sablefish*	*Anoplopoma fimbria*	181–2,740
Blackfinned snailfish	*Careproctus cypselurus*	378–1,608
Smalldisk snailfish*	*Careproctus gilberti*	187–1,181
Blacktail snailfish*	*Careproctus melanurus*	200–2,286
Swellhead snailfish	*Paraliparis cephalus*	604–1,384
Longnose snailfish	*Rhinoliparis barbulifer*	775–1,128
Shortspine thornyhead*	*Sebastolobus alascanus*	181–1,524
Longspine thornyhead*	*Sebastolobus altivelis*	409–1,757
Two-line eelpout	*Bothrocara brunneum*	432–1,253
Snakehead eelpout	*Lycenchelys crotalinus*	392–1,236
Deepwater eelpout	*Lycodapus endemoscotus*	555–2,122
Black eelpout	*Lycodes diapterus*	242–1,007
Black mouth eelpout	*Lycodapus fierasfer*	416–1,046
Dover sole*	*Microstomus pacificus*	367–1,253
Deep-sea sole	*Embassichthys bathybius*	416–1,433

*Shows high-latitude emergence

NOTE: Principal depth ranges determined from data in Lauth (1999), museum collection records, and various published accounts.

SCI Species Covered Under the Magnuson-Stevens Act

The MSA, reauthorized and amended by the Sustainable Fisheries Act of 1996, requires the eight regional fishery management councils to describe and identify EFH in each fishery management plan. EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity."

The MSA requires federal agencies to consult with NMFS on all actions, or proposed actions, that may adversely affect EFH. Adverse affects may include direct (e.g., contamination; physical disruption), indirect (e.g., loss of prey), site-specific or habitat-wide impacts, including individual or cumulative consequences of actions). Table 3-28 includes all species known to occur in waters around SCI that are included in Fishery Management Plans; and therefore, covered under MSA.

Table 3-28. Species known to occur in nearshore waters of San Clemente Island, based on published sources for which Essential Fish Habitat must be reviewed under the Magnuson-Stevens Act.

Coastal Pelagic Species Fishery Management Plan	
market squid (*Doryteuthis opalescens*)	jack mackerel (*Trachurus symmetricus*)
Pacific mackerel (*Scomber japonicas*)	Pacific sardine (*Sardinops sagax*)
northern anchovy (*Engraulis mordax*)	
Highly Migratory Species Fishery Management Plan	
north Pacific albacore (*Thunnus alalunga*)	bluefin tuna (*Thunnus thynnus*)
Pacific swordfish (*Xiphias gladius*)	yellowfin (*Thunnus albacares*)
thresher shark species (Family Alophiidae)	mackerel shark species (Family Lamnidae)
Pacific Groundfish Fishery Management Plan	
sablefish (*Anoplopoma fimbria*)	widow rockfish (*Sebastes entomelas*)
lingcod (*Ophiodon elongatus*)	petrale sole (*Eopsetta jordani*)
rex sole (*Glyptocephalus zachirus*)	spiny dogfish (*Squalus acanthias*)
Pacific hake (*Merluccius productus*)	Dover sole (*Solea solea*)
leopard shark (*Triakis semifasciata*)	soupfin shark (*Galeorhinus galeus*)
blue rockfish (*Sebastes mystinus*)	bocaccio (*Sebastes paucispinis*)
grass rockfish (*Sebastes rastrelliger*)	kelp rockfish (*Sebastes atrovirens*)
olive rockfish (*Acanthoclinus fuscus*)	cabezon (*Scorpaenichthys marmoratus*)

Factors Affecting Fish Abundance and Distribution

El Niño-Southern Oscillation and Pacific Decadal Oscillation

El Niño-Southern Oscillation events occur naturally as intervals of alternating warm and cool oceanographic conditions in the eastern tropical Pacific; however, affect regions great distances away, including the California marine environment. El Niño events consist of the warm extremes of the cycle, resulting in higher sea surface temperatures, weaker upwelling, and reduced nutrient levels in the water column. These events normally occur every four to five years, last from 12 to 15 months, and appear the strongest every ten to 15 years (e.g., the El Niño conditions of 1982–1983 and 1997–1998).

La Niña and more neutral conditions alternate in an irregular pattern with El Niño events in the El Niño-Southern Oscillation cycle. La Niña events are the cool extremes of the cycle, resulting in lower sea surface temperatures, stronger and deeper upwelling, increased nutrient levels, and heightened productivity in coastal waters. These events may last between one and three years; however, areas south of Point Conception appear to be less affected by La Niña conditions (Moser et al. 1987). Periods of sustained climate conditions between El Niño-Southern Oscillation cycles (i.e., El Niño and La Niña) are termed the PDO and are associated with shifts in ecosystem production regimes in cycles of about 50 years (Mantua et al. 1997; Zhang et al. 1997). Although a shift to a cold-water regime has been suggested (Bograd et al. 2000) for the California Current system that may be associated with the PDO (Mantua et al. 1997), parameters monitored do not indicate a regime shift (Durazo et al. 2001), although Chavez et al. (2003) presented evidence to the contrary. Therefore, the marine environment of California exhibits regional complexities aside from the recognized trends in climate change.

El Niño events clearly affect fish distributions in California waters. Lea and Rosenblatt (2000) documented numerous warm-water, Panamic species in the SCB during the 1997–1998 El Niño event, including deepwater cornetfish (*Fistularia corneta*), greater sand perch (*Diplectrum maximum*), pink cardinalfish (*Apogon pacificus*), Mexican barracuda (*Sphyraena ensis*), blackspot wrasse (*Decodon melasma*), and loosetooth parrotfish (*Nicholsina denticulata*). The alternating La Niña events can cause reduced abundance among species of warm-water associations (e.g., reef finspot) or increased abundance of a transitional species in the same rocky intertidal habitat, such as the woolly sculpin (Davis 2000). Among commercially important species, several warm-water species, including yellowtail and skipjack tuna (*Katsuwonus pelamis*), were landed in much greater numbers during the strong 1982–1983 El Niño event (McGowen 1985; Tegner and Dayton 1987). Primary productivity and zooplankton abundance appear to be reduced during El Niño events as well as the reproductive success and condition of adult rockfish (Lenarz et al. 1995).

Similar to an El Niño-Southern Oscillation event, the PDO is comprised by a warm and a cool interval, but the PDO regimes are each 20 to 30 years in duration (Mantua et al. 1997; Hare et al. 1999; Hare and Mantua 2000; Chavez et al. 2003; Levin 2003). The warm regime is characterized by above average sea surface temperatures along the coasts of the Americas and in the tropics, cooler than average sea surface temperatures in the central North Pacific, anomalously low atmospheric pressure at sea level over the north Pacific and eastern Tropical Pacific, and high pressure anomalies in the western tropical Pacific centered over northern Australia (Horn and Stephens 2006). These conditions are reversed during the cool regime. Over the past century, two cool ocean regimes (1900–1924 and 1947–1976) and two warm regimes (1925–1946 and 1977–1999) have been generated by PDOs. Chavez et al. (2003) showed that northern anchovy (cool-water species) increases in abundance during a cool regime, lasting about 25 years followed by a shift to a warm regime during which the Pacific sardine (warm-water species) becomes more abundant.

Climate Change

Temperature has long been recognized as a major factor influencing the distribution of marine organisms. There is evidence that southern species tend to expand their distribution northward and northerly species retreat farther north during this time (Lenarz et al. 1995). However, not all species will shift their ranges in response. If their rate of northward migration is too slow to adapt to changes, they will either adapt genetically, live under suboptimal conditions, or perhaps go locally extinct (Horn and Martin 2006). If climate change is not too extreme some species may adjust phenotypically, and thus tolerate climate change in place (Fields et al. 1993). Northward migration may not be an option for all species. For example, intertidal fishes exhibit limited powers of dispersal (Marliave 1986), and rocky intertidal habitats are separated by stretches of sandy or muddy shores (Horn and Ojeda 1999).

Overexploitation

Quantitative assessments of fishery catch data demonstrated that intense, size-selective fishing mortality over the last 50 years has resulted in a decline in the mean trophic level of exploited fish groups (Pauly et al. 1998, 2000; Sala et al. 2004). The world catch shifting gradually from primarily long-lived, high trophic-level species to short-lived, low trophic level species is termed "fishing down the food web." Recent assessments report world declines in biomass of large predatory fishes of 90% from pre-industrial levels in the last 40 years (Myers and Worm 2003), abrupt declines in large shark abundance (Baum et al. 2003; Baum and Myers 2004), and a collapse in abundance of principal fishery species groups from known historic levels with slow, even unlikely, prospects for recovery (Hutchings and Reynolds 2004).

Recent assessments indicate that the biomass of at least seven species of rockfishes are at or below 25% of the 1970s estimate, and bocaccio has fallen in biomass by about 98% from its 1969 level (Love et al. 2002). Although reduction in fishing pressure is clearly necessary, persistence and recovery also are influenced by life history features, habitat alteration, changes in food webs, genetic response to overexploitation, and declines in population growth as a result of the Allee effect (Hutchings and Reynolds 2004). These authors emphasize that effective recovery strategies require greater understanding of how fish behavior, habitat, ecology, and evolution impact population growth at low abundance (Horn and Stephens 2006).

Current Management

Current management of marine fishes out to 3 nm (the current SCI marine footprint) is the responsibility of the state of California. The harvesting of fish in SCI waters is managed directly by the CDFW. Ocean fishing regulations are drafted by the Marine Region, reviewed in public hearing, revised if needed, and adopted by the Fish and Game Commission. Harvest regulation seek to manage sustainable populations through a combination of techniques: area and seasonal closures; gear limitations; and size, catch, and possession limitations. See Table 3-28 for species at SCI covered under a Federal Fishery Management Plan.

The federal government also has jurisdiction in nearshore waters of SCI. Under the MSA, federal agencies, including DoD, are required to consult with NMFS if activities may adversely affect EFH. An adverse effect may include direct (e.g., contamination), indirect (e.g., loss of prey), site-specific, or habitat-wide impacts. Consultations are generally done in conjunction with other federal statues, such as NEPA, CWA, or ESA. EFH is described and identified for each species managed under a Federal Fishery Management Plan adopted by the region's Fishery Management Council.

The Navy also supports the management of marine fishes in nearshore waters of SCI through surveys. Researchers from Occidental College completed a study in 2011 to characterize the rocky reef biological communities at sites inside of ASBS in the SCB, comparing them to sites outside of the ASBS in the SCB. This study included three survey sites in nearshore waters of SCI, which included China Point, Lil' Flower, and Pyramid Cove.

NSZ surveys will occur in Fiscal Year 2012 and 2013 and will capture the presence and abundance of marine fishes. These surveys will be conducted by UCSC and will help to establish baseline information on fish species in these areas.

Minimization and mitigation efforts have been developed within the SOCAL EIS (Navy 2008) in support of the EFH Assessment. Minimization and mitigation measures that protect fishes include: conducting most exercises during daylight hours in calm seas; visual monitoring to ensure an area is clear of significant concentrations of sea life; including fish before ordnance or explosives are used; and prohibiting detonations within 0.5 nm (1 km) of any artificial reef, shipwreck, or live hard-bottom community; within 1.6 nm (3 km) of shoreline; or within 3.2 nm (6 km) of an estuarine inlet.

Assessment of Resource Management

- Surveys and assessments of the ASBS at SCI support required monitoring by the state of California.
- Temporary and permanent closure of NSZs are thought to provide similar benefits as an MPA. However, it is unknown if these areas are properly enforced by the U.S. Coast Guard and poaching of marine fishes could exist, impacting the ecological benefits of the closure.
- Monitoring beginning in Fiscal Year 2012 and 2013 will establish baseline information on marine fish species and abundance in NSZs and adjacent comparable areas. These data will be essential to analyze the trends of marine fish species in waters around SCI and the effects of the NSZ closures located in Safety Zones G and Wilson Cove.
- Current surveys of rocky intertidal habitats sufficiently monitor the status and trends of fish populations in this habitat.
- Initial kelp forest monitoring captured important baseline information on fish species in this habitat. However, the absence of surveys at these sites in recent years has prevented SCI NRO from monitoring the status and trends of fish species in this community. NSZ surveys are essential to gathering information on this biologically-rich habitat that contains California State protected species.
- Mitigation measures are proactive towards the protection of marine fishes that utilize waters surrounding SCI. However, the effectiveness of these mitigation measures have not been evaluated.

Management Strategy

Objective: *Monitor fish populations and diversity.*

I. Comply with EFH guidance on defining effects of military activities on habitat for any in-water projects.

II. Follow mitigation measures detailed in the EFH Assessment on Navy activities in the SOCAL Range Complex.

- ***A.*** Evaluate the effectiveness of current mitigation measures on the population of marine fishes at SCI.

III. Protect fish populations as a source of food for larger marine predators.

- ***A.*** Properly monitor and engage the U.S. Coast Guard to enforce NSZ closures.

Federal agencies are required to ensure that their actions will not adversely impact EFH. If EFH is likely to be adversely impacted, the Navy shall enter into consultation with NMFS (OPNAVINST 5090.1C CH-1).

IV. Provide marine fishes with habitat protection and water quality improvement.

- ***A.*** Conserve eelgrass and unvegetated, shallow habitat that provides reproductive, nursery, and foraging functions for fishes.

   - ***B.*** Comply with the Southern California Eelgrass Mitigation Policy.

V. Cooperate with CDFW to inform both public fishers and SCI personnel of fishing regulations.

VI. Promote education and outreach of on-island personnel.

   - ***A.*** Cooperate with interagency environmental programs and make available informational literature and signs to raise awareness of threats, concerns, and management needs for marine fishes, including fishing regulations.

VII. Continue to develop information on the status of marine fish populations around SCI.

   - ***A.*** Conduct surveys in NSZs to gather baseline data on the trends and abundance of species utilizing these habitats.
   - ***B.*** Continue to survey kelp forest and rocky intertidal monitoring sites to document abundance, distribution, and trends of fishes, as well as new species occurrences.

VIII. Cooperate in interagency monitoring that will help improve fish management decisions.

IX. Investigate the following to gain a better understanding of fish abundance and trends at SCI.

   - ***A.*** Contribution of productivity at SCI from federally managed fish species.
   - ***B.*** The shift of fish productivity from nearshore areas of SCI.
   - ***C.*** Range expansion of fishes at SCI.
   - ***D.*** Population and abundance of federally managed coastal pelagic, groundfish, and highly migratory species.
   - ***E.*** Track the use of habitats surrounding SCI by species of concern, such as the basking shark, bocaccio, and cowcod.

Each INRMP shall maintain a relevant and updated baseline list of plant and animal species located at each installation for all pertinent taxonomic and regionally important groups (DoDINST 4715.03).

3.9.2.4 Terrestrial Reptiles

There are only two native species of reptiles, the side-blotched lizard and the island night lizard, that occur on SCI (Schoenherr 1999). Both species feed primarily on invertebrates and some plant material. Lizards may be important prey items for the island fox and many bird species on SCI, including the loggerhead shrike. Incidental observations of other non-native reptiles have occasionally occurred. Of note was the capture, and subsequent return to the mainland, in 2006 of a gopher snake (Photo 3-45) believed to have been transported on the supply barge (IWS, unpubl. data). Amphibian species have never been recorded on the island (USFWS 1984).

Side-blotched lizards are one of the most common lizards found in desert and semi-arid regions of the western and southwestern United States (Stebbins 1985). Their preferred habitat includes sandy washes and grassy areas with low-growing shrubs and scattered rocks and trees (Stebbins 1985). The side-blotched lizard has not been the subject of focused surveys on SCI. However, methods used to capture island night lizards, federally-listed as threatened, are also effective with this species. Since island night lizard surveys began in the 1970s, side-blotched lizards have been incidentally captured in all habitats, although they appear to exist in higher numbers at the southern end of the island where it is more arid and habitats are more open (W. Mautz, pers. com. 2012).

Photo 3-45. Gopher snake captured on San Clemente Island (J. Stahl, Institute for Wildlife Studies 2006).

The island night lizard is endemic to only three of the Channel Islands (SCI, SNI, and Santa Barbara Island). The best quality habitat and largest population of island night lizards occurs on SCI as a result of the removal of feral herbivores in 1992. In 2013, the USFWS published a proposed rule to remove the island night lizard from the ESA (78 FR 7908). See Section 3.9.3 Federally Threatened and Endangered Species for more information regarding the island night lizard.

Current Management

Current management for terrestrial reptiles on SCI is in accordance with the existing BO on SCI Military Operations and Fire Management Plan (USFWS 2008a) arising from Section 7 consultations on fire management and military use impacts to the island night lizard, and surveys are conducted on a regular basis to monitor the recovery of this species. Terrestrial reptiles on SCI benefit directly from the control of non-native predators, such as rats and feral cats, and indirectly though invasive flora and erosion control.

Assessment of Resource Management

- The side-blotched lizard directly benefits from management criteria established for the federally threatened island night lizard as it occupies the same habitats and is well distributed throughout SCI.
- Current management for reptile populations of SCI is sufficient to maintain the resilience of these populations on SCI.
- Annual surveys performed in accordance with the existing BO on SCI Military Operations and Fire Management Plan (USFWS 2008a) provides adequate tracking of the side-blotched lizard and maintains a mechanism to document invasive species introductions.
- Feral cat control benefits reptiles on SCI through the reduction of non-native predation pressure.
- Terrestrial reptiles on SCI benefit from the control of non-native invasive flora and erosion through increased habitat quality.

Management Strategy

Objective: *Provide for sustainable populations of native reptiles.*

I. Ensure conservation of native reptiles is considered in planning of all military and biological projects.

II. Assess and report on status and condition of terrestrial reptiles.

A. Support regular monitoring of reptiles as part of island night lizard monitoring.

B. Consolidate and assess existing information on the side-blotched lizard.

3.9.2.5 Sea Turtles

Four species of sea turtles have been reported in the SCB: the loggerhead sea turtle (*Caretta caretta*), olive ridley sea turtle (*Lepodochelys olivacea*), leatherback turtle (*Dermochelys coriacea*), and eastern Pacific green sea turtle (*Chelonia mydas*) (NMFS 2001). Over the last few centuries, sea turtle populations have declined dramatically due to anthropogenic activities, such as coastal development on nesting beaches, bycatch from commercial fishing, and overharvesting of animals and their eggs. As a result, the four species are listed as endangered or threatened under the ESA and are discussed further in Section 3.9.3 Federally Threatened and Endangered Species.

3.9.2.6 Resident and Migratory Birds

A diverse assortment of bird species from nearly all taxonomic groups have been observed on SCI. In the past, habitat degradation and introduction of non-native predators probably caused declines in many species on SCI. Availability of nest sites declined, which was likely due to a decrease in tree and shrub cover. The introduction of feral cats and rats also may have reduced reproductive success of many species. These declines may affect other species on SCI since landbirds often play a significant role as prey items for larger vertebrate species, such as raptors, and as predators on insect and small mammal populations. Most birds typically nest between January and August and nest in trees, shrubs, on the ground, in canyon walls, and buildings. See Sullivan and Kershner (2005) and Bradley et al. (2011) for a more complete discussion of bird observations at SCI.

The Channel Islands [and SCI] were recently identified as globally important bird areas, as well as a California important bird area (Audubon 2011; Audubon California 2011). Recognition by Audubon increases public awareness about the sites; however, it does not confer any legal status upon them.

Landbirds

Landbirds encompass a broad range of species, including raptors, owls, herons, and songbirds. This diverse array of species inhabits a variety of land cover types including forest, scrub, riparian, and coastal habitats. Table 3-29 lists the endemic and sensitive landbird species observed at SCI, along with their state, federal, and global conservation status.

There are currently 26 resident (year-round) landbird species that breed on SCI, including four introduced species. An additional three species are believed extirpated, at least as breeders. Some of these species have nested only sporadically (chipping sparrow [*Spizella passerina*], grasshopper sparrow [*Ammodramus savannarum*], black-chinned sparrow [*Spizella atrogularis*]) or recently (peregrine falcon [*Falco peregrinus anatum*]) on SCI. Two resident species, the San Clemente loggerhead shrike and San Clemente sage sparrow, are endemic subspecies of SCI; currently listed as federally endangered and threatened, respectively, by the USFWS (Table 3-29). See Section 3.9.3 Federally Threatened and Endangered Species for more information. An additional four species are endemic to the Channel Islands, all at the subspecies level.

Table 3-29. Endemic and sensitive landbird species observed at San Clemente Island.

Scientific Name	Common Name	SCI Status	Federal and State Status	Global or State Rank
SCI ENDEMICS				
Lanius ludovicianus mearnsi	San Clemente loggerhead shrike	Resident	BSSC, PIF, FE	G4T1, S1
Artemisiospiza belli clementae	San Clemente sage sparrow	Resident	BSSC, PIF, FT	G5T1, S1
CHANNEL ISLANDS ENDEMICS				
Selasphorus sasin sedentarius	Allen's hummingbird	Resident	BCC	
Empidonax difficilis insulicola	Pacific-slope flycatcher	Resident		
Eremophila alpestris insularis	horned lark	Resident		G5T3Q, S3
*Oreothlypis celata sordida**	orange-crowned warbler	Resident		
Haemorhous mexicanus clementis	San Clemente house finch	Resident		
OTHER RESIDENTS AND MIGRANTS				
Aquila chrysaetos	golden eagle	Hypothetical	FP	
Ardea herodias[a]	great blue heron	Migrant		G5, S4
Egretta thula[a]	snowy egret	Transient		G5, S4
Nycticorax nyxticorax[a]	black-crowned night-heron	Transient		G5, S3
Circus cyaneus[a]	northern harrier	Migrant	BSSC	G5, S3
Accipiter striatus[a]	sharp-shinned hawk	Migrant		G5, S3
Haliaeetus leucocephalus	bald eagle	Transient	BCC, PIF, SE, FP	G5, S2
Elanus leucurus	white-tailed kite	Migrant	FP	G5, S3
Falco columbarius	merlin	Migrant		G5, S3
Falco peregrinus anatum[a]	peregrine falcon	Migrant, breeding	BCC, FP	G4T3, S2
Athene cunicularia hypugea	burrowing owl	Migrant, winter	BCC, BSSC, PIF	G4, S2
Asio flammeus[a]	short-eared owl	Migrant	BSSC	G5, S3
Asio otus[a]	long-eared owl	Transient	BSSC	G5, S3
Selasphorus rufus	rufous hummingbird	Transient		G5, S1S2
Chaetura vauxi[a]	Vaux's swift	Transient	BSSC	G5, S3
Contopus cooperi[a]	olive-sided flycatcher	Migrant	BSSC, PIF	G4, S4
Empidonax traillii[a]	willow flycatcher	Transient	SE	G5, S1S2
Riparia riparia[a]	bank swallow	Transient	ST	G5, S2S3
Toxostoma bendirei	Bendire's thrasher	Transient	BCC, BSSC, PIF	G4G5, S3
Setophaga occidentalis[a]	hermit warbler	Migrant		G4G5, S3?
Icteria virens[a]	yellow-breasted chat	Transient	BSSC	G5, S3
Piranga rubra[a]	summer tanager	Transient	BSSC	G5, S2
Spizella passerina[a]	chipping sparrow	Breeding, sporadic		G5, S3S4
Spizella breweri[a]	Brewer's sparrow	Transient	BCC, PIF	G5, S3
Spizella atrogularis[a]	black-chinned sparrow	Transient, breeding	BCC, PIF	G5, S3
Xanthocephalus xanthocephalus[a]	yellow-headed blackbird	Migrant	BSSC	G5, S3S4
Spinus lawrencei[a]	Lawrence's goldfinch	Migrant	BCC	G3G4, S3

USFWS and CDFW Codes: FE = federally endangered; FT = federally threatened; SE = state endangered; ST = state threatened; FP = state fully protected; BCC = USFWS Birds of Conservation Concern (USFWS 2008b); BSSC = CDFW California Species of Special Concern; PIF = DoD Partners in Flight

Global or state Rank: GH = All sites are historical, has not been seen in 20 years, but suitable habitat still exists, G1 = Less than 6 viable element occurrences or less than 1,000 individuals or less than 2,000 acres, G2 = 6–20 element occurrences or 1,000–3,000 individuals or 2,000–10,000 acres, G3 = 21–100 element occurrences or 3,000–10,000 individuals or 10,000–50,000 acres, G4 = Apparently secure but some factor exists to cause some concern, G5 = Population or stand demonstrably secure; T-rank = reflects the global status of the subspecies using same definitions as the G-rank; S-rank = the status within California using same definitions as G-rank.

* also found on the Palos Verdes Peninsula and Point Loma

[a] BSSC and BCC for nesting only

SCI may represent significant portions of the populations of four Channel Islands endemic subspecies: San Clemente house finch, horned lark, Allen's hummingbird, and orange-crowned warbler. San Clemente house finches typically feed on seeds and can be found in a variety of habitats including scrub, canyon woodlands, and around human developments. Horned larks feed and nest on the ground in very open habitats. Allen's hummingbirds nest in shrubs, especially lemonade berry, on steep slopes. They feed on nectar and may be important to the pollination of the federally endangered SCI indian paintbrush. All of these species, especially the ground nesters, are vulnerable to predation from non-native feral cats and rats.

SCI is also used as a stopover point during migration by more than 100 species. Breeding of the migratory Anna's hummingbird (*Calypte anna*) was confirmed on SCI for the first time in 2012 (M. Booker, pers. com. 2012). The burrowing owl (*Athene cunicularia*), which only winters on SCI, is considered a species of concern by USFWS. Burrowing owl populations on the mainland have declined dramatically, and SCI may represent an important wintering and migration stopover location for this species (Arnold 2012). Island populations of other migrant species likely do not represent a significant portion of their population. Many species of migratory birds have suffered significant population declines. As a result, native migratory birds are the subject of an international conservation effort, the MBTA. See Appendix E for a more detailed discussion.

Years of anecdotal observations indicate noteworthy trends in raptor presence and populations. In years of high small mammal abundance (indicated by influxes in buildings and observations in the field), migratory raptors such as white-tailed kites (*Elanus leucurus*) and short-eared owls (*Asio flammeus*) may be present at SCI in winter at much greater numbers. Presumably, migrating individuals stay longer at SCI because of the presence of a readily available food source. White-tailed kites have been observed in high numbers roosting along power lines and short-eared owls are observed in higher numbers, during spotlighting surveys, in high small mammal years (M. Booker, pers. com. 2011).

Barn owls are resident breeders at SCI. In recent years, twice after rodent populations have peaked and then dropped off, barn owls were observed hunting during the day. Presumably, owl populations peaked with the rodents, and subsequently following rodent population dips, owls struggled to successfully forage at night and were forced to forage during the day. Daytime hunting for this species has been observed elsewhere. This interesting cycle has potential management implications in two ways. First, high barn owl numbers in general may impact nesting seabirds (Velarde et al. 2007). Second, if barn owls are forced to hunt during the day, there is the potential, albeit small, to hunt listed SCI species (M. Booker, pers. com. 2011).

Two previously extirpated raptor species were regularly observed on SCI in 2011: the bald eagle (*Haliaeetus leucocephalus*) and peregrine falcon (M. Booker, pers. com. 2011). See Section 3.9.5 Management Focus Species for more information regarding these species. One to two osprey (*Pandion haliaetus*), another former resident raptor, are observed annually, although osprey no longer nest on SCI. Osprey were common breeders on SCI in the early 1900s, when they were known to breed on the southwest side of the island; up to 20 pairs were observed in 1907 (Jorgensen and Ferguson 1984). Reasons for decline of this species from SCI are unknown, and thought to be related to shooting by fishermen or a change in food supply (Johnson and Ferguson 1984).

Shorebirds

Shorebirds are closely associated with wetland and coastal environments. They utilize estuaries, wetlands, beaches, rocky shorelines, coastal dunes, islands, and mudflats for nesting, foraging, and as stopover sites during migration; plovers, sandpipers, and sandpiper allies are included in this definition.

There are 36 shorebird species that were observed at SCI, which include four with sensitive status (Table 3-30). One of these, the western snowy plover, is listed as threatened by USFWS. See Section 3.9.3 Federally Threatened and Endangered Species for more information regarding the western snowy plover and its federal listed status. Winter observations of this species are common at SCI; however, since monitoring began, breeding has been confirmed only three times in the 1990s.

Table 3-30. Sensitive status shorebirds observed at SCI.

Scientific Name	Common Name	SCI Status	USFWS, CDFW, PIF Status	Global or State Rank
Charadrius nivosus	western snowy plover	Migrant, winter	FT, BSSC	G4T2, S2
Charadrius montanus	mountain plover	Transient	BCC, BSSC	G3, S2?
Numenius americanus	long-billed curlew	Migrant	BCC	G5, S2
Haematopus bachmani	black oystercatcher	Breeding	BCC	G5, S2

USFWS and CDFW Codes: FE = federally endangered, FT = federally threatened SE = state endangered, ST = state endangered, BCC; USFWS Birds of Conservation Concern (2008); BSSC = CDFW California Species of Special Concern
Global or state Rank: G3 = 21–100 element occurrences or 3,000–10,000 individuals or 10,000–50,000 acres, G4 = Apparently secure but some factor exists to cause some concern, G5 = Population or stand demonstrably secure; T-rank = reflects the global status of the subspecies using same definitions as the G-rank; S-rank = the status within California using same definitions as G-rank.

There is only one other shorebird known to breed on the island, the black oystercatcher. The black oystercatcher is a long-lived monogamous shorebird completely dependent upon the marine shoreline for food and nesting (Andres and Falxa 1995). Black oystercatchers are a locally distributed resident on the west coast of Baja California south to Laguna San Ignacio, including offshore islands (Jehl 1985). Breeding pairs establish well-defined breeding and foraging territories and will occupy the same territory for years. Nests can be found in a variety of sites ranging from sand and pebble beaches, shell beaches, cobble beaches, gravel outwashes, exposed rocky shorelines, wave cut platforms, and offshore boulders. Nests are usually placed just above the high tide line, where the parents can forage nearby and provision chicks. The dominant prey items of the oystercatcher are mussels and limpets, along the rocky intertidal zone. During the winter, the oystercatcher will often leave their territories and form large flocks in areas of high mussel density (Andres and Flaxa 1995). In 1991–1996, one to two pairs were noted to be breeding in the Seal Cove Area with an estimated population of one to four breeding birds for SCI (Carter et al. 1992, 2010). All nests were found on two offshore rocks, possibly to avoid mammalian predators (i.e., San Clemente island fox, feral cats, or black rats [*Rattus rattus*]). Lack of breeding at China Point Area and Lost Point South may result from the level of human disturbance, while impacts from a large number of roosting or breeding seabirds and hauled out pinnipeds may prevent breeding at Bird Rock. Black oystercatchers may also hybridize with American oystercatchers (*Haematopus palliatus*) and have been occasionally found on SCI due to the nearby proximity of the northern extent of American oystercatcher breeding range in northern Baja California. Some hybrids have been known to breed. However, no records of pure American Oystercatchers have been documented on SCI.

The mountain plover (*Charadrius montanus*), a large member of the shorebird family listed as a federal and state Species of Concern, has been observed in low numbers on SCI for many years, but due to range-wide declines and few recent coastal California records, it is not expected to occur into the future. Open grass fields and areas of bare ground are wintering habitat for the species. They use heavily grazed areas frequented by sheep, and probably used the grasslands during the sheep-grazing era.

A variety of shorebird species winter on SCI or use it as a migration stopover point. However, the numbers of any given species are small relative to other areas with more suitable non-rocky intertidal habitat. See Sullivan and Kershner (2005) and Bradley et al. (2011) for a more complete discussion of bird observations at SCI. Appendix B contains a comprehensive species list for the island.

Seabirds

In general, seabirds live longer, begin breeding at a later age, and invest more energy in fewer young than other bird species. Seabirds spend a majority of life at sea, usually coming ashore only to breed, commonly in large colonies.

Approximately 60 species of seabirds have been observed on SCI or in the waters surrounding the island. Examples include loons, cormorants, seaducks, pelicans (Photo 3-46), terns, gulls, petrels, and murrelets. However, only a few species are regular migrants and fewer breed on the island. Several species are considered sensitive by the CDFW, USFWS, and DoD (Table 3-31).

Most seabirds are observed from shore and many are known from only a few records. Some species, such as gulls and terns, will congregate near boats and at Wilson Cove. Sheltered coves on the island are often used for feeding and relief from severe storms that can have significant impacts on seabird populations. Gulls may be predators on nests of some landbirds; however, most seabirds feed primarily on fish and invertebrates.

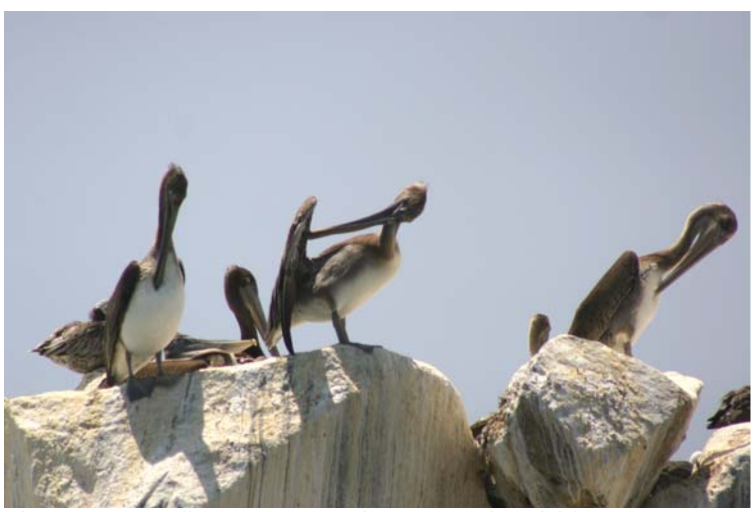


Photo 3-46. Pelicans at San Clemente Island (Tierra Data Inc. 2009).

Table 3-31. Seabirds considered sensitive observed at San Clemente Island.

Scientific Name	Common Name	USFWS, CDFW, PIF Status	Global or State Rank
Gavia immer	common loon	BSSC	G5, S1
Oceanodroma homochroa	ashy storm-petrel	BCC, BSSC, PIF	G2, S2
Oceanodroma melania	black storm-petrel	BSSC	G2, S1
Pelecanus occidentalis californicus	California brown pelican	FP	G4, S1S2
Phalacrocorax auritus	double-crested cormorant		G5, S3
Larus californicus	California gull		G5, S2
Hydroprogne caspia	caspian tern		G5, S4
Thalasseus elegans	elegant tern	PIF	G2, S1
Sterna forsteri	Forster's tern		G5, S4
Synthliboramphus scrippsi	Scripps's murrelet	BCC, ST	G3, G4, S3
Synthliboramphus hypoleucus	guadalupe murrelet	BCC	G3, G4, S3
Cerorhinca monocerata	rhinoceros auklet		G5, S3

USFWS and CDFW Codes: FE = federally endangered; FT = federally threatened; SE = state endangered; ST = state threatened; FP = state fully protected; BCC = USFWS Birds of Conservation Concern (2008); BSSC = CDFW California Species of Special Concern (2008); PIF = DoD Partners in Flight Species of Concern

Global or State CNDBB Rank (2011): G2 = 6–20 element occurrences or 1,000–3,000 individuals or 2,000–10,000 acres, G3 = 21–100 element occurrences or 3,000–10,000 individuals or 10,000–50,000 acres, G4 = Apparently secure but some factor exists to cause some concern, G5 = Population or stand demonstrably secure; T-rank = reflects the global status of the subspecies using same definitions as the G-rank; S-rank = the status within California using same definitions as G-rank.

Seabirds mainly prefer rocky shores of isolated islands for breeding. There are breeding records for seven seabird species at SCI: the double-crested cormorant, Brandt's cormorant, Scripps's murrelet, ashy storm-petrel, California brown pelican, and western gull (Carter et al. 2009, 2010; IWS 2012). Breeding seabirds on the island are partly limited, due to the abundance of terrestrial predators, such as foxes and cats, and a lack of suitable offshore rocks. See Sullivan and Kershner (2005) and Bradley et al. (2011) for a complete discussion of seabird observations at SCI.

Murres, Auklets, Murrelets, and Relatives (Family Alcidae). Alcids are marine birds with a stout bill, short wings and tail, webbed feet, a large head and heavy body, and thick, compact plumage. Important southern breeding colonies historically occurred on the Channel Islands and continue to exist at mostly unknown levels.

Sightings of the Scripps's and Guadalupe murrelet have recently been increasing on SCI even though the species has continued to be a rare breeder on the island (Carter et al. 2009). See Section 3.9.5 Management Focus Species for more information on the Scripps's and Guadalupe murrelet. Other migrants from the Family Alcidae include the rhinoceros auklet (*Cerorhinca monocerata*) and Cassin's auklet (*Ptychoramphus aleuticus*).

Loons (Family Gaviidae). Loons are specialized fish eaters with dagger-like bills, a short neck, long wings, and legs set far back, giving them a distinctive shape. They are the size of a large duck or small goose and spend most of their time in water. Two species of loons are known to be migrant visitors to the island, the common loon (*Gavia immer*) and Pacific loon (*Gavia pacifica*) (IWS 2012). Although rare, the red-throated loon (*Gavia stellata*) is also recorded on SCI (J. Stahl, pers. com. 2012).

Storm-Petrels (Family Hydrobatidae). Storm-petrels are the smallest of seabirds and feed on planktonic crustaceans and small fish picked from the surface, typically while hovering. The ashy storm-petrel is a small seabird and is known to breed in small numbers on SCI

(Carter et al. 2009). See Section 3.9.5 Management Focus Species for more information.

Gulls and Terns (Family Laridae). The California gull (*Larus californicus*), herring gull (*Larus argentatus*), Heermann's gull, glaucous-winged gull (*Larus glaucescens*), elegant tern (*Thalasseus elegnas*), and royal tern (*Thalasseus maximus*) are known migrants to SCI.

The western gull is the only species from the Family Laridae known to breed on SCI. The species is a common breeder and resident on the island (Sullivan and Kershner 2005). Small numbers of western gulls nested at SCI in 1991–2009, primarily on offshore rocks at Bird Rock and Seal Cove Area, as well as at other scattered locations along the west side of the main island (Carter et al. 2010). In 1991, 103 nests were estimated at SCI, slightly higher than the 60 to 82 nests found in 1975–1980. A peak of 142 nests were documented in 2008 with 79 nests (55%) at Bird Rock. In 2010 a total of 111 nests were counted on SCI (UCSC unpublished; Table 3-32). The gull population is predominately limited to offshore rocks, likely due to the absence of high quality breeding habitat and the presence of mammalian predators.

Table 3-32. Whole-colony counts of nests, sites, and birds for the western gull at San Clemente Island (May 2010, University of California Santa Cruz unpublished data).

	Western Gull		
Sample Colony	***Nests***	***Sites***	***Birds***
Castle Rock	1	1	7
Bird Rock	56	24	226
China Point Area	0	2	7
Lost Point South	0	0	0
Mail Point South	30	15	134
Seal Cove Area	24	1	83
Total	111	43	457

On 20 May 1992, western gull eggs were collected at SCI as part of a study of the effects from organochlorine pollutants. This study was conducted by the Western Foundation of Vertebrate Zoology and the University of California Davis for USFWS. Elevated dichlorodiphenyltrichloroethane (DDT) and PCBs were found in 13 of the 16 eggs examined; similar high levels were found at Santa Catalina and San Miguel Islands; less elevated levels were found at Santa Barbara, Santa Cruz, and Anacapa Islands (Fry 1994). Continuing effects from organochlorine pollutants were found for some individuals with earlier exposure, but reproductive success by 1992 at SCI likely was no longer affected to a large degree (Carter et al. 2010). However, earlier impacts from organochlorine pollutants in the 1950s to 1980s likely resulted in low reproductive success, contributing to smaller population sizes at SCI.

Seaducks (Subfamily Merginae). Sea ducks are migratory birds, wintering primarily in the marine environment with specialized bills to eat mollusks and crustaceans from the ocean floor. The surf scoter (*Melanitta perspicillata*), common goldeneye (*Bucephala clangula*), and red-breasted merganser (*Mergus serrator*) are seaduck migrants seen or previously seen on SCI. The surf scoter is the only migrant seaduck species seen regularly on SCI (J. Stahl, pers. com.).

Pelicans (Family Pelecanidae). Pelicans are large birds that have pouched bills used to catch fish by plunge-diving. The only pelican found in the SCB is the species California brown pelican, a common migrant and visitor to SCI. In 2011, a breeding colony of California brown pelicans was discovered on SCI (M. Booker, pers. com. 2011). However, as of 2012, the colony does not consistently breed every year. The species is a resident of the island. See Section 3.9.5 Management Focus Species for more information on the California brown pelican.

Tropicbirds (Family Phaethontidae). Tropicbirds are medium-sized birds with easily distinguishable long tail streamers. There are only three species of tropicbirds, and the red-billed tropicbird (*Phaethon rubricauda*) is the only known migrant to SCI.

Cormorants (Family Phalacrocoracidae). Cormorants are considered coastal rather than oceanic birds, although some have colonized inland waters. There are three species found on SCI: the Brandt's cormorant, the double-crested cormorant, and the pelagic cormorant. Brandt's and double-crested cormorants are known breeders at the island.

The Brandt's cormorant is a fairly common breeder (Table 3-33) and resident to SCI, nesting on sea cliffs and offshore rocks (Sullivan and Kershner 2005); the species nested in low numbers (<100 nests) at SCI from 1991–1996 (Carter et al. 2010). Numbers slightly increased in 1997–2001 (100–200 nests). After this period a large increase occurred, from about 300 nests in 2002 to a peak of 1,630 nests in 2008. The largest colony each year (except 1991 when no nests occurred) was located on Bird Rock, with a peak count of 1,501 nests in 2008; all other colonies on the island were small (<50 nests). In 2010 a total of 787 nests were counted with 715 on Bird Rock (UCSC unpublished; Table 3-33). While this was a decrease from the peak number in 2008, the count is an increase from prior surveys in 1991–2001. Lost Point South is the only other breeding colony used regularly, while Seal Cove, China Point, and Mail Point South are infrequently used. Large feeding flocks form around the island during late winter and spring (Jorgensen and Ferguson 1984). About 2,000 individuals were seen on SCI in January/February 2012 (J. Stahl, pers. com. 2012).

Table 3-33. Whole-colony counts of nests, sites, and birds for the Brandt's and double-crested cormorants at San Clemente Island (May 2010, University of California Santa Cruz unpublished data).

	Brandt's Cormorant			Double-crested Cormorant		
Sample Colony	**Nests**	**Sites**	**Birds**	**Nests**	**Sites**	**Birds**
Castle Rock	0	0	88	-	-	-
Bird Rock	715	340	1,475	-	-	-
Lost Point South	21	6	39	-	-	-
Mail Point South	1	0	1	5	0	7
Seal Cove Area	0	0	0	53	1	48
Total	737	346	1,603	58	1	55

Dash (-) = breeding has not been documented

Colonization of the double-crested cormorant on SCI was first noted in 1999 (Carter et al. 2010). Since, small numbers of nests (<100) have been seen annually in the Seal Cove Area. In 2007–2009, a few nests (<10) occurred at Mail Point South, which likely reflect limited nesting habitats at Seal Cove Area. In 2010 a total of 58 nests occurred at Mail Point South and the Seal Cove area (UCSC unpublished; Table 3-33). Small numbers of the double-crested cormorant are likely to continue breeding at SCI; however, a substantial population increase is unlikely unless they begin to use Sea Cove rocks or Bird Rock for breeding (Carter et al. 2010).

Grebes (Family Podicipedidae). Grebes are small to medium-large in size and excellent swimmers and divers with their feet placed far back on their body, helping to propel and steer underwater. The eared grebe (*Podiceps nigricollis*) and western grebe (*Aechmophorus occidentalis*) are known regular migrants to SCI.

Shearwaters (Family Procellariidae). Shearwaters are medium-sized seabirds. They are common in temperate and cold waters and are pelagic outside of the breeding season. The pink-footed shearwater (*Puffinus creatopus*) and sooty shearwater (*Puffinus griseus*) are regular migrants to SCI.

Jaegers (Family Stercorariidae). Jaegers are rapacious birds resembling a dark gull with a forward-set black cap and projecting central tail feathers. The pomarine jaeger (*Stercorarius pomarinus*) and parasitic jaeger (*Stercorarius parasiticus*) are regular migrants to SCI while the long-tailed jaeger (*Stercorarius longicaudus*) is rarely seen on the island.

See Sullivan and Kershner (2005) and Bradley et al. (2011) for more information on seabird species observed at SCI.

Current Management

Although the Navy has never funded an island-wide survey of the resident land bird populations, Navy wildlife biologists receive ancillary information on resident land birds, including raptors and ravens, by conducting annual San Clemente loggerhead shrike and sage sparrow surveys. Specific findings regarding the loggerhead shrike and sage sparrow are discussed in Sections 3.9.3.8 and 3.9.3.9, respectively. From 1992–2004, environmental contractors collected information on resident land birds, developing a list of birds that are present on SCI, which culminated in a 2005 publication in *Western Birds* entitled, The Birds of San Clemente Island (Sullivan and Kershner 2005). Further surveys resulted in an updated submission to *Western Birds* (Bradley et al. 2011).

Other intermittent focused surveys on raptors conducted through Cooperative Research Agreements have led to several peer reviewed publications in scientific journals. However, few of these included information on habitat associations for other resident land birds. In addition, the Navy performed burrowing owl surveys over two winters from 2009–2010 and 2010–2011 to identify locations used by owls and to assess the potential for conflicts with western snowy plovers, which also overwinter on SCI (Arnold 2012).

The Navy funded focused breeding season surveys of offshore rocks for the black oystercatcher and Scripps's murrelet, along with incidental observations of other nesting seabirds in 2012. The Navy also funds aerial surveys for ground nesting seabirds, including gulls, cormorants, and pelicans. In addition, Navy funded shorebird surveys are conducted once per month, related to western snowy plover monitoring. The monthly western snowy plover shorebird surveys are currently restricted to the sandy beaches on the north end of SCI and in the infield area of the airfield, due to access restrictions to High Explosive Impact Areas in SHOBA per Commander Navy Region Southwest Instruction 4000.2. These western snowy plover shorebird surveys provide ancillary information regarding the use of SCI by other shorebird species. Data is also shared with DoD Partners in Flight (PIF), which contributes towards increased regional knowledge. For more details regarding western snowy plover monitoring see Section 3.9.3.10 Western Snowy Plover.

The Navy funds non-native predator control and habitat enhancement in support of migratory bird use. This program is in alignment with DoD PIF. Data obtained through listed species monitoring is archived through the DoD Coordinated Bird Monitoring Program and shared through presentations at professional conferences. The Navy programmed, but has yet to fund, a monitoring program for landscape scale use of the island by breeding and wintering birds. In addition, the Avian Power Pole Protection project assesses risks and designs avoidance measures to protect raptors and corvids from electrocution.

Table 3-34. Conservation requirements for birds.

Each INRMP shall maintain a relevant and updated baseline list of plant and animal species located at each installation for all pertinent taxonomic and regionally important groups (DoDINST 4715.03 18 March 2011).
DoD Components shall, where appropriate, protect migratory bird species pursuant to the MBTA; EO 13186; and the MOU between DoD and USFWS (DoDINST 4715.03).
DoD components shall protect bald eagles pursuant to ESA where appropriate. DoD shall continue to implement military readiness activities in accordance with Part 15 of Title 50 CFR (MBTA) (DoDINST 4715.03).
DoD shall protect the bald eagle pursuant to sections 668-668d of Reference (h) (also known as the "Bald and Golden Eagle Protection Act, as amended") and MBTA in accordance with parts 13 and 22, regardless of Federal listing status (DoDINST 4715.03).
EO 13186 *Responsibilities of Federal Agencies To Protect Migratory Birds* and unintentional take.
EO 13186 requires that federal agency management plans such as this INRMP promote programs and recommendations of comprehensive migratory bird planning efforts such as PIF, U.S. National Shorebird Plan, North American Waterfowl Management Plan, North American Colonial Waterbird Plan, and other national and international planning efforts.
MOU between the DoD and USFWS to Promote the Conservation of Migratory Birds. This MOU outlines a collaborative approach to promote the conservation of bird populations. The MOU was developed to support EO 13186 rather than the MBTA. The MOU addresses procedures for addressing incidental take of migratory birds during non-readiness activities under the MBTA.

A wildlife risk assessment performed in 2002 indicated that a Bird/Animal Aircraft Strike Hazard (BASH) program was not necessary at that time. Currently, a monthly BASH visit to assess risks occurs. Some recommendations from the visits include: more regular mowing, removing perch areas adjacent to and between the landing strips, and excluding nesting in buildings adjacent to the airfield. In general, the times of greatest threat during migratory bird activity are March through April and August through November.

Assessment of Resource Management

- Conservation measures for migratory birds are reported to the USFWS as part of the INRMP metrics and/or through species-specific partnerships. This reporting will help to ensure that the Navy is compliant with laws, regulations, and measures for uninterrupted continuation of the military mission on SCI.
- Invasive non-native flora may reduce habitat quality for birds. Control of non-native species should occur in areas of high bird use.
- The predation of invasive non-native fauna on native birds may cause a concern for conservation of migratory birds. The impact of predation on native birds should be investigated.
- Periodic surveys previously conducted by Sullivan and Kershner (2005) and Bradley et al. (2011) provided important information regarding bird species utilizing the island. However, access to areas of high potential use by migratory species is currently prohibited due to potential UXO (i.e., Lemon Tank). Aerial surveys have been

successfully used to locate nesting seabirds and may present a method to survey restricted areas.

- Current monitoring efforts are insufficient for tracking long-term trends and status of existing and new non-listed bird species.
- The continuation of seabird monitoring on SCI will add to knowledge of seabird habitat and use of the island.
- The implementation of a regular BASH assessment and implementation of the recommendations reduces BASH risk for military aircraft.

Management Strategy

Objective: *Conserve and enhance native habitat for migrating and resident birds that utilize SCI for stopover resting, feeding, and nesting.*

I. Maintain and enhance the native habitats used by migratory and resident bird species on SCI.

II. Monitor and control for non-native invasive species.

III. Develop a monitoring framework to assess long-term status and trends of migratory and resident birds and their preferred habitat types.

- ***A.*** Conduct seabird surveys to gather more information on the seasonal use and abundance of seabird species on SCI.
- ***B.*** Conduct surveys of management focus species to determine abundance at SCI and potential conflicts with listed species.
- ***C.*** Develop a comprehensive database, including geospatial data, of bird species to facilitate management.

IV. Assess land management techniques for long-term viability of resident bird habitat.

V. Cooperate with large-scale efforts to research, monitor, and manage land, shore, and seabird populations.

VI. Implement recommendations from the 2012 Avian Power Pole Project.

3.9.2.7 Mammals

There are three native terrestrial mammals on SCI: San Clemente Island deer mouse, San Clemente island fox, and California bat (*Myotis californicus*). The San Clemente Island deer mouse and San Clemente island fox, both found throughout the island, are endemic subspecies of SCI, and the fox species is unique to the Channel Islands. The California bat is the only bat species confirmed as a year-round resident during surveys conducted in 2002 (O'Farrell and Haas 2002a, 2002b, 2002c). These bats are largely migratory and feed primarily on insects. They inhabit caves, rock crevices, and human habitations around the island. Three other bat species have been reported on SCI historically: fringed bat (*Myotis thysanodes*), Townsend's big-eared bat (*Plecotus townsendii*), and free-tailed bat (*Tadarida brasiliensis*) (Brown 1980).

The American deer mouse (*Peromyscus maniculatus*) is one of the most widespread rodents in North America. They occur throughout much of Canada into Mexico and are found from the Pacific coast to the Atlantic Ocean. Within this range, they occupy almost every habitat from swamps to the desert (Reid 2006). The San Clemente Island deer mouse is a subspecies of the American deer mouse and is the only rodent native to SCI.

It is found at higher densities on SCI in grasslands than in other habitats (IWS, unpubl. data). Deer mice are nocturnal and usually nest in holes in the ground, but they also will nest under logs, rocks, or other debris in their environment and will occupy structures. Deer mice are omnivores and their diet includes invertebrates, seeds, fruits, flowers, nuts, and other plant parts. They provide an important food source to a large number of predators on SCI, including the San Clemente island fox, feral cat, San Clemente loggerhead shrike, and a variety of other predatory birds. However, deer mice can carry hantavirus and thus can be a hazard to humans that come into contact with the animal, and its feces or urine (Center for Disease Control 2009).

Little is known of the current status of most of the SCI terrestrial mammals, with the exception of the San Clemente island fox. At the state level of jurisdiction, all six island fox subspecies (SCI, SNI, San Miguel, Santa Rosa, Santa Cruz, and Santa Catalina Islands) are listed by CDFW as threatened under the California Endangered Species Act of 1984. At the federal level of jurisdiction, four of the island fox subspecies (San Miguel, Santa Rosa, Santa Cruz, Santa Catalina) were listed by the USFWS as endangered under the ESA in March 2004 (69 FR 10335, USFWS 2004). This listing was based on dramatic population declines, attributed to raptor predation and disease. The SNI and SCI populations were not included in the Draft or Final. The SCI population is currently managed under a Conservation Agreement (USFWS 2003a). See Section 3.9.4.1 San Clemente Island Fox (Urocyon littoralis clementae) for more information.

Eleven mammal species were introduced to SCI in the recent past, although many are no longer present. Goats and sheep were introduced by the early Europeans; cattle, pigs, and mule deer were introduced in the 1950s-1960s, all resulting in severe habitat degradation. After intensive costly removal programs, SCI is now free of the feral herbivores, but their impacts are still visible.

The California meadow mouse (*Microtus californicus*) and western harvest mouse (*Reithrodontomys megalotis longicaudus*), both salt marsh specialists, were likely introduced with ranching activities prior to the 1940s (P. Collins, pers. com. 2012) and have not been documented on the island for a number of years (Cohen 1979). The black rat, house mouse, and feral cat still occur on SCI. A predator control program, operated in conjunction with shrike management, is currently working to control the feral cat and black rat populations. See Section 3.9.7.3 Non-Native Terrestrial Wildlife for more information on these species. Although not allowed on the island, except under the Military Working Dog policy (Naval Auxiliary Landing Field SCI Instruction 5585.2), domestic dogs have occasionally had access to the island through ranchers and recreational boats landing on the island. Appendix B contains a comprehensive species list for the island.

Table 3-35. Conservation requirements for terrestrial mammals.

Each INRMP shall maintain a relevant and updated baseline list of plant and animal species located at each installation for all pertinent taxonomic and regionally important groups (DoDINST 4715.03 18 March 2011).
Support the 2006 MOU for bat conservation on military lands to "develop a policy of cooperation and coordination between the DoD and Bat Conservation International."

Current Management

Native terrestrial mammals are limited in diversity on SCI and are currently managed individually, as in the case of the San Clemente island fox and, to a lesser extent, the San Clemente Island deer mouse. Management of the San Clemente island fox is discussed in more detail in Section 3.9.4.1 San Clemente Island Fox. The pest management and control program at SCI contributes to native terrestrial mammal management by restricting the use of poisonous rodenticide bait for rat control and defining guidelines for control of feral cat populations. Management of non-native species is addressed in Section 3.9.7.3 Non-Native Terrestrial Wildlife and focuses on impacts from feral cats, black rats, and house mice (*Mus musculus*) on SCI.

Assessment of Resource Management

- The current management of native terrestrial mammal populations on SCI is focused on the San Clemente island fox and lacks a comprehensive approach capable of documenting the status and trends of native terrestrial mammal species.
- Small mammal populations are important sources of food for a number of species on the island, including the federally-listed San Clemente loggerhead shrike. Intermittent survey efforts of the San Clemente Island deer mouse has provided basic information on continued presence. More surveys are needed to track trends of small mammals on the island.
- Surveys for bats have occurred intermittently. Natural resources monitoring is precluded at one of the few known sites utilized by bats on the island due to its location within an Impact Area. Bat surveys have only been sufficient to track species presence on SCI. Future studies would have to be conducted if the NRO needed detailed information on bat species use of SCI.

Management Strategy

Objective: *Manage for sustainable populations of native terrestrial mammals in alignment with the military mission.*

I. Maintain and enhance native habitats.

II. Monitor and control for non-native invasive species.

III. Reassess bat presence at least every ten years or as any change in conditions or species status warrants.

IV. Initiate a study of the habitat use, population dynamics, and ecology of the San Clemente Island deer mouse.

V. Develop and implement a bio-security plan containing specific measures to identify and reduce threats to listed and endemic species, reduce the arrival of non-native species, and promote early detection of new arrivals.

3.9.2.8 Marine Mammals

There are 34 cetacean species (whales, dolphins, and porpoises) (Photo 3-47; Photo 3-48), six pinniped species (sea lions, fur seals, and true seals), and one sea otter species that can be found in the SCB (Table 3-36; Navy 2009c). Pinnipeds are known to occur year-round on SCI and, due to the rapid increase in water depth, within a relatively short distance from the east shore, some cetacean species normally found in deep and/or offshore waters have been, or could be expected, close to shore.

Photo 3-47. Risso's dolphin off of San Clemente Island (Tierra Data Inc. 2008).

Photo 3-48. Killer whales (orcas) migrating through nearshore waters of San Clemente Island (Navy).

Marine mammal movement is often related to feeding or breeding activities (Stevick et al. 2002), as migrating marine mammals can take advantage of favorable conditions in other areas. For example, humpback whales (*Megaptera novaengiliae*) make an extensive annual migration to low-latitude areas for mating and giving birth in warm winter waters and to high-latitude, highly productive waters to feed in the summer. Movements of toothed whales (Odontocetes) are likely to follow preferred prey or feed opportunistically, since they lack the fasting capabilities of baleen whales (Mysticetes, filter feeders). Long-ranging movements are also quite common in pinnipeds. Male northern elephant seals (*Mirounga angustirostris*) will make extensive foraging migrations to the Gulf of Alaska and eastern Aleutian Islands during the non-breeding season (Stewart and Huber 1993).

1

Table 3-36. Summary of marine mammal species in waters off southern California (Navy 2009c).

Species	***NMFS Stock Designation***	***Warm Season (May-Oct)***	***Cold Season (Nov - Apr)***
ESA listed marine mammals			
Blue whale	Eastern North Pacific	Yes	No
Fin whale	California, Oregon, and Washington	Yes More	Yes Less
Humpback whale	California, Oregon, and Washington	Yes	No
North Pacific right whale*	Eastern North Pacific	Rare	Rare
Sei whale	Eastern North Pacific	Unk	Unk
Sperm whale	California, Oregon, and Washington	Yes More	Yes Less
Guadalupe fur seal*	Mexico	Unk	Unk
Steller sea lion	California, Oregon, and Washington	No	No
Southern sea otter*	California	Yes	Yes
Mysticetes (non-ESA listed baleen whales)			
Bryde's whale	Eastern Tropical Pacific	Unk	Unk
Gray whale	Eastern North Pacific	No	Transient
Minke whale	California, Oregon, and Washington	No	Yes
Odontocetes (non-ESA listed toothed whales and dolphins)			
Baird's beaked whale	California, Oregon, and Washington	Unk	Unk
Bottlenose dolphin - coastal stock	California coastal	Yes	Yes
Bottlenose dolphin - offshore stock	California offshore	Yes	Yes
Cuvier's beaked whale	California, Oregon, and Washington	Yes	Unk
Dall's porpoise	California, Oregon, and Washington	No	Yes
Dwarf sperm whale	California, Oregon, and Washington	Unk	Yes Less
False killer whale	Eastern Tropical Pacific	Unk	Unk
Killer whale - offshore stock	Eastern North Pacific	No	Yes
Killer whale - transient stock	Eastern North Pacific	No	Yes
Long-beaked common dolphin	California	Yes	Yes
Mesoplodont beaked whale	California, Oregon, and Washington	Unk	Unk
Northern right whale dolphin	California, Oregon, and Washington	No	Yes
Pacific white-sided dolphin	California, Oregon, and Washington	Yes Less	Yes More
Pantropical spotted dolphin	Eastern Tropical Pacific	Unk	Unk
Pygmy sperm whale	California, Oregon, and Washington	Unk	Unk
Risso's dolphin	California, Oregon, and Washington	Yes Less	Yes More
Rough-toothed dolphin	Tropical and Warm Temperate	Rare	Rare
Short-beaked common dolphin	California, Oregon, and Washington	Yes More	Yes Less
Short-finned pilot whale	California, Oregon, and Washington	Unk	Unk
Spinner dolphin	Tropical and Warm Temperate	Rare	Rare
Striped dolphin	California, Oregon, and Washington	No	Rare
Pinnipeds (non-ESA listed sea lions, fur seals, and true seals)			
Pacific harbor seal	California	Yes	Yes
Northern elephant seal*	California breeding	Yes	Yes
California sea lion	U.S. Stock	Yes	Yes
Northern fur seal	San Miguel Island	Yes More	Yes Less

*California Department of Fish and Wildlife Fully Protected Species/Non-game Wildlife Program

Oceanographic conditions and primary productivity (chlorophyll concentrations) are a factor in marine mammal distribution and abundance. Ocean floor topography has been correlated with odontocetes (Hui 1985; Tynan 1996), fin whales (*Balaenoptera physalus*) (Woodley and Gaskin 1996), and southern elephant seals (*Mirounga leonina*) (McConnell et al. 1992). Depth and temperature have been able to predict distribution of right whales (*Eubalaena japonica*) (Moses and Finn 1997). Temperature has also been seen to affect the distribution of baleen species (Woodley and Gaskin 1996; Munger et al. 2009), sperm whales (*Physeter macrocephalus*) (Smith and Whitehead 1993), and southern elephant seals (Hindell et al. 1991). Additionally, cetacean distribution has been correlated to chlorophyll concentrations (Smith et al. 1986; Jaquet et al. 1996; Munger et al. 2009), although marine mammals may not respond to instantaneous changes in primary productivity. Instead, there may be a time lag between the change of primary productivity and predator responses. For baleen whales feeding on zooplankton, which are trophically close to primary production, this lag may be on the order of several weeks, whereas the lag may be considerably greater for toothed whales feeding on cephalopods, which are removed from primary production by approximately four months (Vinogradov 1981).

Large-scale climatic events may affect the distribution and abundance of marine mammal species, either directly or indirectly (Trillmich et al. 1991; Keiper et al. 2005; Simmonds and Isaac 2007). Changes from El Niño events result in lower productivity at lower trophic levels, which results in reduced availability of fish and cephalopods at upper trophic levels (Barber and Chavez 1983; Chavez et al. 2002). Four major declines in the annual count of California sea lion (*Zalophus californianus*) pups occurred during El Niño events in 1983–1984, 1992–1993, 1998, and 2003 (Carretta et al. 2007). California sea lion pup and juvenile mortality rates also increase during El Niño events (DeLong et al. 1991), which affect future recruitment into the adult population.

Marine Mammals at San Clemente Island

Many migratory routes for cetacean species in the SCB are unknown. However, it is understood that SCI and its associated offshore waters is an important migratory corridor for marine mammals. Several marine mammal surveys have been conducted to examine the presence of marine mammals and those biotic and abiotic factors that drive the presence of marine mammals in a specific area. The Carretta et al. (2000) study includes some of the most accurate estimates marine mammal density in waters around the island and involved the use of both ground and aerial photogrammetric surveys (Table 3-37).

Table 3-37. Density of marine mammals encountered in waters adjacent to San Clemente Island during aerial surveys in 1998 and 1999 (Carretta et al. 2000).

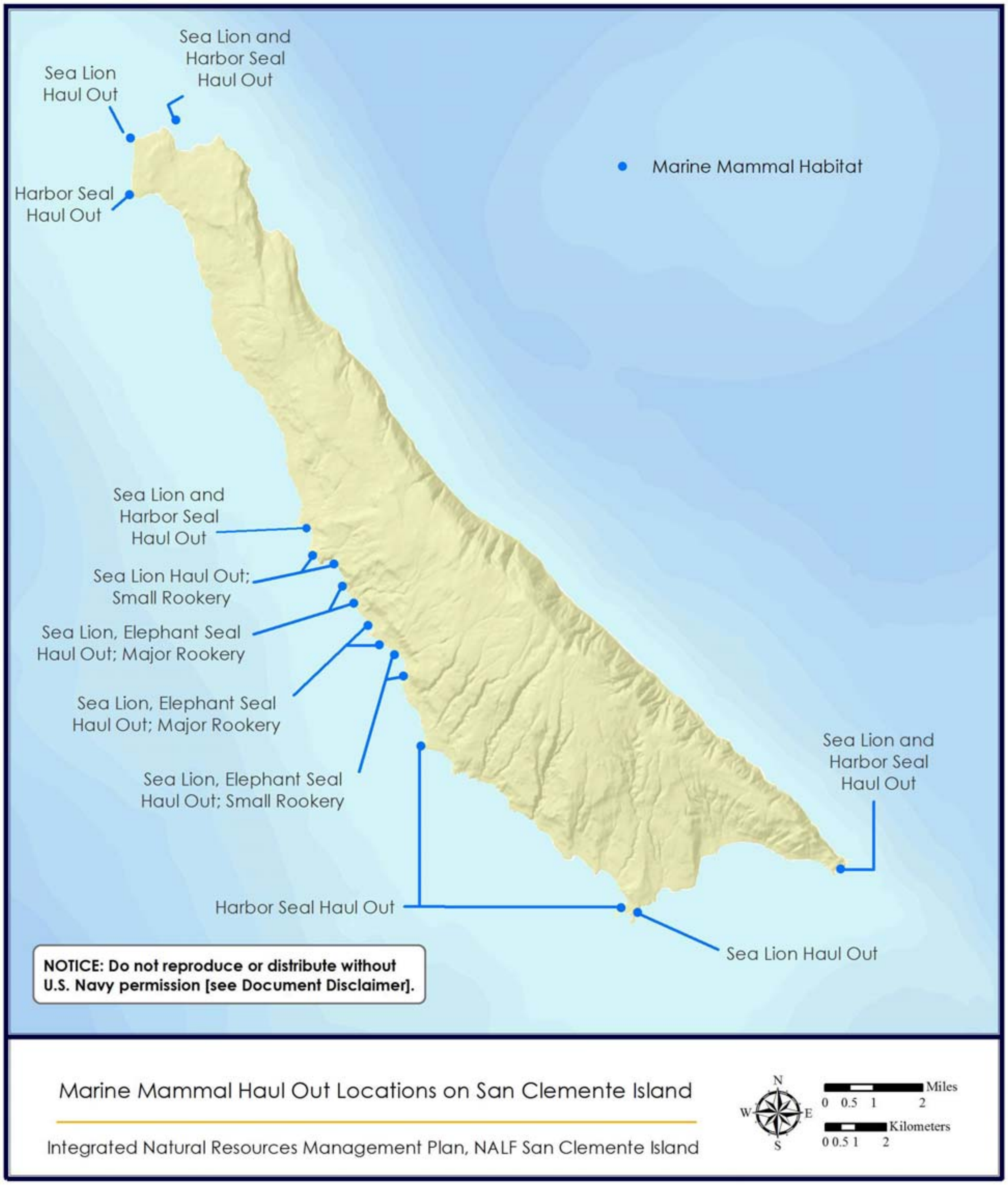
Species	Estimated Density (#/km^2) May-Oct	Estimated Density (#/km^2) Nov-Apr
Short-beaked common dolphin	4.65	1.78
Risso's dolphin	0.061	0.18
Pacific white-sided dolphin	No data	0.197
Northern right whale	No data	0.09
Bottlenose dolphin	0.015	0.034
Dall's porpoise	No data	0.04
Fin whale	0.0089	0.0027
Blue whale	0.0047	0.00045
Humpback whale	No data	0.0015
Gray whale	No data	0.115
California sea lion	0.75	1.19
Pacific harbor seal	0.054	0.025
Elephant Seal	0.051	0.011

The number of gray whales found during NMFS aerial surveys in 1998 and 1999 (n=31) indicate that a significant fraction of the entire population passes through the SCB during southbound and northbound migrations (Carretta et al. 2000). Additionally, the main migratory corridor for humpback whales likely occurs offshore of SCI (Forney and Barlow 1998; Carretta et al. 2000).

The southern sea otter (*Enhydra lutris nereis*) is rarely observed at SCI. Individuals potentially occurring around the island are most likely sub-adult males, as younger males are known to make long-distance movements (Tinker et al. 2008). During the NMFS 1998 and 1999 aerial surveys, three otters were observed on the west coast of the island (Carretta et al. 2000). However, abundance was not estimated due to an insufficient number of sightings (n=3) (Carretta et al. 2000). Since the implementation of the Navy's marine mammal monitoring program in 2008, no sightings of sea otters have been documented at SCI (Navy 2009b, 2010, 2011). For a detailed description of the southern sea otter see Section 3.9.4 Other Special Status Species.

Three species of pinnipeds are seen regularly on SCI: California sea lion (Photo 3-49), northern elephant seal, and Pacific harbor seal (*Phoca vitulina richardsi*). The Guadalupe fur seal (*Arctocephalus townsendi*) and Steller sea lion (*Eumetopias jubatus*) are pinniped visitors to the island. Pinnipeds at SCI predominately haul out in the vicinity of Mail Point and on the offshore rocks of Seal Cove, although other haul outs include Castle Rock, China Point, South Point (Pyramid Head), and Northwest Harbor Islet (Map 3-15; Carretta et al. 2000). All species haul out on rocky substrates; however, the greater climbing ability of the California sea lion allows them to inhabit a larger portion of the rugged coastline.

Photo 3-49. California sea lions on San Clemente Island (Tierra Data Inc. 1993).

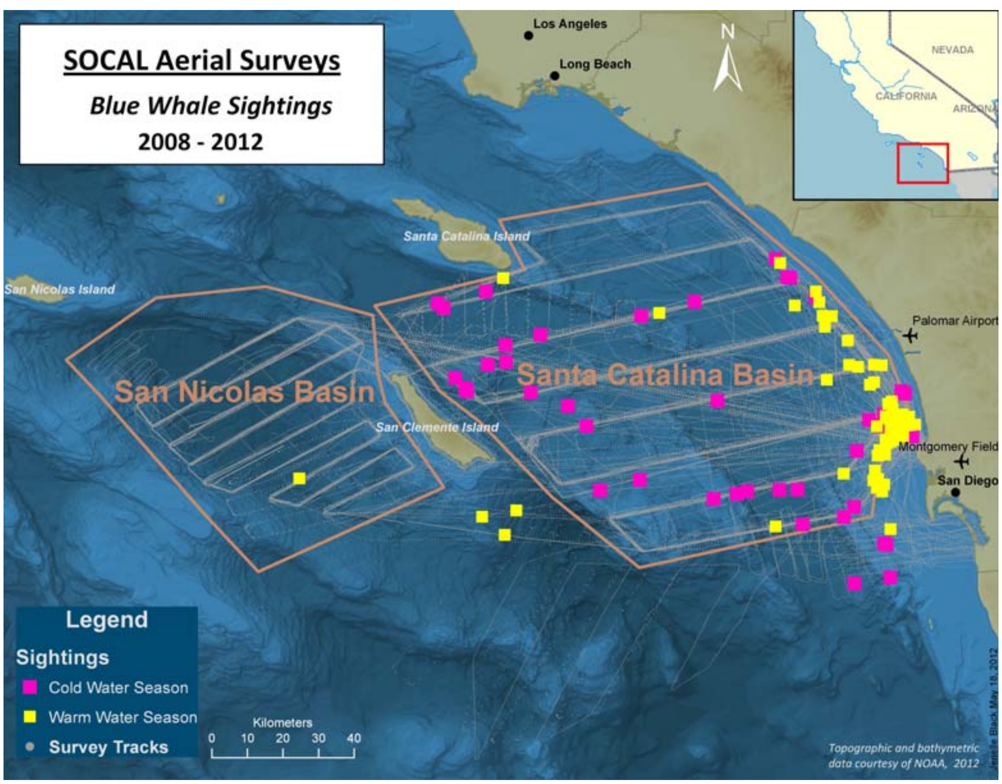


Map 3-15. Marine mammal haul out locations on San Clemente Island.

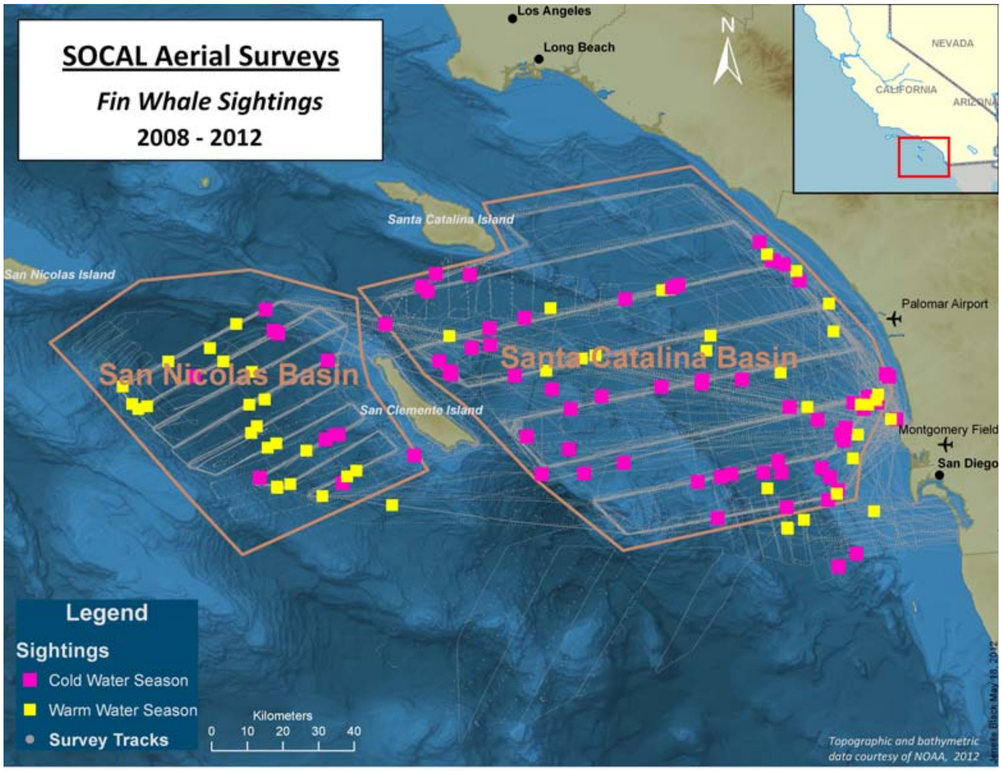
In addition to the Carretta et al. (2000) study, the Navy has funded more recent aerial surveys were from 2008-2012 to monitor the occurrence, abundance, and behavior of marine mammals in the SCB in accordance with the Navy's Letter of Agreement (LOA). The study area overlapped with the survey area in Carretta et al. (2000) and coincided with their warm-water period (See Table 3-36 to compare current abundance data). Although, there were several different marine mammal species identified near SCI during the four-year monitoring period, specific species are discussed in detail below given their federally-listed status and/or high densities near or on SCI.

Blue whale (*Balaenoptera musculus*) densities (Map 3-16) were well below historical estimates, while fin whales (Map 3-17) continue to be the most commonly abundant large whale. Risso’s dolphins (*Grampus griseus*) have dramatically increased in numbers and/or distribution over the last several decades: calculated density east of SCI was 19.99 animals/100 km^2. This density is much higher compared to the warm season density in Carretta et al. (2000). However, densities for the cold season were similar.

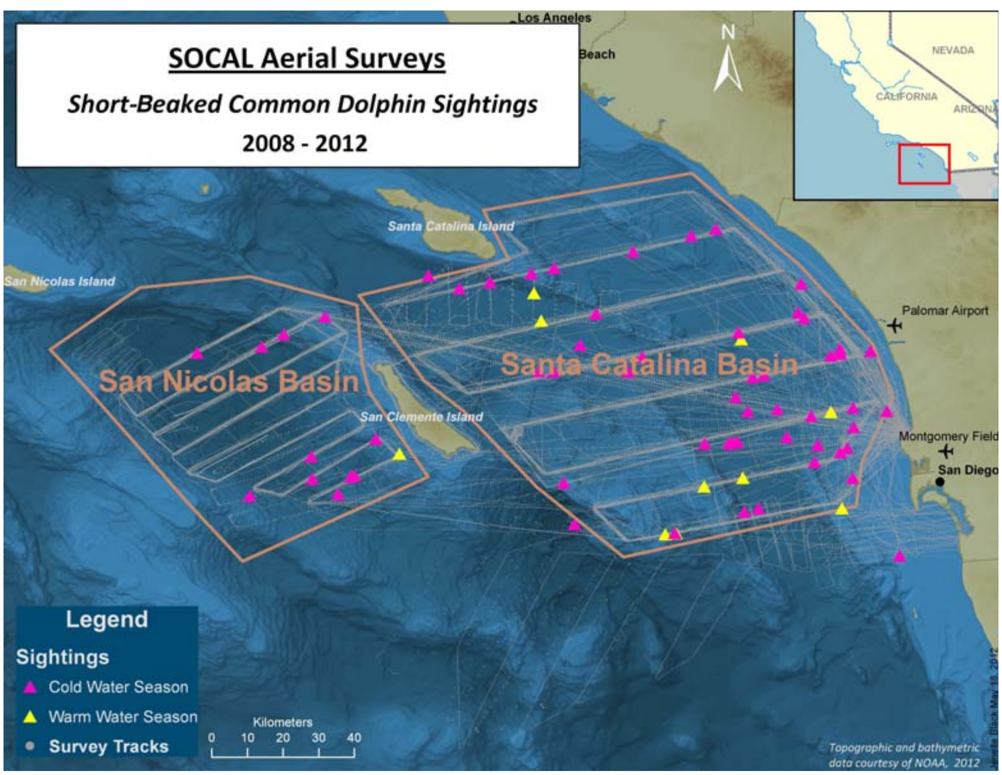
Current densities of common dolphins were lower in recent warm-water surveys (318.99 animals/100 km^2 east of and 58.43 animals/100 km^2 west of SCI) than Carretta et al. (2000). However, short-beaked common dolphins (*Delphinus delphis*) (Map 3-18) were still by far the most abundant species (~29,044 individuals) followed by the California sea lion (Map 3-19).



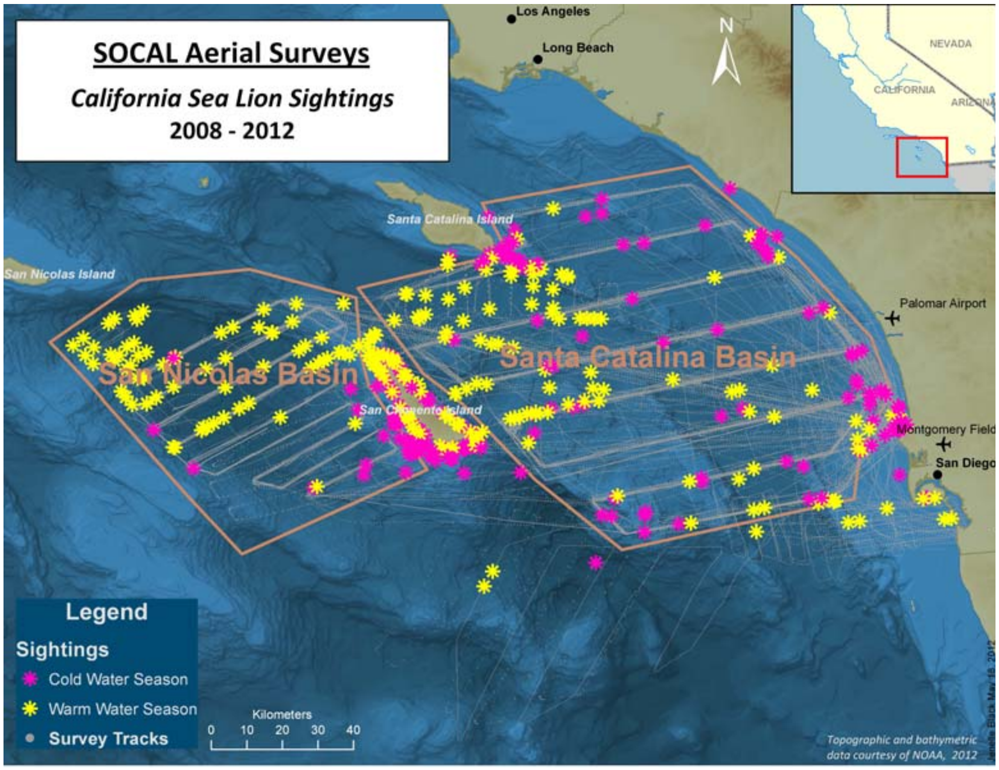
Map 3-16. Blue whale sightings in the Southern California Bight 2008–2012 (Navy 2012).



Map 3-17. Fin whale sightings in the Southern California Bight 2008–2012 (Navy 2012).



Map 3-18. Short-beaked common dolphin sightings in the Southern California Bight 2008–2012 (Navy 2012).



Map 3-19. California sea lion sightings in the Southern California Bight 2008–2012 (Navy 2012).

Historically, Pacific white-sided dolphins (*Lagenorhynchus obliquidens*) were seen only in the cold-water season; however, Navy monitoring made 26 sightings (density 19.7 individuals/100 km^2), all of which were in the warm-water period. Additionally, pilot whales, though historically common, were never seen. Results indicate that recent patterns of relative cetacean abundance and presence are, in many cases, very different from historical records. The decrease in sightings has been common throughout the SCB since the strong El Niño in 1982-83.

The highest number of California sea lions (n=71) were seen during the September 2010 survey and occurred west of SCI, within the Southern California Anti-Submarine Warfare Range. Sightings for California sea lions in September were about 100 times higher than July, due to virtual absence during the month of July (Navy 2011).

California Sea Lion (*Zalophus californianus*)

The California sea lion is the most abundant pinniped species on SCI; however, the population appears to be relatively small when compared with SNI. In July 2011, it was estimated that SCI supported approximately 10,500 animals while SNI supported approximately 120,000 animals (M. Lowry, pers. com. 2011). More than 99% of all California sea lion pups in North America are born in the Channel Islands, and San Clemente and Santa Barbara Islands contain about 10% of pups born in the Channel Islands (M. Lowry, pers. com. 2011). In 2010 about 2,000 pups were born on SCI. The average annual growth of animals at SCI from 1970–2010 was 4.9% and 5.4% for the entire SCB (M. Lowry, pers. com. 2011). The United States population of California sea lions is about 298,000.

California sea lions are seen year-round (Map 3-19) and it is the only pinniped to regularly breed on the island. As in other areas of the SCB, most births occur from mid-June to mid-July (with a peak in late June). During the breeding season reproductively active males establish territories from May through July on both land and in water (See Map 3-15). Territorial males fast, using their blubber for energy. Females come ashore in May and June where they give birth and nurse for about a week before going on their first foraging trip. At about two months of age, pups learn to swim and hunt with their mothers. Pups are weaned between four and ten months of age, although females have been observed nursing yearlings. In the non-breeding season, adult and juvenile males migrate as far north as British Columbia, Canada, while females and pups remain near rookeries (breeding colony). Sea lions molt once a year, usually after the breeding season; however, their molting period is unlike that of true seals, who must stay on land and fast due to the inability to regulate their body temperature, where they gradually loose their hair and grow it back by the next breeding season.

Northern Elephant Seal (Mirounga angustirostris)

Northern elephant seals are State Fully Protected species (Fish and Game Code § 4700). The species has been seen near and on SCI, although in far lower numbers than those of California sea lions. The island supports the smallest elephant seal rookery in southern California with about 30–50 pups born each year (M. Lowry, pers. com 2011.). The United States population of northern elephant seals in 2011 was about 143,000 animals (M. Lowry, pers. com. 2011).

Northern elephant seals typically come ashore only to breed and molt. In early December, all bulls are hauled out on rookeries (See Map 3-15). Pregnant females begin to arrive in mid-December, and peak numbers are present at the end of January and early February. Unlike female California sea lions, female northern elephant seals fast while nursing their pup. This usually lasts for 25–28 days. After the first week in March, females on the rookery will decline. However, this generalized pattern, characteristic of the larger colonies, such as those at SNI, may not be evident at SCI, as the population density is relatively low. Juveniles of both sexes and adult females come ashore to molt in late April and early May, while males will haul out to molt in mid-summer. Yearlings and some juvenile elephant seals will molt in autumn.

Pacific Harbor Seal (Phoca vitulina richardsi)

The Pacific harbor seal is one of five subspecies of harbor seals recognized (Rice 1998). The Pacific harbor seal is known to occur in the eastern North Pacific, ranging from the eastern Aleutian Islands, Alaska to central Baja California, Mexico (Rice 1998). The species is a year-round resident at SCI, and although there are no population counts specifically for SCI, about 6,000 animals can be found in the Channel Islands (M. Lowry, pers. com. 2011). The harbor seal population in the Channel Islands has remained relatively stable since 1984 (NMFS 2011).

Harbor seals generally are non-migratory and stay close to their haul out sites throughout the year. On SCI, as at most sites along the southern coast of California, the pupping period extends from late February to early April with a peak in late March. The nursing period extends from late February to early May, at which time females and their pups will haul out for long periods of time. Pups are nursed for about four weeks before weaning. Unlike most true seals, nursing females with pups make short feeding trips. Mating takes place primarily in the water; adult males gather in potential breeding areas and compete by performing aquatic displays, underwater vocalizations, and fighting. Molt occurs during early June to early July.

Current Management

Management of marine mammals at SCI is conducted in accordance with NMFS and their regulatory authority to implement the MMPA of 1972. The MMPA requires NMFS to ensure that activities with a potential to impact marine mammal populations are conducted in a manner, time, and location most appropriate to minimizing possible adverse effects to those populations. In 2008, an EIS (Navy 2008) and the associated Record of Decision was released, detailing the potential effects to marine mammals as a result of increased Naval activity in the SCB. As a result of the SOCAL EIS (Navy 2008), a LOA and BO (2009) was issued by NMFS to the Navy to the outline requirements necessary to remain in compliance with environmental laws and regulations. In 2012, the Hawaii-Southern California EIS (2012) was published detailing new Naval in-water exercises and their potential effects to marine mammals.

The NMFS ESA Section 7 Consultation Programmatic Final BO (NMFS 2009), Final Rule, and the LOA for the Navy to *take* marine mammals incidental to training exercises in the SOCAL Range Complex currently provides measures to avoid and minimize impacts to marine mammals from Navy training and operations. These measures were implemented to prevent marine mammals from exposure to potentially harmful received levels of active sonar and underwater donations in nearshore waters. The measures are centered on safety zones that trigger reductions in maximum transmission levels, depending on the proximity of one or more marine mammals to surface vessels, helicopters, and submarines that might be transmitting or preparing to transmit active sonar. These measures rely primarily on Navy watchstanders, helicopter pilots, and other Navy assets detecting marine mammals visually so the Navy can take appropriate action.

The Navy has also developed a SOCAL Monitoring Plan to monitor marine mammals. The plan is required under the MMPA, due to the request for the LOA and in support of the BO on the Navy's Training in the SOCAL Range Complex (NMFS 2009). Through the Plan, aerial-, vessel-, and shore-based surveys are conducted along pre-determined aerial survey track lines and include waters within the SCI management footprint.

An MOU between NMFS and NBC was signed in 1981 to protect SCI pinnipeds and cetaceans. This MOU provides for education of Navy personnel and coordination regarding the issuance of permits for research. Currently, Naval Air Station North Island works in collaboration with NMFS to manage pinniped populations by facilitating access on SCI; monitor populations at haul out areas and rookeries; provide enforcement pertinent to the MMPA and its associated regulations; and consult with NMFS regarding potential take from training activities. For details on specific terms of pinniped and cetacean management agreed upon by NMFS and Naval Air Station North Island, see the MOU regarding management and protection of marine mammal populations at SCI.

The Navy follows regional stranding and injured wildlife protocol established by the Southwest Region Marine Mammal Stranding Network. An MOU between the NMFS and the Navy, *Assist in Marine Mammal Stranding Investigations* (Agreement No. PR-055), requires the development of Regional Stranding Investigation Assistance Plan. The Regional Stranding Investigation Assistance Plan is being developed at the regional level with the Navy Stranding Response Coordinators. In addition, NBC Instruction 5090.1, *Base Fishing Regulations*, requires compliance with federal and state laws concerning fish and wildlife, including marine mammals.

Measures are take during military operations to avoid disturbing pinnipeds. Prior to helicopter training exercises, aircrews are briefed by SCORE and told to avoid flying over Mail Point and Seal Cove, which are population pinniped haul out locations.

Assessment of Resource Management

- The Navy is taking a proactive approach to ensure minimal marine mammal take during military training exercises on and around SCI through the establishment of detailed guidance to be followed during these exercises. Minimizing impacts is imperative in order to comply with the NMFS BO on the Navy's proposal to conduct training exercises in the SOCAL Complex (2009) and continue to achieve the military mission on SCI.
- Mitigation measures are aiding in the protection of marine mammal populations that use waters surrounding SCI. However, the effectiveness of the Navy watchstanders is unknown and visual monitoring is limited to daylight hours and decreases in poor weather conditions. As of 2012, the Navy is conducting studies to evaluate the effectiveness of Navy watchstanders.
- SCI NRO has continued to support annual NMFS pinniped surveys on the island, which have captured important population and trends data.

Management Strategy

Objective: *Minimize impacts to cetaceans in nearshore and offshore waters by compliance with the 2009 NMFS BO on the Navy's proposal to conduct training exercises in the SOCAL Range Complex and subsequent BOs associated with the Navy's training and testing activities.*

Objective: *Maintain viable pinniped populations through the protection of SCI haul out sites while no net loss of military training activities.*

I. Follow mitigation measures detailed in the NMFS Final Programmatic BO on Navy activities in the SOCAL Range Complex.

II. Survey for marine mammals before, during, and after conducting exercises.

III. Continue monitoring of marine mammal populations around SCI according to the Navy's LOAs associated with activities in the SOCAL Range Complex.

IV. Protect rookery and haul out sites for pinnipeds on SCI.

- ***A.*** Minimize access and disturbance near California sea lion haul outs and rookeries during the months of May through July that may result in the mortality of pups and/or disturbance of breeding animals.
- ***B.*** Restrict island personnel from approaching or disturbing pinnipeds.

V. Support annual pinniped surveys conducted by NMFS.

VI. Contact NMFS Southwest Fisheries Science Center, when dead or stranded marine mammals are found on the island.

VII. Investigate the following to increase protection of cetaceans and understanding of cetacean behavior in the SOCAL Range Complex:

- ***A.*** Effects of Naval training activities on Cuvier's beaked whales (*Ziphius cavirostris*) at the individual and population level.

- ***B.*** Behavioral reactions of cetaceans to sound.
- ***C.*** Movement patterns and residence time of blue, fin, and Cuvier's beaked whales.
- ***D.*** Density of Cuvier's beaked whales in the northern SOCAL Range Complex.
- ***E.*** What are the behavioral activities of cetaceans within the SOCAL range complex?
- ***F.*** Annual occurrence of blue and fin whales northern SOCAL Range Complex.
- ***G.*** Winter densities of cetaceans within the nearshore and offshore waters.

3.9.2.9 Pollinators

Pollination is a key process in the life cycle of all flowering plants. When pollen is moved within a flower or carried from one flower to another of the same species its leads to fertilization. This transfer of pollen is necessary for healthy, productive native ecosystems. A small percentage of plant species rely on wind or even water to transfer pollen, but the vast majority, 88% of all plant species, needs the help of animals (http://www.dodpollinators.org/). Species such as bees, butterflies, moths, flies, birds, bats, and beetles act as pollinators. Pollinators are keystone species, meaning their presence in an ecosystem is essential for the health and function of that environment.

Pollinators are at risk from numerous threats and this, in turn, threatens the many benefits people and ecosystems derive from pollination services. The quality and quantity of pollination has implications for species and ecosystem conservation and recovery as well as resilience to environmental changes, such as climate change.

Pollinators are vital to installation landscapes and for carrying out the military mission. Without pollinators, native landscapes might become barren, or be overrun by invasive species. Declines of at-risk species might translate into access restrictions and, therefore, could reduce the military's capacity to test and train. Diverse native plant communities are frequently more resilient to impacts from training activities than poorer quality habitats. Native plant communities resist erosion from military operations, are less susceptible to catastrophic and/or small frequent fires, and provide realistic and safe training environments.

Current Management

A healthy habitat is essential for the continued long-term existence of pollinators. Monitoring of vegetation condition and trends is necessary to measure the health of an ecosystem. Maintaining a healthy ecosystem with native species is critical to supporting the military mission on SCI. For that reason, the Navy implemented a long-term vegetation monitoring program on SCI. Since the initiation of the program in 1992, surveys have occurred in interim years with reports produced by TDI in 1996, 2000, 2002, 2003, 2006, 2008, and 2011. Another important goal of the program is to distinguish between natural and anthropogenic factors affecting trends in vegetation and land cover. For more details on this program, see Section 3.7.1.14 Long-Term Vegetation Monitoring Program.

The NRO on SCI is also involved in restoration and revegetation projects on the island in addition to erosion control. These projects are intended to increase the quality of habitat on SCI and enhance ecosystem function. Erosion issues and mitigation measures have been discussed in the SOCAL EIS (Navy 2008), Record of Decision for the EIS, and the BO on SCI Military Operations and Fire Management Plan (USFWS 2008a).

Surveys of invertebrates, bats, and birds have all provided information on potential pollinators on SCI. For more information on these surveys, see Section 3.9.2.1 Terrestrial Invertebrates, Section 3.9.2.6 Resident and Migratory Birds, and Section 3.9.2.7 Mammals.

Assessment of Resource Management

- The SCI LCTA program has been successful at providing a baseline description of the floristic composition and vegetation on SCI, including the documentation of rare and endemic plants. This data is and will continue to be used to measure the success of applicable natural resources programs.
- Habitat restoration, through the removal of invasive plant species and augmentation of the native floral population can result in high quality pollinator habitat, even on small patches of ground.
- Projects to control and prevent erosion enhance habitat used by pollinators. This is important to sustain healthy populations of pollinators, as well as island ecosystems that rely on pollinators.
- Surveys to establish the presence of pollinators on SCI are imperative to begin to understand the importance of pollinators on SCI habitats. Future surveys should continue to investigate their role in the island ecosystem.

Management Strategies

***Objective:** Maintain and enhance pollinator populations and their habitat when not in conflict with human and wildlife health and safety and the military mission.*

I. Manage for beneficial pollinators in collaboration with DoD and other agency partners, as feasible.

II. Plant native species that will improve habitat value for pollinators.

- ***A.*** Identify pollinator-friendly landscapes at SCI as high value habitats on the ground (as necessary) and in management plans to protect them from unnecessary disturbances, including any potential misapplication of pesticides, and to maintain a record of their location for successive habitat enhancement activities and monitoring.
- ***B.*** Seek opportunities to coordinate with post-construction and facility maintenance activities to establish and promote pollinator-friendly plants and landscapes.

III. Inventory and monitor pollinator populations.

- ***A.*** Establish the baseline conditions of pollinators and the plants and animals dependent on them at SCI. Investigate opportunities to establish research partnerships through cooperative agreements to accomplish this goal.

IV. Identify and develop pollinator-friendly landscapes.

V. Continue to control the spread of invasive species.

VI. Develop and implement a management program that supports bee relocation as opposed to bee eradication in the case of any conflicts.

VII. Develop and distribute educational materials on pollinators, including a pollinator protection guide for managers specific for SCI.

VIII. Review existing literature on pollinators.

3.9.3 Federally Threatened and Endangered Species

Table 3-38 is a summary of federally-listed plants and animals that occur within the SCI footprint and fall under the protection of the ESA. Under Section 7 of the ESA, federal project proponents must consult with USFWS or NMFS if one or more listed species may be affected by an action. Consultation with USFWS or NMFS may range from informal discussions to formal consultation, requiring a Biological Assessment by the project proponent. Refer to Appendix F for benefits to endangered species.

Table 3-38. Federally-listed plants and animals occurring within the INRMP footprint that fall under the protection of the Endangered Species Act.

ESA Status	Scientific Name	Common Name
Plants		
FE	*Acmispon dendroideus* var. *traskiae*	San Clemente Island lotus
FE	*Castilleja grisea*	San Clemente Island indian paintbrush
FE	*Delphinium variegatum* subsp. *kinkiense*	San Clemente Island larkspur
FE	*Lithophragma maximum*	San Clemente Island woodland-star
FE	*Malacothamnus clementinus*	San Clemente Island bush-mallow
FE	*Sibara filifolia*	Santa Cruz Island rockcress
Terrestrial Species		
FT	*Artemisiospiza belli clementae*	San Clemente sage sparrow
FT	*Charadrius nivosus*	western snowy plover
FE	*Lanius ludovicianus mearnsi*	San Clemente loggerhead shrike
FT	*Xantusia riversiana*	island night lizard
Marine Species		
FT	*Arctovephalus townsendi*	Guadalupe fur seal
FE	*Balaenoptera borealis*	sei whale
FE	*Balaenoptera musculus*	blue whale
FE	*Balaenoptera physalus*	fin whale
FT/FE*	*Caretta caretta*	loggerhead sea turtle
FT/FE*	*Chelonia mydas*	green sea turtle
FE	*Dermochelys coriacea*	leatherback turtle
FT	*Enhydra lutris nereis*	southern sea otter
FE	*Eubalaena japonica*	North Pacific right whale
FT/FE	*Eumetopias jubatus**	Steller sea lion
FE	*Haliotis sorenseni*	white abalone
FE	*Haliotis cracherodii*	black abalone
FT/FE*	*Lepidochelys olivacea*	olive ridley sea turtle
FE	*Megaptera novaeangliae*	humpback whale
FE	*Physeter macrocephalus*	sperm whale

FE=federally endangered; FT= federally threatened

* The species has separate designations for populations that are discrete from other populations.

3.9.3.1 San Clemente Island Lotus (*Acmispon dendroideus* var. *traskiae*)

The San Clemente Island lotus, listed as federally endangered since 1977 (42 FR 40682), is endemic to SCI (Junak 2010). The San Clemente Island lotus has made a strong recovery since the eradication of non-native herbivores in 1992 and has been proposed to be downlisted to threatened under the ESA (77 FR 29078). It is a distinctive shrub with dark green foliage and light brown legumes. It grows to about 3 feet (1 m) tall. Flowering generally occurs from March to May with small, bisexual yellow flowers. Flowers of this size and color are generally pollinated by small bees, which have been observed foraging on the flowers. All species in this genus are capable of self-pollinating but still depend on insects for effective pollination (Junak and Wilken 1998). Fruits are indehiscent (remain attached to the plant after ripening) and after collection, both scarified and unscarified (abraded) seeds germinated readily at similar rates. Although this is believed to be a rare event, the San Clemente Island lotus has been known to hybridize with the San Clemente Island bird's-foot trefoil when they occur together (Liston et al. 1990). Evidence for hybridization has only been confirmed near Wilson Cove; however, hybridization may still pose a possible threat to continued recovery (USFWS 2012a).

The San Clemente Island lotus grows somewhat colonially around rock outcrops in grassy areas or along the interface between grassland and maritime sage scrub. It is frequently found on north- and east-facing slopes at elevations ranging from 25 to 1,400 feet (8 to 430 m) along the entire length of the island from Wilson Cove in the north to Pyramid Cove in the south (Junak and Wilken 1998; Junak 2006). Potential habitat may include most of the eastern escarpment and cooler slopes on the west shore. It readily occupies disturbed sites (Beauchamp, n.d.), and some locations are close to buildings, roads, and pipelines.

Other species in the genus, including the mainland counterpart deerweed (*Acmispon glaber*), germinate prolifically following fire; however, the fire response of the short-lived San Clemente Island lotus is not known. In a permanent monitoring plot established in Canchalagua Canyon, two adults were burned in 1995. In 1996, one adult and six seedlings were recorded (E. Kellogg, pers. com. 2006). At another site in the same canyon, two adults were burned and two seedlings were later discovered. Although fire may benefit the San Clemente Island lotus, short-interval, frequent fires may also pose a threat to continued recovery due to the potential to exhaust the seed bank (USFWS 2012a).

Species Status and Trends

Early reports from 1996 and 1997 identified over 3,000 individuals in 64 location with the largest population comprising 750 individuals (Junak and Wilken 1998). Between 2003 and 2006, 69 locations totaling approximately 6,750 individuals were mapped (Map 3-20). The largest population consisted of 2,300 plants (Junak 2010). Surveys in 2011/2012 by SERG recorded 119 locations, with a total of 9,847 individuals. The maximum population size was estimated at 1,500 individuals and the average population size was 82 individuals (B. Munson, pers. com. 2011).

Map 3-20. Existing locations of San Clemente Island lotus (Acmispon dendroideus var. traskiae).

Current Management

To alleviate threats to this species caused by fire, erosion, non-native flora, and alteration of habitat from military training and development, the Navy has implemented conservation measures and projects, such as measures outlined in the WFMP and control of erosion and non-native plants.

Assessment of Resource Management

- The eradication of non-native herbivores on SCI has been effective in expanding populations of the species across the island. Currently, there are no other predators on SCI known to pose a significant threat to the San Clemente Island lotus.
- There is a need for a programmatic maintenance/utility/infrastructure plan to address impacts occurring to this species in Wilson Cove. An expansion of facilities in the vicinity of Wilson Cove may negatively impact newly established populations.
- An increase in the both number of locations and number of individuals has been documented, suggesting threats to this species have been reduced.
- Expansion of iceplant in the Wilson Cove area may pose a localized threat to some individuals.
- Coordination with USFWS should be pursued to address identified threats and associated management actions to support the downlisting and eventual delisting of the species.

Management Strategy

Objective: *Maintain viable populations and facilitate delisting of the San Clemente Island lotus.*

I. Protect established populations of the San Clemente Island lotus through habitat enhancement activities.

A. Control and remove non-native species where needed.

1. To the extent feasible, remove iceplant at Wilson Cove annually.

B. Continue to complete vegetation management and restoration activities to enhance habitat.

II. To the extent feasible, implement recommendations from the USFWS Five-Year Review (USFWS recommendations for future actions; USFWS 2012a).

A. Develop a systematic survey protocol for the San Clemente Island lotus. These surveys should include confirmation of existing locations at greater regularity to better determine accurate population status and trends for the species. Additionally, these protocols should include the standardization of information collected, such as habitat conditions, habitat type, number of plants, date collected, etc.

B. Conduct studies to investigate hybridization with related species and the extent of this hybridization on the island.

C. Conduct studies to determine the fire tolerance and preferred fire regime of the San Clemente Island lotus.

D. Work with USFWS to better estimate fire frequency in areas occupied by the San Clemente Island lotus.

III. Monitor robust, geographically diverse, and redundant populations.

A. Develop methods to monitor populations and trends of the San Clemente Island lotus without conducting a census.

B. Focus population surveys on LCTA plots.

3.9.3.2 San Clemente Island Indian Paintbrush (*Castilleja grisea*)

The San Clemente Island indian paintbrush (Photo 3-50) was listed as endangered under the ESA on 11 August 1977 (42 FR 40682). On 16 May 2012, the USFWS announced a proposal to change the status of the species from endangered to threatened (17 FR 29078).

The San Clemente Island indian paintbrush is a small, perennial shrub endemic to SCI (Chuang and Heckard 1993) and is the only species from the genus *Castilleja* found on the island (Helenurm et al. 2005). It grows to a height of 15–24 inches (40–60 cm) and has yellow flowers borne in terminal spikes. Its vegetative parts are green and densely hairy (Hickman 1993).

Photo 3-50. San Clemente Island indian paintbrush on San Clemente Island (Tierra Data Inc. 2008).

The species generally flowers from February through May, although flowering has also been recorded in December (Junak 2010). Its seeds are passively dispersed from June through August (Beauchamp n.d.). Junak and Wilken (1998) found that 67 to 71% of all flowers produced fruits and seeds per fruit varied widely. These data suggest the species may not be able to self-pollinate and be strongly dependent on insect visitation for pollination and seed set. Although specific data on pollinators of this species are lacking, generally yellow-flowered members of the genus *Castilleja* are bee-pollinated (Muller and Junak 2010).

Although not confirmed in this species, all members of the genus *Castilleja* are considered hemiparasitic, with their roots tapped into the root systems of other species to ensure an adequate water, and possibly nutrient, supply (Junak and Wilken 1998). Parasitism in *Castilleja* spp. does not appear to be limited to one or a few host species, but parasitism within a wide range of families, including Asteraceae, Fabaceae, Polygonaceae, Poaceae, and Rosaceae (Muller 2005). There is no definitive information on which plant this species might be dependent on, although California brittlebush, coast prickly pear (Navy 1996), and coast goldenbush (Beauchamp n.d.) have been proposed. The list of species known to be associated with the San Clemente Island indian paintbrush is broad and indicates that no single species is overwhelmingly associated with the species (Muller and Junak 2010). The most common associates were California sagebrush, showy island snapdragon, coast prickly pear, and golden spined cereus. However, mere co-occurrence may only be related to species having similar habitat requirements.

The San Clemente Island indian paintbrush is found on steep canyon walls along both sides of the island and coastal bluffs, slopes, and flats around the perimeter (Junak 2010). Some of the largest populations are in bowl-shaped swales on the coastal terraces. The species is found in both the coastal sage scrub and maritime cactus scrub plant communities at elevations between 33 and 1,750 feet (10 and 533 m). Its distribution also overlaps with the boundary of SHOBA with 48 populations (40%) occurring inside and 71 populations (60%) occurring outside (Junak 2006).

Members of this genus tend to follow fire and other non-catastrophic disturbance; however, this species is larger and woodier than its mainland counterparts and adaptability may differ. A monitored population in Pyramid Cove peaked in 1984 after a fire in 1983, declining for numerous years after (Navy 1996).

The effects of disturbance on this species, such as fire or trampling, would be difficult to assess given the observed wide variation in population numbers and trends on monitored sites, where no apparent disturbance has occurred. The number of locations and individuals of the species have increased substantially following the removal of non-native herbivores from the island in 1992 (TDI 2011b).

Species Status and Trends

Historically, San Clemente Island indian paintbrush was relatively common on the southeast coast of SCI and west canyons. The population declined from the 1930s throughout the 1970s as a result of the rise in feral goat numbers until only a few individuals remained (Oberbauer 1978). By 1984 an estimated 1,000 plants were spread across rock faces of cliffs in the eastern escarpment canyons with about 400 to 500 individuals on a sandy flat at Pyramid Cove.

Map 3-21. Existing locations of San Clemente Island indian paintbrush (Castilleja grisea).

Currently, the species is widely distributed from Jack Point south, on both the east and west sides of SCI (Map 3-21). A total of 198 separate locations of the San Clemente Island indian paintbrush were mapped, comprising 9,718 individuals, on SCI between 2003 and 2006 (Junak 2010). Locations ranged from isolated plants to populations with 1,400 individuals. The average population size was approximately 49.1 individuals; therefore, the population was listed as increasing (Junak 2006). Estimates from SERG in 2011/2012 recorded 325 total locations (compared to 335 locations in 2007; many of Junak's points merged into polygons, especially on the east side) for a total of 35,280 individuals (compared to 14,064 individuals in 2007). Maximum population size was approximately 5,000 individuals, with an average population of 108. The current population is between 35,000 and 60,000 individuals (B. Munson, pers. com. 2013).

Current Management

Seed has been collected and stored on the island for possible future propagation and outplanting, if needed. The Navy has implemented conservation measures and projects, such as measures outlined in the WFMP and control of erosion and non-native plants to alleviate threats to this species caused by fire, erosion, non-native flora, and alteration of habitat from military training and development.

Dr. Kaius Helenurm conducted a genetics study of sensitive plant species on SCI, including the San Clemente Island indian paintbrush. The San Clemente Island indian paintbrush exhibits a high level of genetic diversity, exceeding expectations for a species endemic to one island (Helenurm et al. 2005).

Assessment of Resource Management

- Feral herbivores were the primary threat to this species and since they were eradicated in 1992, this species has increased dramatically.
- Increases in both the number of locations and individuals of the San Clemente Island indian paintbrush have been documented on SCI, suggesting threats to this species have been reduced. The species is likely recovered, or near recovery; therefore, protection under the ESA is most likely unnecessary. A monitoring program should begin to assist with delisting this species.
- Threats are believed to be specific to individual plants, rather than to the species as a whole. The Navy should coordinate with USFWS to address identified threats to these individuals.

Management Strategy

Objective: *Maintain existing populations of the San Clemente Island indian paintbrush and continue recovery efforts, where needed.*

Objective: *Protect bumble bee and/or other native insect pollinators throughout the current distribution of the San Clemente indian paintbrush.*

I. Continue to protect the San Clemente Island indian paintbrush through fire management planning, non-native flora control, restoration activities, and erosion control.

II. Foster robust, geographically diverse, and redundant populations to maintain and increase the population and protect genetic diversity.

III. Develop methods to monitor populations and trends of the San Clemente Island indian paintbrush without conducting a census.

- ***A.*** Use methods that separate weather factors from other causes of trends.

IV. To the extent feasible, implement recommendations from the USFWS Five-Year Review (USFWS recommendations for future actions; USFWS 2012b).

- ***A.*** Develop a systematic survey protocol for the San Clemente Island indian paintbrush. These surveys should include confirmation of existing locations at greater regularity to better determine accurate population status and trends for the species. Additionally, these protocols should include the standardization of information collected, such as habitat conditions, habitat type, number of plants, date collected, etc.
- ***B.*** Conduct research to determine the host plant or plants of the San Clemente Island indian paintbrush and degree of dependence on host plants.
- ***C.*** Conduct studies to determine the fire tolerance and preferred fire regime of the San Clemente Island indian paintbrush.
- ***D.*** Work with USFWS to better estimate fire frequency in areas occupied by the San Clemente Island lotus.

V. Focus population surveys on long-term condition and trend plots.

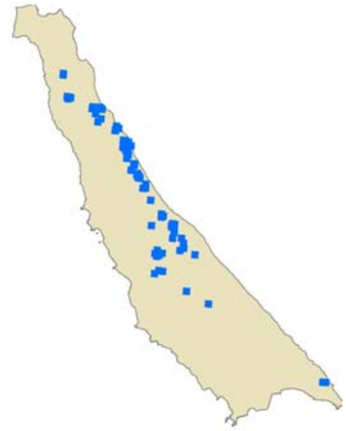
3.9.3.3 San Clemente Island Larkspur (*Delphinium variegatum* subsp. *kinkiense*)

The San Clemente Island larkspur (Photo 3-51), listed as endangered under the ESA since 12 September 1977 (42 FR 40685), has been proposed to be downlisted to threatened by the USFWS (USFWS 2008c). It is a herbaceous perennial that generally flowers from March to April (CNPS 2001). It grows between 6 and 33 inches (14–85 cm) tall but is generally less than 20 inches (50 cm) (Warnock 1993). Approximately 65–79% of flowers produce fruit, and herbivory of both fruit and seeds has been reported. Many species of this genus are self-incompatible and require insect mediation for pollination (Junak and Wilken 1998); seeds may also require a dormancy period prior to germination.

Photo 3-51. The Thorne's larkspur (left) and San Clemente Island larkspur (right) are currently recognized as two subspecies (Navy 2012).

The San Clemente Island larkspur and Thorne's royal larkspur (two of the three subspecies) are endemic to SCI (Warnock 1993; Dodd and Helenurm 2002). The San Clemente Island larkspur is found primarily on open grassy terraces (Map 3-22) between elevations of 260-840 feet (80-255 m) (Junak 2010). Populations grow on gentle slopes with rocky soils on northwest, north, and east exposures (Junak 2010), associated with both annual (*Avena* spp. and *Bromus* spp.) and perennial grasses (i.e., purple needlegrass) (Beauchamp n.d.). Common garden, greenhouse propagation, and reciprocal transplant-type experiments have been proposed and may be implemented in the next several years to investigate the effects of soils, exposure, and microclimate on floral color.

Thorne's larkspur generally occurs in southern SCI with bright blue (i.e., darker), slightly larger flowers than the San Clemente Island larkspur (Photo 3-51; Dodd and Helenurm 2000; Warnock 1993), although there is overlap between the two. The third subspecies, the royal larkspur (*D. v.* subsp. *variegatum*), is found only on the California mainland (Dodd and Helenurm 2002). While the San Clemente Island larkspur is listed as endangered, the other two have no federal status.



Map 3-22. Existing locations of San Clemente Island larkspur (Delphinium variegatum subsp. kinkiense).

Sepal color, lateral sepal length, and lower petal blade length are generally used to distinguish the subspecies (Dodd and Helenurm 2000). However, Dodd and Helenurm (2000) have found broad variation within populations and substantial overlap among the SCI subspecies in regard to these floral characters. Sepal color appears to be the least ambiguous for differentiating the island subspecies. However, using sepal color as a distinguishing tool may be problematic where central populations, which represent a large percentage of the total population, contain both light and dark individuals, as well as individuals of intermediate color (Dodd and Helenurm 2000, 2002). Hybridization, among other taxa in this genus, has been documented; as a result, the intermediate character of central populations strongly suggests there may be hybridization among the subspecies in these populations (Dodd and Helenurm 2002).

Alternatively, the variation observed in the island taxa may indicate that they are a single, highly variable subspecies of *D. variegatum* or a completely different species of larkspur (J. Koontz, pers. com. 2012). Genetics work on the two subspecies has yet to show any variation between plants with light or dark flowers (Dodd and Helenurm 2000). Additional genetic studies and morphological projects will further investigate the variation in the two subspecies. In the future, these studies may suggest combining the varieties, perhaps resurrecting *Delphinium kinkiense* Munz as the species of larkspur on SCI, thus combining both subspecies (J. Koontz, pers. com. 2012). They will remain separate until this taxonomy is published or reported. Until additional studies (currently underway) are completed, and in light of existing genetic data, it would be most prudent to manage both island taxa to maintain the variation observed in the field (J. Koontz and B. O'Brien, pers. com. 2012).

Field observations following fire suggest that this species (including both SCI larkspur and Thorne's larkspur) is tolerant of fire during its dormant period (USFWS 1984). Other species of *Delphinium* respond positively to fire, but burns prior to seed set and dormancy may be adverse. However, this species probably depends more on resprouts than seed for fire recovery due to carbohydrate storage in its tap root. Fire adaptation may be increased by the plant's ephemeral nature and rapid seed set. This species does not appear to be displaced by invasive species and even appears to grow well among invasive grasses that normally would expel native plants (B. Munson, pers. com. 2011).

Non-native herbivores historically threatened the San Clemente Island larkspur until they were eradicated from the island in 1992. Populations still likely face threats from erosion, competition from non-native plant species, alteration of habitats, increased fire frequency, and constrained access to the southern portion of its range.

Species Status and Trends

Surveys conducted by SERG in 2011/2012 recorded 36 populations of the San Clemente Island larkspur with a total of 2,950 individuals, with a maximum population size of 620 individuals and an average population size of 82 individuals. Counts of individuals were based on numbers of flowering plants; therefore, counts are expected to be much higher since non-reproductive individuals were not counted. Efforts are ongoing to determine the ratio of seedlings, juveniles, non-flowering adults, and reproductive individuals (B. Munson, pers. com. 2011).

These surveys also recorded 53 populations of Thorne's royal larkspur with a total of 3,770 individuals and a maximum population size of 600 individuals and an average population size of 71 individuals. Counts for this subspecies were also only based on reproductive individuals (B. Munson, pers. com. 2011).

Current Management

Currently, SCI NRO is developing plans to propagate the two subspecies of larkspur on the island to investigate whether they are indeed different subspecies. Additional genetic studies will investigate genetic differences between the two subspecies, as existing genetic data have not shown any difference between the two species (Dodd and Helenurm 2002).

The San Clemente Island larkspur benefits from conservation measures and projects aimed at managing fire, erosion, non-native flora, and the alteration of habitat from military training and development. Management of these threats occurs through measures outlined in the WFMP and control of erosion and non-native plants.

Assessment of Resource Management

- The status of the San Clemente Island larkspur has improved substantially since the removal of non-native herbivores in the early 1990s, suggesting that the principle threat limiting the subspecies has been removed.
- Threats are believed to be specific to individual plants, rather than to the species as a whole. The Navy should coordinate with USFWS to address identified threats to these individuals.

Management Strategy

Objective: *Maintain existing populations and continue recovery efforts, where needed, while avoiding fragmentation of habitat throughout its current distribution.*

I. Protect against habitat fragmentation that impairs pollinator movement.

II. Monitor for erosion within island grasslands and control erosion where it may be threatening specific locations of the San Clemente Island larkspur (Conservation recommendation).

III. Establish appropriate fire management goals for island grasslands that are sensitive to this subspecies (Conservation recommendation).

IV. Evaluate potential impacts of fire on the San Clemente Island larkspur (Conservation measure FMP-M-3 on the BO on SCI Military Operations and Fire Management Plan).

V. Monitor for new invasions of species that may pose a threat to the recovery of the San Clemente Island larkspur.

VI. Focus population surveys on LCTA plots.

VII. Continue to study the differences or relationship between the two subspecies on SCI to help understand if they are indeed different subspecies.

VIII. Develop methods to monitor populations and trends of the San Clemente Island larkspur without conducting a census, and which are sufficient to separate weather-related drivers of trend (for instance, many more plants sprout from dormant roots during wetter years than during drier years).

IX. To the extent feasible, implement recommendations from the USFWS Five-Year Review of this species (USFWS conservation recommendation; USFWS 2008c).

A. Perform additional systematic studies to determine the evolutionary relationships of the San Clemente Island larkspur to Thorne's royal larkspur and two closely related taxa, royal larkspur and San Bernardino larkspur (*Delphinium parryi*).

B. Continue to implement directed sensitive plant surveys every several years to document new locations and further range expansions.

3.9.3.4 San Clemente Island Woodland-Star (*Lithophragma maximum*)

The San Clemente Island woodland-star (Photo 3-52) was listed as endangered under the ESA on 08 August 1997 (62 FR 42692). The species is a perennial, rhizomatous herb endemic to SCI and grows to 24 inches (60 cm) in height. It generally flowers from April to June. The species was thought to be extinct until rediscovered on SCI in 1978 by Mitch Beauchamp and Howard Ferguson.

Photo 3-52. San Clemente Island woodland-star.

This species' flowers are small, bisexual, and white but sometimes tinted pink. All other species in this genus are self-incompatible, and mainland species are mainly pollinated by moths and solitary bees (Junak and Wilken 1998). Its seeds are spiny and depend on wind or animals for dispersal. Consequently, it may initially require active seed dispersal efforts due to its naturally slow dispersal mechanisms. The plant also clonally reproduces from rhizomes. However, sexual reproduction within clonal clumps is likely to be very weak, given the lack of genetic variation (K. Helenurm, pers. com. 2006).

The San Clemente Island woodland-star occurs on gentle north-facing slopes in moist canyon bottoms on the east side of the island between elevations of 400 and 1,100 feet (120 to 335 m) (Junak 2010; Map 3-23). It is restricted to a few canyons on the eastern escarpment between Vista Canyon and Mosquito Cove. Most populations visited in 1996 and 1997 were located downslope from sizable groves of the Santa Cruz Island ironwood. The entire range falls within SHOBA (area of high military use); however, it is remote and protected by terrain from ordnance impact areas.

The east side canyons have shown dramatic recovery since goats were removed in the early 1990s. Tolerance to fire is generally unknown for this species; however, its preferred habitats at canyon bottoms are unlikely to burn during the growing season, minimizing the impacts by fire.

Map 3-23. Existing locations of San Clemente Island woodland-star (Lithophragma maximum).

Species Status and Trends

A total of 465 individuals were located within ten locations during surveys in 1996 and 1997 (Junak and Wilken 1998) (Map 3-23). Two locations of the San Clemente Island woodland-star, comprising 17 individuals, were mapped on SCI between 2003 and 2006 (Junak 2010); both of these populations were found in previously unreported locations. Current estimates based on surveys through 2007 are 12 locations with 17 individuals. The species is difficult to locate in the field, and most populations are not relocated in every survey (B. Munson, pers. com. 2011). Most sites where populations occur pose access challenges, and relocation of reported sites by new observers is similarly difficult. One new location was found in Grove Canyon under oaks in 2011 and was relocated in 2012, with approximately 30 individuals. No historic locations have been relocated since Junak's surveys in 2006/2007, despite yearly visits to those coordinates. Many of the historic sites have high cover of showy island snapdragon or island morning-glory, which may be obscuring or growing over the San Clemente Island woodland-star (B. Munson, pers. com. 2011).

Current Management

Genetic studies were conducted by Dr. Kaius Helenurm in 1997–1998. These studies found no genetic variation in any location sampled. Additional genetic studies are planned to provide guidance for management.

The San Clemente Island woodland-star receives benefits from management of fire, erosion, non-native flora, and alteration of habitat from military training and development through measures outlined in the WFMP and control of erosion and non-native plants.

Assessment of Resource Management

- Due to the low number of locations and high probability for local extinction from a catastrophic event, propagation techniques should be developed to ensure the continued existence of the San Clemente Island woodland-star.
- Efforts should be made to monitor and control erosion in current habitat utilized by the San Clemente Island woodland-star.

- It is difficult to access the eastern canyons due to military training activities, where all populations currently exist. Efforts should be made to access these areas at least intermittently.
- Delisting is not likely in the near future due to lack of genetic fitness, but current numbers could potentially be increased through a propagation program that maximizes outcrossing and the use of modern vegetative propagation to preserve known genetically distinct clones within a nursery setting.

Management Strategy

Objective: *Conserve existing locations and enhance the genetics of the populations in tissue culture lab and in situ while continuing to improve habitat for this species through woodland recovery on the eastern escarpment.*

I. Monitor known locations for trends, condition, and threats.

- ***A.*** Survey canyons in eastern escarpment for undiscovered populations of the San Clemente Island woodland-star.

II. Investigate the feasibility of propagating the species to preserve genetically distinct clones.

III. Monitor and control erosion in habitat utilized by the San Clemente Island woodland-star.

IV. Encourage habitat restoration of oak and ironwood groves in moist canyons on the eastern escarpment.

V. Protect the San Clemente Island woodland-star through invasive species control and vegetation management.

VI. To the extent feasible, implement recommendations from the Five-Year Review (USFWS conservation recommendation; USFWS 2007b).

- ***A.*** Study the reproductive ecology and breeding system of the San Clemente Island woodland-star to determine whether populations suffer from low pollinator visitation and/or have a self-incompatibility mechanism that limits sexual reproduction in the species.
- ***B.*** Continue genetic studies on the San Clemente Island woodland-star using randomly amplified polymorphic DNA or other appropriate genetic markers.
- ***C.*** Adopt a set of policies for SHOBA on SCI to facilitate effective management and monitoring.
- ***D.*** Incorporate techniques from the WFMP (Navy 2009) to prevent wildfires from spreading east of Ridge Road.

3.9.3.5 San Clemente Island Bush-Mallow (*Malacothamnus clementinus*)

The San Clemente Island bush-mallow (Photo 3-53) was federally-listed as endangered in 1977 (USFWS 1977). The San Clemente Island bush-mallow is a low shrub reaching 27.5 to 39 inches (70–100) cm tall. Its branches are tomentose (flat and matted) when young, covered with long, gray, stellate hairs. It produces a spike of densely crowded bisexual pink flowers, generally from April to August (Munz 1974). Fruits dehisce (ripen and detach from plant) slowly and irregularly. Viable seeds have been found in recent years but it is unclear if limited seed collection in the past is due to lack of viable seeds or limited survey efforts (B. Munson, pers. com. 2011). Wild plants have been known to survive for more than a decade (USFWS 1984) and appear to be long-lived on SCI (S. Junak, pers.

com. 1996). As is the case for many species on SCI, the eradication of feral grazers from the island removed a substantial threat to the population. A proposal to the USFWS to downlist San Clemente Island bush-mallow to threatened status was declined (77 FR 29078) due to the low genetic fitness, a change in the intensity of training and habitat impacts associated with the BO on Military Operations and Fire Management Plan (USFWS 2008a), and the inability to access four USFWS occurrences (described below) due to safety concerns.

Photo 3-53. San Clemente Island bush-mallow (Tierra Data Inc. 2006).

This species can spread by means of runners, leading to the production of what appears to be individual shrubs but are, in fact, a single individual with subsurface connections. Species locations were often counted as 'clumps' rather than discreet individuals. Even seemingly isolated individuals may actually be connected to another plant via underground runners that may extend as much as 30 feet (S. Junak, pers. com. 1996). However, based on more refined genetics studies, clumping is not as common as once thought (B. Munson, pers. com. 2011). Although individuals next to each other are indeed often clones from a parent plant, many are in fact distinct individuals with varying degrees of relatedness to their neighbors.

Pollination experiments found that San Clemente Island bush-mallow is self-compatible (capable of self-fertilization), but not self-pollinating (USFWS 2012c). Plants produced seed when hand-pollinated with pollen from the same plant but not when flowers were bagged to prevent pollinator visitations. Anecdotal observation in the field suggests that plants may be somewhat self-incompatible, or incompatible with closely related individuals. Cross pollination in the greenhouse seemed to increase seed set (B. Munson, pers. com. 2011).

It is generally thought that San Clemente Island bush-mallow is pollinated by insects, although no specific pollinator for this species is known. Other species in the family Malvaceae are pollinated by specialist bees in the genus *Diadasia* (USFWS 2012c). Given the evidence that suggests pollinators may be necessary for successful seed production, the long-term viability of the San Clemente Island bush-mallow may in part depend upon adequate insect populations for pollination (USFWS 2012c).

It is unclear if seed set in wild populations has increased as the species has expanded in recent years. If the plants are somewhat self-incompatible, it is possible that at a smaller population size with fewer isolated individuals, cross pollination with a non-closely related individual could have been difficult. If this is the case, seed production can be expected to increase as populations expand and cross pollination becomes more likely.

Initial allozyme data identified two polymorphic loci in SCI bush-mallow sampled. These loci showed very little diversity across the island-wide population. Since the allozyme studies were conducted, a more precise analysis, known as random amplification of polymorphic DNA (RAPD) analysis, identified 29 polymorphic loci. This analysis showed a very different result, with almost as many genotypes as individuals within each population. Therefore, individual plants within each population are genetically different from nearby individuals, leading to the conclusion that clonal growth is not as extensive as once thought. The results also showed that there is significant genetic variation between populations. Based on the existing genetic data for this species, 64.35% is contained within populations, and only 35.65% is found among populations. Thus, individual populations tend to carry the majority of the genetic variation. For example, populations that were sampled in Horse Beach Canyon, only contained 1.61% of the alleles unique to the Horse Beach Canyon populations studied. Two other canyons, Middle Ranch Canyon and Upper Box Canyon had a higher percentage of unique alleles as assessed by most recent genetic studies. However, since a majority of the genetic data appears to be contained within populations, each canyon is almost as important as the next genetically. Genetic diversity may not be as significant of a threat to the recovery of the SCI bush-mallow as once thought since seeds are being produced and populations are expanding rapidly.

Species Status and Trends

Given the challenge in distinguishing individuals in a group of plants and variability in methods by different surveyors, it is difficult to accurately quantify the abundance of the San Clemente Island bush-mallow beyond the appearance of new locations.

For the discussion below, an occurrence is defined as an identifiable and separable group of plants in concurrence with USFWS terminology used in their 12-month finding (USFWS 2012c). In essence, an occurrence was defined by mapping smaller groupings of plants (point locations) and combining point locations that fall within 0.25 mi (402 m) of one another with any corresponding California Natural Diversity Database polygons. This definition of a species occurrence meets the broader CDFW definition of an element occurrence, which is a record of an observation or series of observations. Given this definition of an occurrence, where past surveys for the species have used the term occurrence to describe their findings, this discussion will describe the term as a location. In this context, a location will be defined as an individual point or polygon record linked to a geographic coordinate.

When initially listed in 1977, San Clemente Island bush-mallow was only known from one location near Lemon Tank Canyon (this location was last documented in 1995). Since the initial listing, many new populations have been discovered. Reports from 1996 and 1997 documented 290 individuals in 18 locations (Junak and Wilken 1998). Some of these older records have not been recorded since their initial reports. Although these locations are still depicted in maps of this species, their current status is unknown until surveyors can verify them (some, like the Lemon Tank location, lie within areas with restricted access due to safety concerns). More recent surveys indicate the population is growing (Map 3-24).

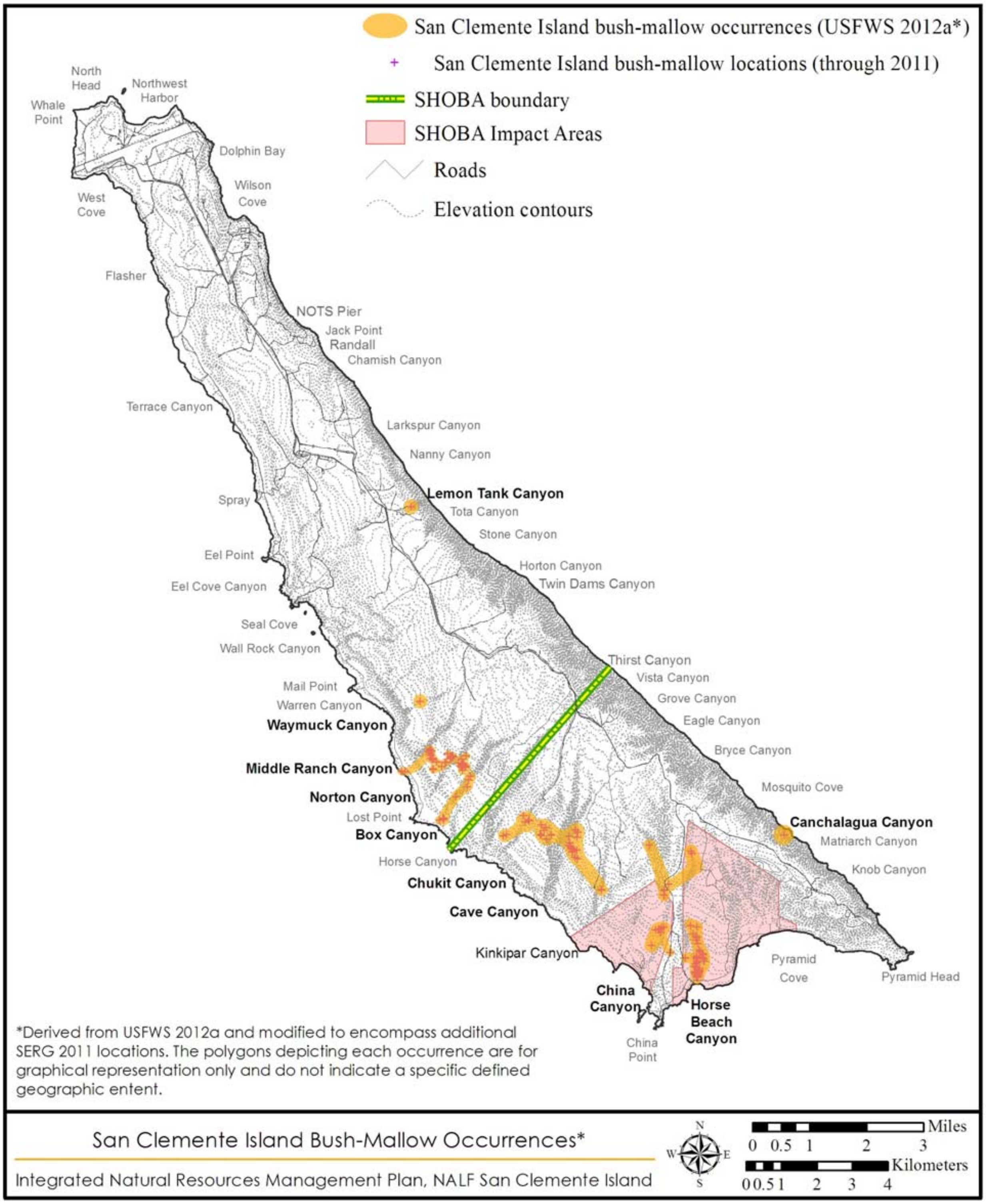
Between 2003 and 2006, 61 locations were mapped comprising 1,300 clumps. The best estimate in 2007 was roughly 1,600 individuals (USFWS 2007c). The largest population consisted of 300 clumps and the average population was 22 clumps (Junak 2010). Surveys in 2011-2012 by SERG documented 96 locations, comprised of 5,562 clumps, with the largest location containing 1,200 clumps and an average size of 80 clumps. Determination of genets vs. ramets remains extremely difficult; therefore, the actual number of individuals may be higher or lower. The most recent surveys haven't been able to access all populations due to access restrictions. One of largest populations occurs in Horse Beach Canyon, most of which cannot be accessed or counted as they lie within an Impact Area. Aerial surveillance of these populations may occur in the near future. Per the BO on Military Operations and Fire Management Plan (2008), the Navy will coordinate with USFWS to establish success criteria for the status of the San Clemente Island bush-mallow.

In their 12-month finding (USFWS 2012c), the USFWS described a total of eleven occurrences (Map 3-24; Table 3-39), including eight which were only documented in recent years. This suggests that the species is responding favorably to the elimination of grazing pressure from feral herbivores on SCI. It is unknown to what extent this increase is attributable to more intensive survey efforts, detection of previously undetected individuals, recruitment from the seed bank, resprouting from rhizomes, recolonization associated with dispersal events, or management efforts. Most of the new plants found are relatively small, and often quite a distance away from larger plants. Due to the fact the most of the newly discovered populations are comprised of smaller plants, it is likely that these are new plants and not plants missed by a previous survey effort.

Table 3-39. San Clemente Island bush-mallow occurrences and locations on San Clemente Island (derived from U.S. Fish and Wildlife Service 2012c).

Occurrence Name	***Number of Locations in an Occurrence (USFWS 2012c)***	***With recent additions from SERG surveys***
Box Canyon	9	9
Canchalagua Canyon	1	1
Cave Canyon (&Kinkipar Canyon)	27	26[1]
Chukit Canyon	2	7
Horse Beach Canyon	48	48
Lemon Tank	1	1
Lower China Canyon	9	9
Middle Ranch Canyon	5	14
Norton Canyon	27	39
Upper China & Horse Beach Canyon	4 (9)[3]	8[1]
Waymuck Canyon	1	1

[1]*Some of the 2011 SERG locations subsumed two to three of the older points used in the USFWS analysis.*
[2]*Last reported in 1995, current status unknown*
[3]*There actually appear to be nine points on the USFWS map; some are close together, so maybe they were lumped together.*



Map 3-24. San Clemente Island bush-mallow occurrences on San Clemente Island.

Current Management

Conservation measures are in place to protect the San Clemente Island bush-mallow during military training activities where the species is known to occur. Greenhouse pollination experiments are being conducted, although very few seeds of this species have been collected (some seeds were collected in 2011). Seed viability studies are being conducted to understand the effects of fire on seed resources, and if wild populations are burned, post-fire assessments of the burned stands is carried out. Long-term trends of the species are monitored, in part, through the LCTA program. Additionally, genetic work will be conducted per the BO on Military Operations and Fire Management Plan (USFWS 2008a).

The San Clemente Island bush-mallow benefits from projects to control erosion and non-native plants, as well as from the restoration of vegetation communities on SCI.

Assessment of Resource Management

- Wild individuals tend to produce few seeds and further studies are needed to see if seed production remains low.
- Management of the San Clemente Island bush-mallow has been effective in expanding and increasing populations of the San Clemente Island bush-mallow across the island, primarily through the removal of non-native herbivores.
- Although the USFWS initially recommended downlisting this species in their most recent Five-Year Review (USFWS 2007c), it was concluded during further review in 2011 that significant threats to the species, particularly from increased military activities, precluded downlisting (USFWS 2012c). Additional information is needed regarding genetic diversity of the populations. The NRO should consult with USFWS to determine management actions needed to downlist the species.
- Access to Impact Areas I and II and SHOBA is prohibited, which limits the ability to conduct active management and monitor all populations. Remote sensing methods may be available to monitor these areas.

Management Strategy

Objective: *Maintain existing viable populations of the San Clemente Island bush-mallow and promote the eventual delisting of the species through the continued expansion of the species on SCI.*

I. Protect established populations of San Clemente Island bush-mallow through non-native species control, erosion control, and vegetation restoration activities.

II. Consult with USFWS to determine management actions needed to downlist the San Clemente Island bush-mallow.

III. To the extent feasible, implement recommendations from the USFWS Five-Year Review (USFWS recommendations for future actions; USFWS 2012c).

- ***A.*** Develop a systematic survey protocol for the San Clemente Island bush-mallow. These surveys should include confirmation of existing locations at greater regularity to better determine accurate population status and trends for the species. Additionally, these protocols should include the standardization of information collected, such as habitat conditions, habitat type, number of plants, date collected, etc.
- ***B.*** Conduct studies to investigate genetic diversity of the San Clemente Island bush-mallow to determine how genetic fitness of the plant affects reproduction and the existence of the plant.

C. Conduct studies to determine the fire tolerance and preferred fire regime of the San Clemente Island bush-mallow.

D. Work with USFWS to better estimate fire frequency in areas occupied by the San Clemente Island bush-mallow.

IV. Monitor robust, geographically diverse, and redundant populations to maintain and increase the population.

A. Develop methods to monitor populations and trends of the San Clemente Island bush-mallow without conducting a census. In particular, develop methods, such as aerial surveys, to monitor populations in areas where access is limited or prohibited.

B. Focus population surveys on LCTA plots.

3.9.3.6 Santa Cruz Island Rockcress (*Sibara filifolia*)

The Santa Cruz Island rockcress (Photo 3-54) was federally-listed as endangered in 1997 (USFWS 1997b). Before it was discovered on SCI in 1986, the species had only been known to occur on Santa Cruz and Santa Catalina Islands. At the time of its listing in 1997, only two of the five known historical occurrences were considered extant, one on Santa Catalina Island and one on SCI (USFWS 2012e). Although feral herbivores have been removed from the island, herbivory by other animals and competition from non-native species (e.g., wild oats, Mediterranean grass [*Schismus arabacus*], red brome, Saharan mustard [*Brassica tournefortii*], and filaree [*Erodium* spp.]) may continue to limit its distribution (USFWS 2006).

The Santa Cruz Island rockcress is an annual with small, bisexual, purplish flowers borne on terminal racemes. Flowers of this size suggest self-compatibility and self-pollination (Richards 1986; Rollins 1981 from Junak and Wilken 1998), which has been observed in cultivated individuals (J. Wall, pers. com. 2002, in Junak and Wilken 1998). Plants generally flower from January until March. Each fruit produces several seeds (Junak and Wilken 1998). Due to its thinly coated seeds, the Santa Cruz Island rockcress does not appear to be well-adapted to fire (USFWS 2006).

Photo 3-54. Santa Cruz Island rockcress (Tierra Data Inc. 2008).

This delicate annual herb occurs in several saddles on three adjacent, open ridgetops and nearby flats on hot, volcanic scree-covered slopes at the southern end of the island below Guds and on Willy's Ridge (Pyramid Cove unit). This area is windy and receives the highest amount of solar radiation on the island. The habitat on SCI contrasts with that described for the species on other islands; reports from Santa Cruz Island indicate that the plant "is to be sought in shady places on the northward slope" (Greene 1887). The stature of the specimens on SCI also appears to be shorter than on other islands (Hickman 1993); this may be suggestive that the species currently persists in marginal habitats where it can escape competition and herbivory pressures (USFWS 2006). Although seed longevity of this species is not currently known, many species in the same family (Brassicaceae) produce seeds that persist for at least five years in the soil seed bank.

Species Status and Trends

This plant is difficult to see without a search image in mind, and populations have possibly been missed on all three islands. Adding to this difficulty is the fact that, like other island annuals, the Santa Cruz Island rockcress appears to be highly dependent on year-to-year rainfall patterns, and restricted access to occurrences precludes monitoring in most of its known extant range. For these reasons, it is difficult to determine whether populations of this plant are increasing or decreasing.

Five locations were reported in Junak and Wilkens' 1996–1997 surveys on three adjacent ridgetops on the very southern tip of the island (Map 3-25). One population was visited in 1996 and 29 individuals were counted; when revisited in 1997 (a wetter-than-average season), 208 individuals were recorded (Junak and Wilken 1998).

The most recent surveys between 2003 and 2006 (years with consecutive drier-that-average seasons) found only three locations of this species with four, 11, and 52 individuals, respectively (Junak 2010). At most, eight locations of this species have been documented since focused rare plant surveys began on SCI (USFWS 2006).

Map 3-25. Existing locations of Santa Cruz Island rockcress (Sibara filifolia).

Genetics of the rockcress on SCI found very low genetic diversity at the species and population levels, and only moderate diversity between populations (Helenurm 2003, Helenurm pers. com. 2012). This in sharp contrast with the Santa Catalina population that is genetically robust with much larger plants. There appears to be very little gene flow between populations, such that populations separated by just 500 feet (150 m) were genetically distinct from one another. Helenurm concluded that the lack of inter-population gene flow could lead to further reductions in genetic variation in the species. However, the 1999 RAPDs data show that all populations are polymorphic and each population shows a similar level of genetic diversity (K. Hellenurm, pers. com. 2006).

Current Management

The Santa Cruz Island rockcress benefits from the annual installation of fuelbreaks, munition restrictions, and fire-fighting policies.

Assessment of Resource Management

- Although it is difficult to access the eastern canyons, where all populations of the Santa Cruz Island rockcress on SCI currently exist, due to military training activities, the Navy has greatly enhanced the understanding of the extent of San Clemente Island rockcress on the island through recent focused surveys. However, efforts should continue to be made to access these areas on a regular basis to monitor the status and trends of this species on SCI.
- The Navy has dedicated significant funding to control non-native plant species and annual reports documenting program activities. However, control efforts are limited within the Impact Areas due to safety concerns. Monitoring for non-native species in the habitat known to support the Santa Cruz Island rockcress has not occurred since 2008 due to UXO concerns. Current efforts to remove UXO will help to provide unimpeded access so that efforts to manage this species can be implemented.
- Efforts should be made to monitor and control erosion in current habitat utilized by the Santa Cruz Island rockcress.
- Genetics diversity of this species is low at both the species and population levels. The feasibility of outcrossing with the more diverse Santa Catalina population should be investigated. Additionally, seed collection in 2003 will be important for future genetic studies and potential outplanting of this species.

Management Strategy

Objective: *Protect and increase existing occurrences and nearby habitat by fostering shrub recovery of associated plants such as cliff spurge, Bigelow's moss fern* (*Selaginalla bigelovii*)*, California brittlebush, and San Clemente Island bird's-foot trefoil while obtaining additional information regarding the life history of the species.*

I. Protect established populations of Santa Cruz Island rockcress.

- ***A.*** Control non-native species in habitat known to support the Santa Cruz Island rockcress, as practical.
- ***B.*** Investigate potential areas to control erosion that would benefit the Santa Cruz Island rockcress.

II. Monitor known populations of the Santa Cruz Island rockcress, if consistent with the military mission.

III. To the extent feasible, implement recommendations from the Five-Year Review (USFWS conservation recommendations; USFWS 2012e).

- ***A.*** Based on recommendations and genetic diversity of occurrences, establish an adequate seed bank with sampling emphasis on genetically less diverse sites on San Clemente Island.
- ***B.*** Maintain and improve non-native plant control programs with a focus on sites where the Santa Cruz Island rockcress occurs or where habitat conditions may support re-emergence of the species from a dormant seed bank.
- ***C.*** Continue to collaborate with USFWS on ongoing projects to assist with conservation of listed species on the island to help facilitate effective management and monitoring.
- ***D.*** Determine soil and habitat preferences and conduct additional surveys where the Santa Cruz Island rockcress has been collected historically using this data to look for previously undetected occurrences as well as identify and characterize potential re-introduction sites.

IV. Investigate the feasibility of outcrossing the Santa Cruz Island population on San Clemente Island with the population on Santa Catalina Island population.

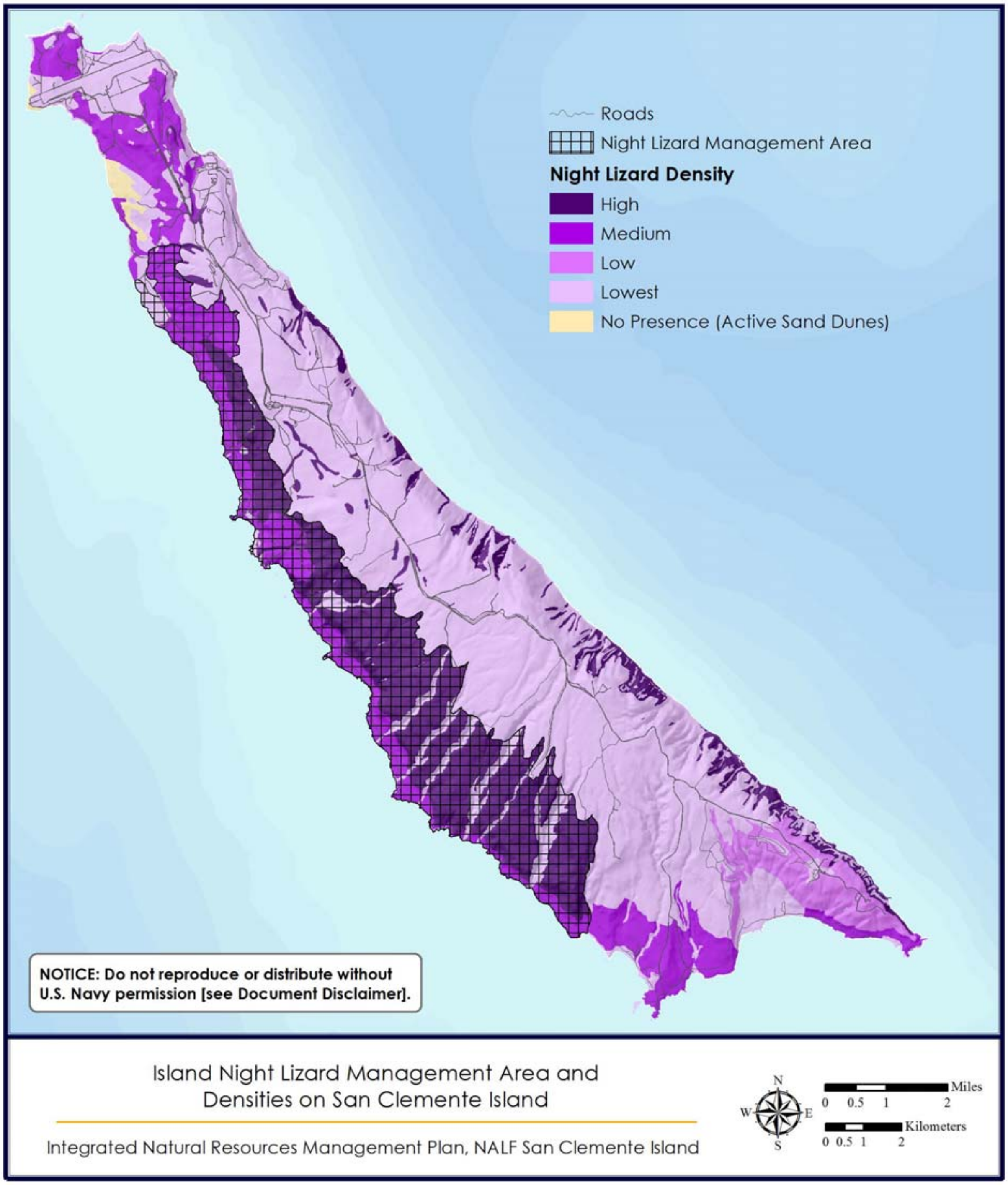
3.9.3.7 Island Night Lizard (*Xantusia riversiana*)

The island night lizard is found on SCI, SNI, and Santa Barbara Island. Of the three islands, SCI contains the most robust population (USFWS 2012g). Habitat degradation from goats and pigs was a concern for the species and led to its federal listing as threatened in August 1977; the Navy has since removed all goats and pigs from SCI.

The island night lizard is the largest member of the Xantusiidae family, growing to a maximum snout-vent length of 4.2 inches (10.7 cm; females) and 4.0 inches (10.2 cm; males). It is the most morphologically and genetically distinct of the endemic vertebrate species on the Channel Islands, which indicates a long period of isolation (Bezy et al. 1980). Despite their name, island night lizards are diurnally active. However, they are secretive, relatively sedentary, and not easily seen, which makes estimating population size difficult (Mautz 2001). The population on SCI is estimated to be approximately 20 million individuals (Mautz 2001) and is thought to be stable. Despite drought conditions in fall 2004, island night lizard trap capture rates and counts revealed population densities as high as earlier data (Mautz 2007). Island night lizards have very slow metabolic rates, which may make them particularly well-adapted to surviving occasional droughts (Mautz and Nagy 2000). However, females produce fewer young in drought years (Mautz 2007).

This species grows slowly, matures late, has a long lifespan, and has a low reproductive rate, which are unusual traits in a lizard (Tinkle 1969). On SCI, approximately half of the adult females breed in a particular year (Goldberg and Bezy 1974; Bezy et al. 1980). Females reach sexual maturity in their fourth year, while males reach sexual maturity a year earlier in the spring of their third year. Breeding begins in March and live young are born in September. Four to five young (mean number of offspring is 4.4) are produced per breeding cycle and their life expectancy ranges from 11 to 13 years (Mautz 2001). They eat a variety of insects as well as the fruits, leaves, and flowers of boxthorn plants.

Lizards, including the island night lizard, regulate their body temperature by changing locations. However, the island night lizard maintains its temperature within a narrower range than most lizards and cannot withstand temperatures in excess of 104°F (40°C) (Mautz 1979). For this reason, habitat structure is potentially even more important than the primary vegetation type (Mautz 2001). Ideal habitat includes dense low-growing cactus, low-lying shrub thickets, rocky outcrops with loose boulders and stones, and man-made debris to shelter them from predators and the heat. The island night lizard is found in all habitats on SCI except active sand dunes, which lack appropriate soils, crevices, and other types of suitable cover required by night lizards. Island night lizard densities across the island are shown in Map 3-26. During the most recent complete surveys, the highest densities of lizards were found in prickly-pear dominated areas (Mautz 2007), though boxthorn also appears to be important habitat (USFWS 1984). The lizard has been observed in significant numbers under debris in Impact Area II, and Mautz (2001) observed that island night lizards can live in close proximity to human habitation where there is adequate low vegetative cover with ground surface and subsurface shelter. It is thought that, due to the sedentary nature of this species, high densities are required for a viable population (Mautz 2001).



Map 3-26. Island night lizard densities on San Clemente Island.

Introduced grass species may compete with existing native plant communities to reduce preferred island night lizard habitat. Although island night lizards inhabit grassland areas, they occur there at much lower approximate density than in maritime desert scrub habitats (Mautz 2001). Non-native grasses may also alter fire frequency and intensity. Predators of the island night lizard include American kestrel, San Clemente loggerhead shrike, San Clemente invasive, and feral cats. Phillips et al. (2007) found that lizards on SCI are eaten more frequently by feral cats (12.9% of diet) than by foxes (4.5%), indicating that feral cats may pose a larger risk to island night lizards than other native predators.

Current Management

The Navy has continued monitoring and put in place conservation measures (Table 3-44) such as the removal of feral cats, and creation of a management area to ensure continued persistence of the island night lizard (Navy 2004). In 2004, the Navy petitioned to designate the SCI population as a distinct population segment and to remove it from the federal list of threatened species pursuant to the ESA (Navy 2004). A Five-Year Review for the island night lizard released in October 2012 recommended delisting of the species (USFWS 2012g), and in 2013, the USFWS published a proposed rule to remove the island night lizard from the ESA (78 FR 7908).

Table 3-40. Conservation measures for island night lizard.

Conservation Measure INL-M-1. The Navy will continue population monitoring and habitat evaluations at three-year intervals while the delisting petition is being evaluated by the USFWS.
Term and Condition 9.1. The Navy shall submit an annual report that summarizes whether any dead or injured island night lizards were found or observed on SCI. The annual report shall include the following information about any lizards detected: date found; general location; cause of death or injury, if known; condition of the animal.
USFWS Conservation Recommendation. We recommend that the Navy continue to recognize the Island Night Lizard Management Area as an important area for impact minimization in future planning documents, including the SCI INRMP.

Night lizards on SCI are monitored every three years using established survey arrays. Included in this is an assessment of the overall body condition of all lizards observed and of reproductive output. Annual visits to visually assess habitat quality and to maintain pitfall traps occur in the intervening years along with population sub-sampling to assess body condition. During the most recent partial sampling period in August 2011, lizard reproductive output was 21%, which was comparable to the long-term average (25%) and a high percentage (52%) of females were pregnant (Mautz 2012). These figures represent a substantial increase over surveys in 2009 and 2010 where reproductive success was much lower (6–8%), although these lower rates are believed to be due to decreased reproduction following drought years in 2006 and 2007 and the population is stable (Mautz 2011).

Based on the island night lizard recovery (78 FR 7907), the Island Night Lizard Management Area (INLMA) is no longer needed as a compliance-based requirement and was removed as a BO obligation. However, the most recent BO on SCI Military Operations and Fire Management Plan issued by the USFWS (2008) lists continued recognition of this area in the INRMP as important for this species. Accordingly, the INRMP recognizes the INLMA as an area of superior habitat for this recovered (pending delisting) species. INLMA designation within the INRMP will only be used to recognize the area as important for species management and impact minimization, as practical, within support of the military mission.

Ongoing predator management activities to reduce the numbers of feral cats and non-native rats supports conservation of the night lizard population. Feral cats on SCI are known to prey on night lizards and analysis revealed that night lizards comprise approximately 12% of their diet. This percentage increases at times when rodent populations decline, particularly during drought years, fall, and winter (Biteman et al. 2012).

Assessment of Resource Management

- Current management of the night lizard population is excellent.
- Management actions (i.e., predator management) taken by the NRO have been effective in recovering the population of this listed species and it is now found in most habitats across SCI.
- The population of the island night lizard on SCI is sufficiently recovered to warrant delisting.
- Existing monitoring strategy provides adequate information to assess distribution, abundance, and general status of the island night lizard on SCI.
- Maintenance of the INLMA, although not a compliance requirement, within the INRMP and regular population monitoring support continued conservation and population trends tracking for this species.
- Minimization measures incorporated into Navy construction projects reduce potential impacts of projects on the island night lizard.

Management Strategy

Objective: *Conserve sufficient high quality habitat to maintain the island night lizard population at recovered population level.*

I. Continue regular monitoring of the population and evaluation of habitat, via transect and pitfall surveys, once every three years with reduced surveys to assess body condition in the intervening years until delisting is achieved and a post-delisting monitoring plan is developed and implemented.

II. Continue to recognize the INLMA as an area of superior habitat for the island night lizard and minimize impacts within this area to the maximum extent practical.

III. Continue non-native predator control in support of island night lizard conservation.

IV. Control non-native, invasive plants that could degrade night lizard habitat quality.

V. Prepare a biosecurity plan with strategies to prevent the introduction of non-native species that could negatively impact island night lizard.

3.9.3.8 San Clemente Loggerhead Shrike (*Lanius ludovicianus mearnsi*)

The San Clemente loggerhead shrike (Photo 3-55) was federally-listed as endangered in August 1977. Endemic to SCI, it is genetically and morphologically distinct from subspecies on other Channel Islands and the mainland (Mundy and Woodruff 1996). These birds are considered nonmigratory. Shrikes from Catalina Island or the mainland occasionally appear on SCI during the winter, but genetic studies indicate they do not breed on the island. Historically, this subspecies was considered tolerably common and well-distributed across SCI (USFWS 1984). However, habitat degradation from prolonged browsing by goats and pigs resulted, directly and indirectly, in the elimination of many nesting and roosting sites and presumably led to a sharp decline in the population (Scott and Morrison 1990). When the California Channel Islands Recovery Plan was published, the total population size of the San Clemente loggerhead shrike was estimated at 18–30 individuals (USFWS 1984).

Photo 3-55. A banded San Clemente loggerhead shrike (Navy 2012).

Since intensive monitoring began, the population estimate has ranged from a low of four breeding pairs in 1991 to a high in 2009 of 82 (Stahl et al. 2011). Figure 3-18 summarizes the trends in numbers of breeding pairs between 1991 and 2010. Above average rainfall prior to some breeding seasons, supplemental feeding, a captive propagation and re-introduction program, and continued predator control have contributed to the increase in the breeding population. Apparent nest success, calculated by dividing the number of nests producing fledglings by the number of nests with eggs, has averaged 46% over the 13 years from 1998 to 2010 (Stahl et al. 2011); this is below the 56% average nest success for mainland loggerhead shrikes (Yosef 1996). Nesting success appears to increase in years with above average rainfall during the prior winter (Farabaugh 2012). From 1998 to 2010, an average of 1.8 juveniles were produced per breeding pair; following winters of higher than average rainfall, 3.9 and 2.5 independent young were produced per pair in 2008 and 2010, respectively (Stahl et al. 2011).

Individuals begin to form pair bonds as early as November, with most nesting occurring between April and May. Average clutch size ranges from four to six eggs (Yosef 1996). Females incubate eggs and males provision females during incubation. Eggs are incubated for 16–18 days and chicks are cared for by both parents until chicks leave the nest as fledglings, approximately 20 days after hatching (USFWS 1984). When fledglings leave the nest, they are not yet fully capable of flight or of feeding themselves; for this reason fledglings are not considered independent until 40 days of age and are vulnerable to predation during this time. Second nesting attempts are made after either failure or fledging of the first nest (Scott and Morrison 1990). Shrikes reach maturity after one year (Miller 1931) and some pairs remain together for multiple years.

Loggerhead shrikes are small, predatory birds with the unique habit of impaling or wedging their prey. They use elevated perches, snags, shrubs and rock outcrops from which to hunt and open foraging areas with a readily available supply of invertebrate and small vertebrate prey (insects, lizards, small birds, and mice) (Scott and Morrision 1990). Shrikes concentrate foraging near nesting locations during the breeding season and use additional areas throughout the island for the remainder of the year (Scott and Morrison 1990). However, males may remain in the same territory for both breeding and wintering seasons (Lynn et al. 2003). During the winter and fall, unpaired shrikes frequently occupy the island's upper mesas (USFWS 1984).

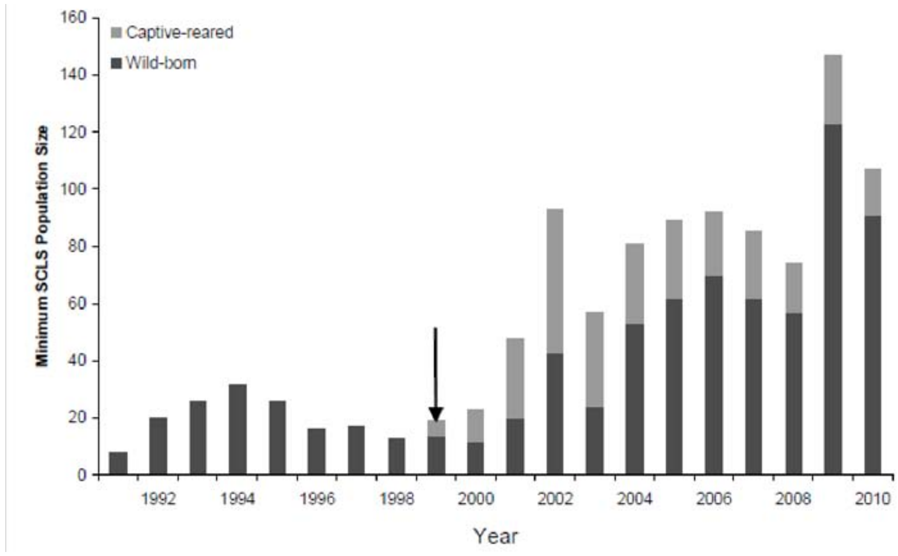
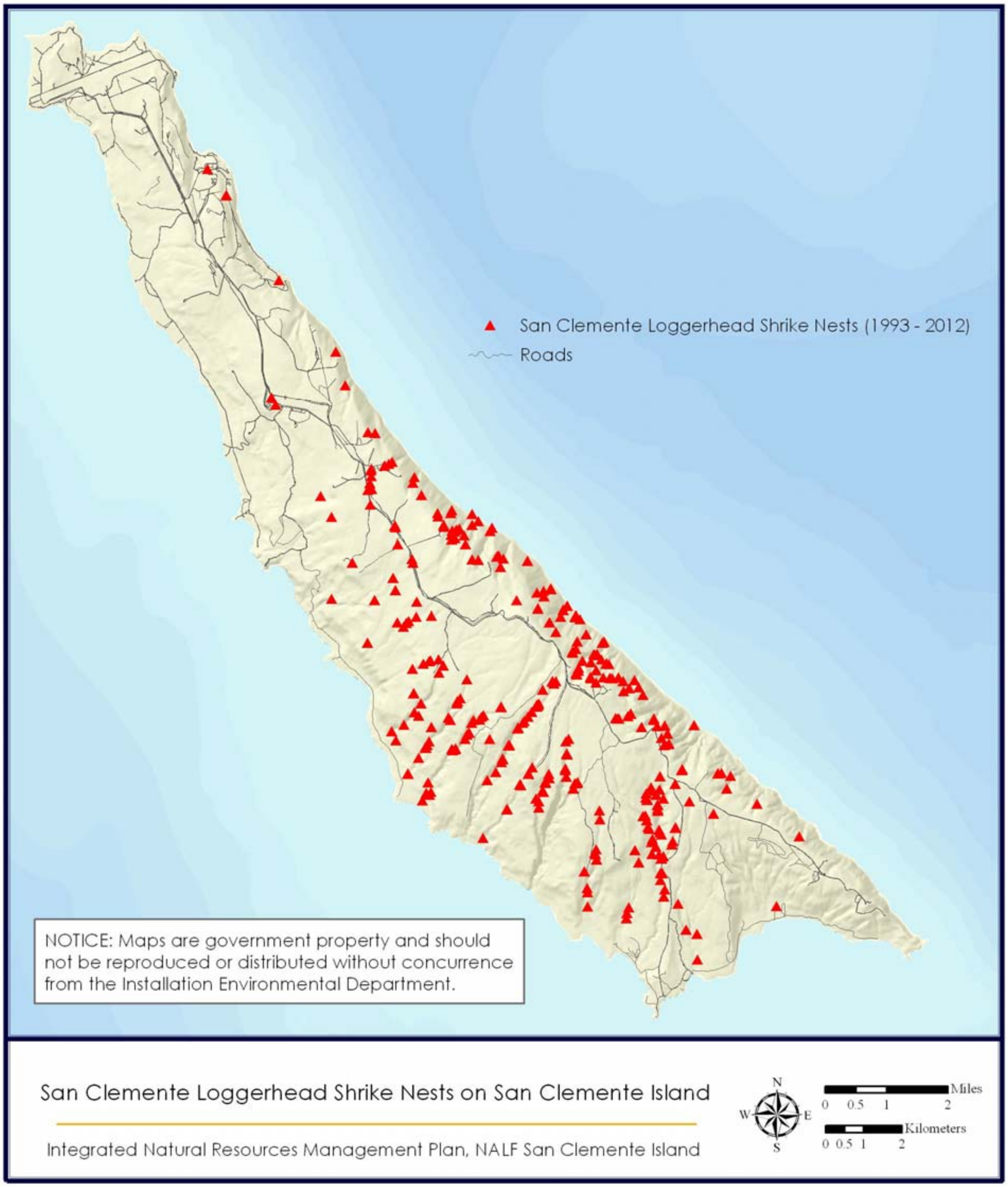


Figure 3-18. The minimum number of San Clemente loggerhead shrike breeding individuals on San Clemente Island separated by origin (wild-born and captive-reared) between 1991–2010. Arrow indicates the year in which Institute of Wildlife Studies began releasing captive-reared shrikes into the wild population (Maley et al. 2010).

Nesting territories vary greatly in size ranging from 2.7 acres (1.1 ha) to 670 acres (271.10 ha) (Lynn et al. 2004b). Nests are generally placed 3.3 to 9.9 feet (1 to 3 m) above ground in densely foliaged trees or shrubs (Yosef 1996), near the bottoms of canyons (USFWS 1984). Locations of nest sites from 1993-2012 are shown in Map 3-27.

In 1998, nest locations were largely located in China Canyon (62.5%) (Lynn et al. 1999), which is inside SHOBA. Population growth has led to more shrike nest locations outside SHOBA; in 2010, more than 70% of the shrike nest locations were outside SHOBA (Stahl et al. 2011). However, most nests are still located in canyons across the southern two-thirds of the island (Stahl et al. 2011). Population growth has also led to a wider variety of nest substrates being used. Of the nests located in 2010, 24.5% (n = 25) were in Catalina Island cherry, 19.6% (n = 20) in lemonade berry, 12.7% (n = 13) in sagebrush (*Artemisia* spp.), 10.8% (n = 11) in coyote brush, 7.84% (n = 8) in big berry toyon, and less than 5% each were in oak (*Quercus* spp.), island morning-glory, Santa Cruz ironwood, Nevin's woolly sunflower, showy island snapdragon, and big-pod ceanothus (Stahl et al. 2011). Nest sites are sometimes re-used between years.

The Navy established an intensive field monitoring program in 1990 and integrated it with a captive breeding program in 1991; the first releases of captive-bred birds occurred in 1992 (Farabaugh 2012). The program was established or continued in cooperation with a number of organizations including the USFWS, Western Foundation of Vertebrate Zoology, the Zoological Society of San Diego, Endangered Species Recovery Council, Merkel and Associates, IWS, Animal and Plant Health and Inspection Service/Wildlife Services, and the Point Reyes Bird Observatory. The captive breeding program has utilized a variety of approaches for protecting and augmenting breeding on SCI including release of captive bred birds, artificial incubation and hand rearing of wild eggs and chicks, captive incubation of wild eggs, predator management, and protection of wild nests. Since the program's inception, 483 birds have been released into the wild and 62 remain in captivity as of 2012 (Farabaugh 2012).



Map 3-27. San Clemente loggerhead shrike nests on San Clemente Island (1993–2012).

Current Management

Table 3-41. Conservation measures for San Clemente loggerhead shrike .

Term and Condition 3.1. The Navy will submit an annual report to USFWS and CDFW documenting actions taken to minimize impacts of their training and fire management activities on the loggerhead shrike.
Term and Condition 4.1. The Navy will notify USFWS and CDFW within 48 hours of discovering any dead or injured San Clemente loggerhead shrikes. The notification will include the following information about any dead or injured shrikes: date found; general location; cause of death or injury, if known; condition of the animal. In addition, the Navy will summarize information regarding death or injury of San Clemente loggerhead shrikes in an annual report submitted to the USFWS and CDFW.
Conservation Measure G-M-7. The Navy will locate heavy ordnance targets within Impact Areas I and II, away from sensitive resources, including San Clemente loggerhead shrike, San Clemente bush-mallow, and coastal salt marsh, to the extent feasible while meeting operational needs.
Conservation Measure SCLS-M-1. The Navy will continue the currently successful program of habitat restoration, predator management, monitoring, captive breeding, and re-introduction to benefit the San Clemente loggerhead shrike until such time that recovery objectives are identified and achieved.
Conservation Measure SCLS-M-2. The Navy will evaluate nest success data for San Clemente loggerhead shrike in sites nearest AFP 6, including those in Eagle and Cave Canyons, and compare it to other sites in and out of SHOBA with the objective of determining whether or not success rates are typical for the species.
Conservation Measure SCLS-M-3. The Navy's range schedulers will be provided the location of shrike nests within operational boundaries and also provided the location of shrike nests to personnel installing fuelbreaks prior to the installation of fuel/fire break lines.
Conservation Measure SCLS-M-4. Within areas of the IOA that are wider than 1,000 feet (300 m) and not in any AVMA, Assault Vehicle Maneuver Road, AFP, AMP, or TAR, the range complex schedulers will provide the GPS coordinates of up to four shrike nests at any one time to operators and advise them that sensitive resources occur within a 10-meter radius of these points.
Conservation Measure AVMC-M-8. The Navy will enforce the existing 35 mph speed limit on Ridge Road. The Navy will post signs, continue public awareness programs; mow roadside vegetation; and monitor roadways for kills of protected or conservation agreement species including San Clemente loggerhead shrike, San Clemente sage sparrow, and island fox.
Conservation Measure FMP-M-5. The Navy will minimize impacts to listed species and occupied habitat associated with Phos-Chek application by considering the locations of federally-listed species in advance of fuel break installation. This will allow the Navy to avoid impacts to the extent practicable. The Navy will avoid application of Phos-Chek within 300 feet (91.5 m) of mapped loggerhead shrike locations to the extent consistent with fuelbreak installation.
USFWS Conservation Recommendation. We recommend that the Navy, in coordination with USFWS, build upon the existing population modeling efforts for the San Clemente loggerhead shrike to better understand the future viability of these populations.

Nearly all individuals in the population are uniquely color-banded and the population is monitored year-round in accessible areas. From 1991 through 2011, 483 (361 juveniles and 122 adults) have been released through the captive and release program, using a variety of methods including single, independent juveniles, and family groups (Farabaugh 2012). Since 1999 when soft captive releases began, between 14 and 59% of the breeding population has been of direct captive origin but indirectly nearly all, if not all, wild birds now have a captive ancestor (see Figure 3-18; Maley et al. 2010).

To assist in acclimation after release, supplemental feeding is provided according to a prescribed schedule at release sites for all released shrikes. It is also provided opportunistically to wild-origin shrikes. Past analyses have shown that supplemental feeding in combination with predator control resulted in 2.5 more fledglings per pair than where no management occurred and supplemental food was not available; results were even stronger when management and supplemental feeding were applied during periods of low rainfall (Heath et al. 2008). In addition, Hudgens et al. (2009) found that supplemental feeding during dry years resulted in earlier nesting and an increased likelihood that a pair would renest after fledging their first chicks. However, it is difficult to analyze the effects of supplemental feeding separate from the effects of predator management. Some current data analyses (2012 and ongoing) appear to indicate more productivity benefits associated with predator control than supplemental feeding. Typically, an individual has more than one preferred perch within its territory from which to hunt. When supplemental foraging perches were added to occupied territories, shrikes increased the use of the surrounding area (Lynn et al. 2006c).

In 1998, most of the breeding population was located within SHOBA (Lynn et al. 1999). As the population has grown, more nesting has occurred outside of this area (Stahl et al. 2011). Release sites for captive bred shrikes are subject to review by the Shrike Working Group and SCI Command prior to implementation and are likely to occur in the canyons that lie north of SHOBA and drain toward the west shore. Beginning in 2011, access from SHOBA gate to Pyramid Head on the east side of Ridge Road was restricted, due to UXO. This is an area of recent (2011) shrike population expansion. In 2011 nesting activity could not be confirmed for 15 pairs that resided within this Restricted Access Area (Desnoyers et al. 2011).

In 2011 there were four cases of anthropogenic-related deaths of shrikes on SCI. Two cases were the result of vehicle collisions. The shrike in the third case died of starvation, which was likely the result of having become stuck to an uncovered glue trap intended for capturing mice. The fourth shrike was found in a bucket of water. Navy management notified the USFWS of the deaths and has recommended that developed areas be checked regularly for potential shrike hazards (M. Booker, pers. com. 2011).

Predation is the largest cause of nest failure; in 2010, 72% of nest failures were attributed to predation (Stahl et al. 2011). Since 1992, the Navy has maintained an ongoing predator management program to remove feral cats and rats particularly in shrike breeding areas, using a variety of methods. While these measures were implemented to aid in the recovery of the shrike population, other listed species, such as San Clemente sage sparrow, western snowy plover, and island night lizard, may also benefit. Until 2002, native predators including island fox, were occasionally removed or held during the breeding season. In 2010, specific management of ravens was initiated and a MBTA depredation permit was obtained after camera evidence documented ravens depredating three shrike nests (Biteman et al. 2011). Three ravens were removed from a site with documented raven predation in 2010 (Biteman et al. 2011).

Assessment of Resource Management

- The Navy has undertaken significant efforts in recovering the San Clemente loggerhead shrike population. The population has grown to over 300 individuals in 2010 (Stahl et al. 2011). An investigation into downlisting the subspecies from endangered to threatened is warranted.
- Through careful selection of individuals in the captive propagation program, a high level of genetic diversity has been maintained.
- Detailed analysis of survival using uniquely identifiable individuals has led to improvements in the release program and knowledge about the importance of rainfall levels.
- An important aspect of the shrike management program is ongoing predator management. Removal of cats and rats and the protection of nesting sites has increased nesting success.
- Access restrictions to some areas limit the ability to fully monitor the population and implement predator management at important nesting locations.
- Regular hazard monitoring in developed areas, which started in 2012, may help minimize mortalities from anthropogenic causes as the shrike population grows, particularly for captive-reared shrikes that may be more accustomed to people and enclosed spaces.
- An approved recovery plan for the subspecies is not in place at this time. As a result, the Navy is managing toward unknown quantitative goals. A definitive assessment toward recovery is not feasible at this time. However, there is a clear trend toward

recovery based on range and population expansion. The Navy is currently working on a plan to identify recovery objectives.

- There is insufficient knowledge of the effects of habitat recovery on the carrying capacity of San Clemente loggerhead shrike population.

Management Strategy

Objective: *Maintain a shrike population that is resilient to native predation pressure and meets recovery objectives for delisting.*

I. Until a sampling plan is approved and to the extent funding is available, continue island-wide monitoring of all shrikes during the breeding season.

II. Continue to enhance and conserve shrike nesting locations and foraging areas as research dictates.

III. Continue the captive breeding and release program, until the point that population sustainability or recovery objectives are met.

IV. Continue the predator management program to minimize losses of adult shrikes and their nests.

- ***A.*** Maintain program to annually remove as many feral cats, black rats, and other non-native rodents as feasible.
- ***B.*** Complete the study to estimate home range size of cats and rats and increase understanding of their spatial use to improve effectiveness of management actions taken to control these non-native populations.
- ***C.*** Determine if ravens pose a population-level threat and investigate the need for raven control in support of shrike recovery.

V. Develop a population sustainability/management plan, in coordination with the USFWS, documenting clearly defined recovery objectives and a sampling plan to be used for ongoing population monitoring. The completed model and plan will be externally reviewed prior to implementation.

VI. Minimize human-caused shrike mortality.

- ***A.*** Discontinue the use of uncovered sticky glue traps for trapping rodents.
- ***B.*** Enforce the 35 mph (56 kph) speed limit on Ridge Road to minimize the likelihood of striking shrikes crossing roadways.
- ***C.*** Regularly survey developed areas for potential shrike hazards.

VII. In accordance with recommendations from the most recent Five-Year Review (USFWS 2009d), summarize and publish data on shrike recovery and management in peer-reviewed journals to facilitate recovery of similar species and to allow comment and modification, if appropriate, of current methodology.

3.9.3.9 San Clemente Sage Sparrow (*Amphispiza belli clementeae*)

San Clemente sage sparrow (Photo 3-56), one of five subspecies (Martin and Carlson 1998), was federally-listed as threatened in August 1977, due to its limited distribution only on portions of SCI and habitat degradation from overgrazing of goats and pigs (USFWS 1977).

Photo 3-56. San Clemente sage sparrow, banded for identification (Navy 2012).

The Navy has since removed all goats and pigs from the island, thus eliminating the primary source of habitat loss. Prior population estimates have been derived in a variety of ways and thus are not always comparable across years. Population estimates for portions of the high density sage sparrow habitat on the west shore have been as low as 38 individuals in 1984 to a high of 1,519 adults in 2002 (reviewed in Beaudry et al. 2004). Most recent estimates of population size are from 1,047 to 1,457 individuals (Figure 3-19; Docherty et al. 2011). Apparent annual survival for both adults and juveniles fluctuates annually. Average apparent adult survival from 2000 to 2010 averaged 50%, while juvenile survival in the same period averaged 24% (Docherty et al. 2011).

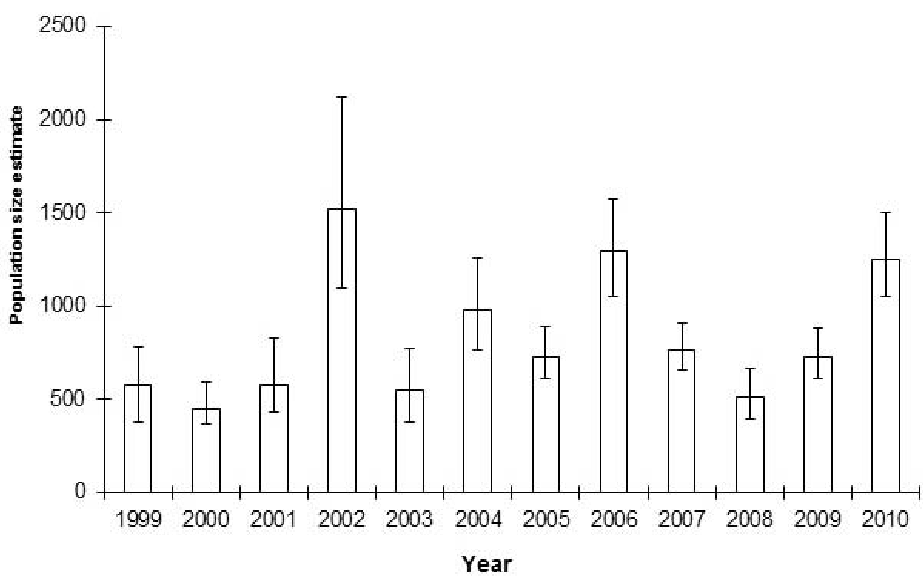


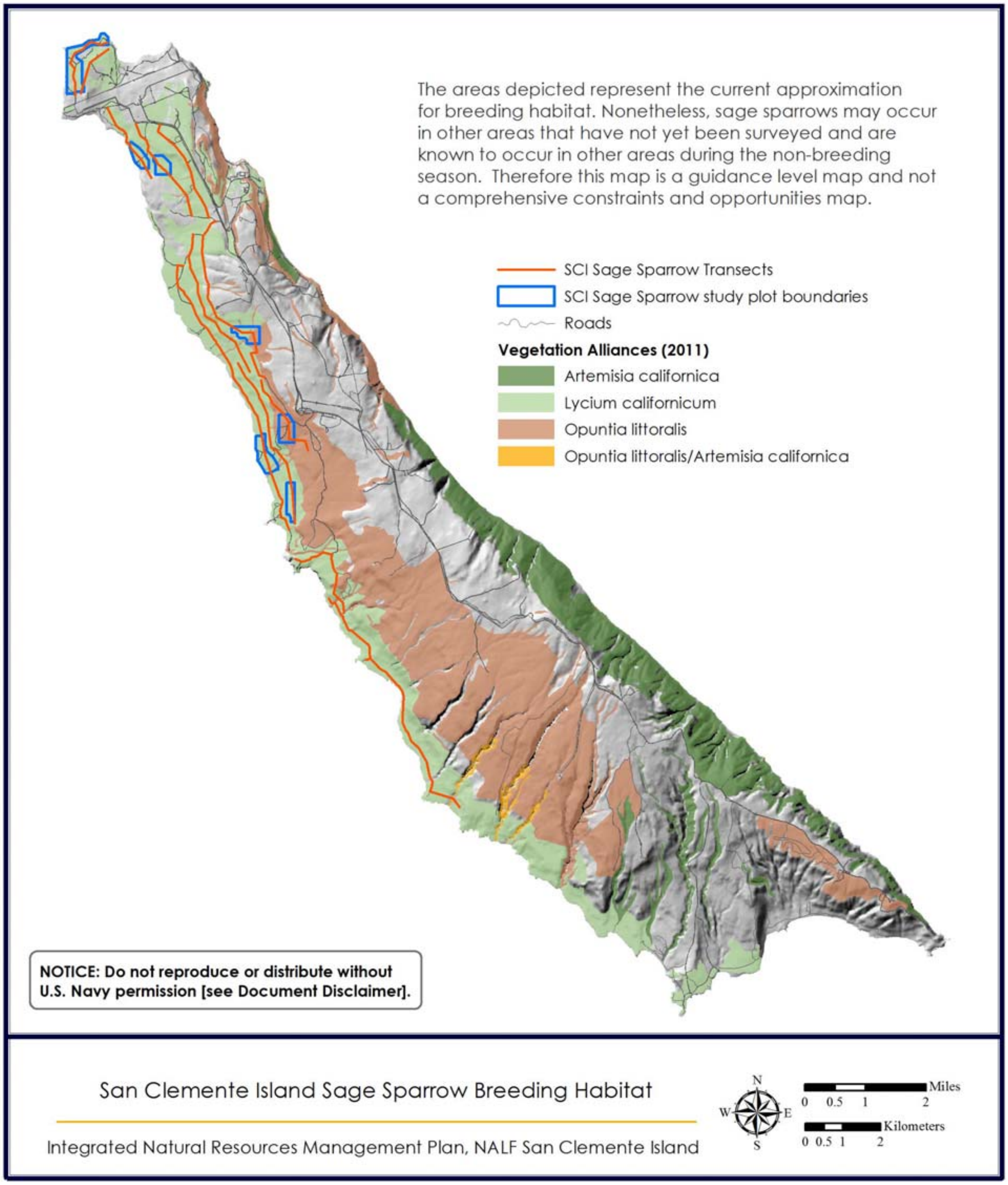
Figure 3-19. Estimated population sizes with 95% confidence intervals of adult San Clemente sage sparrows on San Clemente Island, California, 1999–2010 (from Docherty et al. 2011).

Earlier analyses were completed prior to a recent annual survey that identified sage sparrows nesting in maritime sage scrub habitat, which is outside of their previously documented breeding range (M. Booker, pers. com. 2011). Prior to this discovery, sage sparrows were thought to breed primarily in maritime desert scrub habitat. For this reason, nest monitoring plots were placed exclusively in this habitat type. The recently documented use of maritime sage scrub may be a recent expansion in response to the dramatic recovery of this community and there are likely differences in breeding success and survival between these two habitats. Results from prior studies restricted to maritime desert scrub monitoring plots are, therefore, based on incomplete data regarding population size and survival and likely underestimate the actual population size (M. Booker, pers. com. 2011). Thus, recent population estimates should be viewed with caution; in contrast, population trends are likely well reflected in prior monitoring results.

Sage sparrows are medium-sized sparrows from 4.8 to 5.9 inches (12.1 to 15.0 cm) long with males being larger than females (Martin and Carlson 1998; Turner et al. 2005). Breeding behavior can begin as early as December, but begins more typically in February, and nesting is from mid-March through June. Three to five eggs are laid in a clutch, and birds may lay as many as five clutches in a single year. Females incubate the eggs for 12 to 13 days; both parents bring food to the chicks (Martin and Carlson 1998; Turner et al. 2005). In maritime desert habitat, there has been a trend of decreasing nesting success since 2000, which may be related to nest predation. At this time, we have no data on nesting success in maritime sage scrub habitat. Of the known nest predations in 2010, 61% were attributed to black rats based on post-failure nest checks (Docherty et al. 2011). While overall nest success has decreased, recent surveys have indicated higher sage sparrow reproductive success via a longer breeding season in years following winters of high rainfall (Docherty et al. 2011). Higher rainfall may contribute to increased vegetative growth and invertebrate production, which may then support additional nesting attempts and more nestlings (Martin and Carlson 1998).

Nests in maritime desert scrub habitat are placed low in shrubs with dense branches (Martin and Carlson 1998), particularly boxthorn (76.2% of nests found from 1999 to 2010) (Docherty et al. 2011), which provide important protection and cover from predators. Other plants, such as island butterweed, and island tarplant, are also used for nesting (Munkwitz et al. 2002), and the presence of cactus and forbs in the surrounding habitat is also important. San Clemente sage sparrows forage on California boxthorn berries, cactus and saltbush fruits, other plant seeds, and insects (Hyde 1985).

The SCI subspecies, which has a larger size and bill than the mainland sage sparrow, is nonmigratory and limited in distribution by the lack of suitable habitat, but early ornithologists described it as widespread (USFWS 1984). It has been historically found in the highest densities in areas with a high percentage of boxthorn and a low percentage of bare ground (Munkwitz et al. 2000). The highest densities of boxthorn occur along the western shoreline and low terraces from south of West Cove to the vicinity of Seal Cove (Map 3-28). Management emphasis in these areas is on maintaining military values with high flexibility for maintaining natural resource values as an integral part of day-to-day operations. In recent surveys flocks of juveniles were frequently observed in the stabilized sand dunes south of West Cove (Docherty et al. 2011), which may have a lower predation risk than densely vegetated habitats. Predation of adult sparrows by rats, American kestrel, San Clemente island fox, and San Clemente loggerhead shrike have been documented (Docherty et al. 2011).

1 

2 *Map 3-28. San Clemente sage sparrow habitat on San Clemente Island.*

Current Management

Sage sparrow monitoring has consisted of transect and plot monitoring within Maritime Desert Succulent Scrub habitat typically dominated by boxthorn. Monitoring has been used to generate population estimates, to calculate annual demographic parameters, and track trends. With the addition of a more comprehensive survey for breeding sage sparrows in 2010, it was determined that the monitoring appeared to be underestimating island-wide population, as the sparrows had expanded their range to breeding in sage scrub habitat. In response to this discovery, the Navy initiated a contract in 2011 for the development of a statistically rigorous, peer-reviewed population monitoring plan to better estimate island-wide population and examine habitat differences in nest success and/or productivity. This plan will finalized and initially implemented in 2013.

Recent studies identified nest predation, primarily by rats, as a concern (Docherty et al. 2011). For this reason, a nest camera study was initiated in 2012 that included the placement of cameras at active nests. Rats are also a predator of juvenile and may be a predator of adult sparrows. While efforts are made to control feral cats and rats in loggerhead shrike nesting areas (Biteman et al. 2011), prior to 2011 there was little similar management occurring in sage sparrow habitat. Beginning in 2011, the Navy initiated cat and rat control in sage sparrow habitat and an assessment of cat and rat populations.

Long-term monitoring data indicate that juvenile survival may be low for this species; however, this result was based on apparent survival from band resights, which is expected to provide an underestimate of survival. The Navy initiated a radio-telemetry study in 2009 to get a better assessment of true survival, specific mortality cause, and the potential management implications. This study has gathered three years of data on independent juvenile mortality and two years of data on dependent juvenile mortality. The results of this study identified varied juvenile survival by year, but overall low juvenile survival in the boxthorn habitat. This study did not examine survival in other nesting habitats such as sage scrub but indicated that once independent juveniles dispersed areas outside the boxthorn to other habitats (e.g., dunes) survival increased.

Although the Navy's efforts toward recovering the population were acknowledged in the Five-Year Review completed in August 2009, the USFWS recommended no change to the San Clemente sage sparrow's listing status. In addition, the USFWS emphasized the importance of continued non-native predator removal (USFWS 2009c), which has historically been focused in San Clemente loggerhead shrike habitat. Other threats identified in the Five-Year Review include: limited distribution and small population size, climate change affecting rainfall, loss of habitat from the spread of invasive plants, and other human disturbances.

Assessment of Resource Management

- The Navy has made a significant investment towards understanding factors affecting the recovery of the sage sparrow on SCI. The effects of juvenile survivorship and predation pressure on population recovery warrant continued investigation.
- Predator management was initiated in sage sparrow habitats to control cat and rat populations. These efforts should be evaluated for efficacy and continued or modified through adaptive management.

Table 3-42. Conservation measures for San Clemente sage sparrow.

Term and Condition 5.1. A summary of all fire-related incidental take and/or loss of sage sparrow habitat will be reported annually to the USFWS's Carlsbad Fish and Wildlife Office and to CDFW. Included in the report will be acres of each sage sparrow habitat type burned (high, medium, or low density), mapping of the location of each fire, and a classification of intensity for each fire. The report will be due March 1 of each year. If and when the fire/burn threshold of 18 ha (45 acres) in high density habitat, 20 acres (8 ha) in medium density habitat south of the runway, 25 acres (10 ha) in medium density sage sparrow habitat north of the runway, or 40 acres (16 ha) in low density habitat is reached, take authorization has been met and the Carlsbad Fish and Wildlife Office and CDFW will be notified immediately. Further, if a single fire event burns five or more acres in high density habitat, the Carlsbad Fish and Wildlife Office should be notified within 1 day.
Term and Condition 5.2. The Navy will notify the Carlsbad Fish and Wildlife Office within 48 hours of discovering any dead or injured San Clemente sage sparrows. The notification will include the following information about any dead or injured sparrows detected: date found; general location; cause of death or injury, if known; condition of the animal. In addition, the Navy will summarize information regarding death or injury of San Clemente sage sparrow in an annual report submitted to the Carlsbad Fish and Wildlife Office and to CDFW.
Term and Condition 6.1. The Navy will evaluate post-fire habitat recovery in sage sparrow habitat that burns along the West Shore (i.e., from the airfield to Seal Cove) outside TAR boundaries. If habitat is not recovering, the Navy will implement restoration activities that may include erosion control, focused weed control, outplanting and/or seeding.
Term and Condition 6.2. Fast-Rope exercises should be conducted over disturbed areas rather than sage sparrow habitat to the extent feasible to minimize rotorwash over active nests during the breeding season.
Term and Condition 6.3. Low-elevation helicopter activity over the area between Eel Point and the dunes should be avoided to the maximum extent consistent with training activities.
Term and Condition 6.4. Timing activities at TAR 10 and 17 should be conducted outside the peak period of the sage sparrow breeding season (usually March/April) to the maximum extent consistent with training activities.
Term and Condition 6.5. The footprint of the construction areas for the new building and parking lot within TAR 10, which are slated for construction outside the breeding season, will be marked to avoid habitat areas in coordination with the SCI natural resources program. Anti-perch devices will be installed on the structures.
Conservation measure AVMC-M-8. The Navy will enforce the existing 35 mph speed limit on Ridge Road. The Navy will post signs, continue public awareness programs; mow roadside vegetation; and monitor roadways for kills of protected or conservation agreement species including San Clemente loggerhead shrike, San Clemente sage sparrow, and island fox.
Conservation measure BTS-M-1. Construction of structures will not involve grading and will be conducted outside the sage sparrow breeding season. The footprint of the construction areas will be marked to avoid habitat areas in coordination with the SCI natural resource program. Anti-perch devices will be installed on the structures.
Conservation measure FMP-M-5. The Navy will minimize impacts to listed species and occupied habitat associated with Phos-Chek application by considering the locations of federally-listed species in advance of fuel break installation. This will allow the Navy to avoid impacts to the extent practicable. The Navy will avoid application of Phos-Chek within 300 feet (91.5 m) of mapped sage sparrow locations to the extent consistent with fuelbreak installation.
Conservation measure SCSS-M-1. The Navy will continue surveys and population analysis for the San Clemente sage sparrow and develop additional surveys to assess sage sparrow juvenile survivorship and habitat use. Surveys will be developed and scheduled such that access to training areas is not restricted when training is needed/requested.
Conservation measure SCSS-M-2. The Navy will manage the San Clemente sage sparrow population for long-term persistence in accordance with recommendations in the San Clemente Sage Sparrow Management Plan to the extent feasible and in a manner that is compatible with military training requirements.
Conservation measure SCSS-M-3. The Navy will develop and implement a monitoring plan to assess the incidental take of the San Clemente sage sparrow within and adjacent to TARs 10 and 17 and incorporate the findings into the San Clemente Sage Sparrow Management Plan as recommendations for minimizing or avoiding incidental take, to the extent practicable.
Conservation measure SCSS-M-4. The Navy will address issues associated with habitat and sage sparrow survivorship as part of the INRMP update process, with focus on habitat areas near TARs 10 and 17.
Conservation measure SCSS-M-5. The Navy will conduct construction activities supporting TAR improvements outside the sage sparrow breeding season at TARs and BTS sites that are located within sage sparrow habitat.
USFWS conservation recommendation. We recommend that the Navy, in coordination with the Service, build upon the existing population modeling efforts for the San Clemente sage sparrow to better understand the future viability of these populations. We also recommend that comments from reviewers of the sage sparrow population viability analysis be evaluated and included in future population modeling efforts.

- Recent monitoring studies have identified higher sage sparrow densities in areas that were previously considered low-quality habitat. Increased usage may be related to the recovery of maritime sage scrub in these areas. Expansion of the monitoring program include these areas to assist future management decisions and accurately estimate the status and trends of the population.
- As vegetation communities recover from grazing by feral herbivores, it will be necessary to re-examine the prior classification of potential sage sparrow habitat.
- The nest camera study initiated in 2012 should be continued until there is sufficient data to assess predator-specific nest failure.

Management Strategy

Objective: *Conserve and maintain high quality sage sparrow habitat and control non-native predation pressure to meet recovery objectives for delisting.*

I. Continue annual sage sparrow monitoring efforts and improve upon existing methods of sampling the population.

  A. Complete and implement a sampling plan that will provide more precise estimates of population size.

  B. Monitor incidental take of sage sparrows in accordance with the USFWS BO.

II. Continue predator management efforts to remove non-native rats and feral cats from sage sparrow habitat.

  A. Complete the study to estimate home range size of cats and rats and increase understanding of their spatial use to improve effectiveness of management.

III. Minimize disturbances in sage sparrow habitat during the breeding season to the maximum extent feasible that is compatible with military training requirements.

IV. Construction activities and grading within sage sparrow habitat will occur outside of the sage sparrow breeding season.

V. Minimize loss of sage sparrow habitat to the maximum extent practical.

  A. Site construction areas to avoid sage sparrow habitat.

  B. Evaluate habitat recovery in sage sparrow habitat that burns along the West Shore outside TAR boundaries and implement habitat restoration activities, if needed.

VI. Update and improve delineation of sage sparrow habitat.

  A. Identify areas of high quality occupied habitat that support nesting sage sparrows.

  B. Identify areas on SCI with high usage by juvenile and wintering sage sparrows.

3.9.3.10 Western Snowy Plover (*Charadrius alexandrinus nivosus*)

The Pacific coast population of the western snowy plover was federally-listed as threatened in March 1993. Estimates of the range-wide population as of 2008 were 4,282 birds, with a United States population of 1,812 birds (USFWS 2008a). The recovery plan for the listed population identifies habitat destruction and degradation as the primary factor responsible for the reduction in the breeding population. This can be attributed to the following: 1) habitat loss from the encroachment of introduced species, such as beachgrass (*Ammophila arenaria*), 2) human disturbance, and 3) predation on eggs and chicks (USFWS 2007b).

Although critical habitat was designated for this species in December 1999, SCI was not included in the final designation or in subsequent revisions (USFWS 2005, 2012f). However, consistent presence of western snowy plovers in the winter, and coastal origin of all identifiable individuals on SCI, suggest that this island is an important wintering area, and occasional breeding area, for the coastal population of this species (Lynn et al. 2006b). Map 3-29 shows the location of western snowy plover habitat on SCI.

The western snowy plover is a small shorebird that breeds along the Pacific coast from southern Washington to southern Baja California as well as interior areas of Oregon, California, Nevada, Utah, New Mexico, Colorado, Kansas, Oklahoma, and north central Texas. While a small amount of interbreeding may occur, the Pacific coast population is genetically isolated from western snowy plovers that breed in the interior (USFWS 1993). Snowy plovers are partial migrants with some plovers wintering in the same area in which they breed and others migrating to alternate locations throughout their range (Page et al. 1995; Warriner et al. 1986).

The breeding season of the coastal population extends from mid-March through mid-September (USFWS 1993). Typical clutch size is three eggs with incubation averaging 27 days and fledging time averaging 31 days, and sexual maturity is typically reached in one year for both sexes (Warriner et al. 1986). The chicks are precocial, leaving the nest within hours after hatching to search for food. At beach locations, they feed on invertebrates in the wet sand and within kelp along the high tide line. Nests are in unlined, shallow depressions in hardened clay, silt, loose cobble, pebbles, or sand. Adults and eggs are cryptically colored because nests are in the open, making them vulnerable to predators and exposed to the elements. Sand spits, dune-backed beaches, wide unvegetated beach strands, and open areas at river mouths around estuaries and beaches are preferred for nesting; however, these are generally lacking on SCI.

The snowy plover has been a common winter visitor to SCI, as suggested by numerous reports (Linton 1908; Howell 1917; Page et al. 1986; Sullivan and Kershner 2005; USFWS 2007b). Band recoveries in previous years (Powell et al. 1997; Foster and Copper 2003) suggest that some of the western snowy plovers that breed in San Diego County, regularly move out to SCI during the winter. Powell et al. (1997) detected a plover from Monterey County using Pyramid Cove during the fall of 1997. The visitors sighted are usually in low numbers; however, sightings and numbers of individuals have been consistent. There is no evidence that snowy plovers from inland populations spend the winter on or migrate through SCI, although individuals from inland populations are known to have wintered on the mainland Pacific Coast (Page et al. 1995).

SCI is unlikely to be an important breeding area for this species, due to a combination of factors including the limited extent of sandy beaches on SCI, the narrowness of the beaches (increasingly so at West Cove), and the abundance of predators. The Recovery Plan for the Western Snowy Plover (USFWS 2007b) identified six beaches on SCI as important for wintering birds: Pyramid Cove, Horse Beach, China Cove, West Cove, Graduation Beach, and BUD/S Beach (Map 3-29). These six beaches constitute only 2.8 miles (4.6 km) of the 55 miles (88.5 km) SCI coastline. They are also some of the areas of the island most frequently used for military operations, since sandy beaches provide critical military access (USFWS 2008a).

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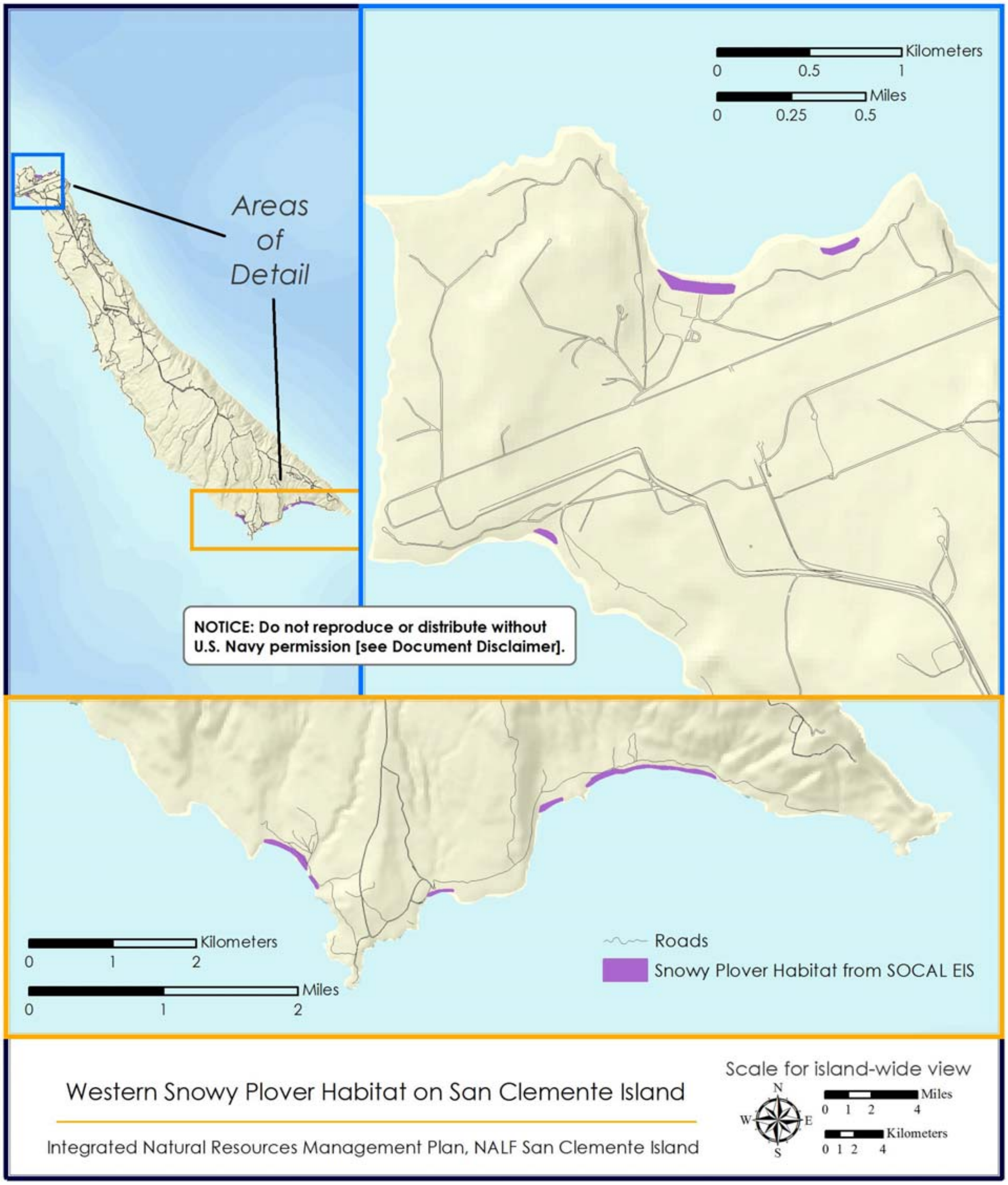


2 *Map 3-29. Western snowy plover habitat on San Clemente Island.*

Typically the number of western snowy plovers on SCI peaks in November, although numbers from surveys from 2003 to 2005 peak in October and the peak during the 2009–2010 survey was in January. Prior to 2004, Pyramid Cove had the largest number of wintering plovers (28 in October 2003) (Lynn et al. 2004b). However, it has not been surveyed since 2003 owing to the presence of a military training range, which may contain live UXO. Of the three currently surveyed beaches, West Cove has the highest number of plovers with 15 - 25 plovers observed during winter monthly counts (Stahl and Bridges 2010; M. Booker, pers. com. 2011). Surveyors in 2010 detected a maximum of 24 plovers at West Cove, BUD/S Beach, and Graduation Beach (Stahl and Bridges 2010). In 2004 at the same locations, 19 plovers were detected.

Breeding on SCI has been confirmed three times. The first confirmed instance of breeding on SCI occurred when an adult and a chick were observed at West Cove in 1989 (Winchell 1990). The only subsequent records of breeding activity were in 1996 and 1997. In 1996, Brian Foster and Robert Patton observed a nest with three eggs at Horse Beach that was later depredated and the three chicks did not survive. In 1997, at Horse Beach Cove, one nest with three eggs was observed to hatch three chicks (Powell et al. 1997; Foster 1998). More recent surveys, from 2000 to 2005 and from 2008 to 2010, have shown no evidence of snowy plover breeding activity on SCI (Foster and Copper 2000, 2003; Lynn et al. 2004b, 2005, 2006b; Stahl and Bridges 2010). However, the southern beaches with the most likely nesting areas have not been surveyed since 2004 due to the exclusion from biological monitoring per Commander Navy Region Southwest Instruction 4000.2, which prohibits access to High Explosive Impact Areas in SHOBA.

Current Management

Current management is aligned with the most recent BO (FWS-LA-09B0027-09F0040) on San Clemente Island Military Operations and Fire Management Plan (2008) listing the following management terms and conditions regarding snowy plovers (Table 3-43): 1) submission of an annual report documenting habitat usage and any incidental take, and 2) enhancement of the habitat near West Cove to provide resting areas that are relatively free of man-made materials and non-native vegetation. Enhancement of this area will increase the suitable habitat available for plovers.

Table 3-43. Conservation measures for western snowy plover.

Term and Condition 7.1 - The Navy shall submit a yearly report that summarizes western snowy plover use of monitored beaches on SCI and any incidental take that is observed.
Term and Condition 8.1 - The Navy shall enhance the upland portions of West Cove Beach to provide additional resting areas for the western snowy plover by controlling non-native plants in the vicinity of West Cove Beach to the extent feasible and by ensuring man-made materials do not accumulate on the beach.
Conservation measure WSP-M-1. The Navy will continue annual breeding and non-breeding season surveys for the western snowy plover at West Cove and Northwest Harbor.
Conservation measure WSP-M-2. The Navy will explore the feasibility of using remote sensing technology to monitor western snowy plover use of Pyramid Beach and China Beach.

In accordance with the BO (FWS-LA-09B0027-09F0040, San Clemente Island Military Operations and Fire Management Plan) conservation measures (Table 3-43), the Navy re-instated monthly, year-round monitoring surveys in 2008 of West Cove, BUD/S Beach and Grad Beach. Results of these surveys are communicated annually to USFWS. Other management undertaken by the Navy that may benefit the snowy plover include efforts to remove non-native predators, such as feral cats and monitoring surveys of wintering burrowing owls, which are a possible predator of adult plovers.

Assessment of Resource Management

- Regular monitoring of snowy plovers on SCI was re-initiated in 2008 and continues to contribute to regional and population information for recovery efforts of the plover.
- The lack of access to the southern beaches of SCI impedes management of the snowy plover and may also lead to an inaccurate estimate of plovers regularly using SCI; this also hinders assessment of SCI as a breeding location.
- Climate change may further reduce already narrow beaches.
- Human disturbance was listed as one of three primary factors contributing to the decline of western snowy plovers in nesting areas (USFWS 1993). Disturbance to plovers on SCI comes from a variety of anthropogenic sources and, along with the limited availability of suitable breeding habitat, may contribute to the lack of nesting on the island. However, most anthropogenic sources of disturbance on SCI are temporary, whether from foot and vehicle traffic associated with military training or from fishing and other recreational activities of off-duty personnel at West Cove.

Management Strategy

Objective: *Maintain sandy beach habitat to provide wintering and stopover resources for western snowy plovers on SCI.*

I. Continue monthly monitoring of West Cove, BUD/S, and Graduation Beach.

II. Report annually to the USFWS a summary of snowy plovers use on monitored beaches and any observed incidental take.

III. Investigate alternative survey methods to monitor western snowy plovers in restricted areas.

- ***A.*** Explore the feasibility of remote-sensing technology or the ability to detect plovers on the beach, while surveying from a boat offshore.
- ***B.*** Once a viable alternative is found and tested, initiate regular monitoring of plovers during the non-breeding season. In addition, consider a breeding season survey of areas most likely to be suitable for nesting.

IV. Enhance upland portions of West Cove Beach in accordance with BO Term and Condition 8-1 (USFWS 2008a). If needed to maintain suitable habitat, West Cove Beach can be improved by restoring sand replenishment with dredged sand as materials become available.

V. Avoid shoreline construction that results in a loss of coastal strand habitat. Loss of this habitat could also reduce beach training capabilities.

VI. Minimize threats to the wintering population from non-native predators by removing feral cats in and around the northern beach sites.

VII. Determine the potential threat, if any, to wintering plovers posed by wintering burrowing owls.

3.9.3.11 White Abalone (*Haliotis sorenseni*)

White abalone are herbivorous gastropods historically found from Punta Abreojos, Baja California, Mexico to Point Conception, California (Cox 1960). Since the mid-1990s, extremely low numbers of isolated survivors have been identified along the mainland coast of Santa Barbara County and at some offshore islands and banks, including SCI, which is a historical center of abundance for the white abalone (Cox 1960; Leighton 1972).

White abalone are found in deep rocky habitat interspersed with sand channels (Tutschulte 1976; Davis et al. 1996). Sand channels may be important for the movement and concentration of drift macroalgae, upon which white abalone are known to feed (NMFS 2006). They can be found at depths of 65 to 196 feet (20–60 m) and were historically most abundant at 80 to 100 feet (25–30 m) (Cox 1960; Tutschulte 1976).

Abalone have separate sexes and are broadcast spawners, releasing millions of eggs or sperm into the water column during a spawning event. Fertilized eggs hatch and develop into free-swimming larvae, spending five to 14 days as a non-feeding zooplankton before development (i.e., metamorphosis) into the adult form. After metamorphosis, they settle onto hard substrates in intertidal and subtidal areas. Abalone grow slowly with a relatively long life span of 35 to 40 years, growing to a maximum diameter of 10 inches (25 cm) (NMFS 2008b).

Juvenile abalone seek cover in rocky crevices, feeding on benthic diatoms, bacterial films, and single-celled algae found on coralline algal substrate (Cox 1962). At about a length of three to four inches (75 to 100 millimeters [mm]), abalone emerge from rocky crevices since they are less vulnerable to predators. At this point in their life cycle, white abalone will start to feed on drift and attached algae, including deeper water brown taxa *Laminaria farlowii* and *Agarum fimbriatum*. They reach sexual maturity at age four to six years and 3 to 5 inches (9 to 13 cm) in diameter.

The most significant threat to white abalone is related to the long-term effects from overfishing. During the 1960s, major changes occurred in the abalone fisheries, including the evolution of diving gear from the Widolf mask and heavy gear into what is used today (Lundy 1997); this increased the efficiency and effectiveness of the fishery by allowing divers to stay underwater longer and dive deeper. The harvest of white abalone became popular in 1968 (Lundy 1997) with a peak of pounds landed in 1973 (Hobday and Tegner 2000). By 1978, the catch of white abalone declined dramatically (Tegner 1989) with a complete collapse occurring in the 1980s (Lundy 1997). Due to the depletion of the fishery, white abalone fishing was closed in 1996 throughout southern California. Overfishing reduced white abalone densities to such low levels that animals are not close enough for successful fertilization, resulting in reproductive failure (Hobday and Tegner 2000). To help combat this problem, captive propagation programs have been established for the eventual outplanting of adults into the wild.

On 29 May 2001, NMFS published a final rule (66 FR 29046) listing the white abalone as an endangered species on the ESA. It was determined that a critical habitat designation would lead to an increase in the threat of poaching (66 FR 29046); therefore, no critical habitat will be designated for the species. In October 2008, NMFS published the White Abalone Recovery Plan with specific management strategies to recover the endangered species. This plan followed the release of the Abalone Recovery and Management Plan adopted by CDFW, which was released in December 2005, addressing the recovery of all abalone species found in California.

In October 1999, surveys were conducted in potential white abalone habitat areas on SCI (Map 3-30). This survey was limited to the northern, western, and southern sides of the island. Most of the individuals observed were found offshore of the center of the island on the west side of SCI. Individuals and groups of two or more individuals were most abundant offshore from Seal Cove and Seal Point. A total of 24 white abalone were found, ranging from one to six individuals per site, at ten of the 26 sites surveyed. Abalone were found in 100 to 200 feet (30–60 m) of water, with most at approximately 157 feet (48 m).

In August 2004, the Navy partnered with NMFS and California State University Monterey Bay to quantify the amount of suitable habitat available for white abalone to obtain an accurate estimate of the number of remaining individuals at SCI, as well as Tanner and Cortez Banks (Butler et al. 2006). The surveys were conducted over a ten-day period off the west shore of SCI from Castle Rock south to China Point and consisted of multibeam and sidescan sonar from the seaward edge of the kelp beds at 82 feet (25 m) out to approximately 245 feet (75 m). Extensive remotely operated vehicle surveys were conducted where suitable habitat was found to measure abalone densities. Butler et al. (2006) found all abalone at 100 to 130 feet (30–40 m) and 130 to 165 feet (40–50 m) depth ranges with none sighted at 165 to 200 feet (50–60 m). White abalone densities were about three abalone per hectare (1.2 abalone per acres). Due to these low densities, a pattern in size distribution was unavailable. Suitable habitat on SCI was measured at 2,220 acres (889 ha), respectively, and the SCI population was estimated at 1,938 +/-1,598 individuals.

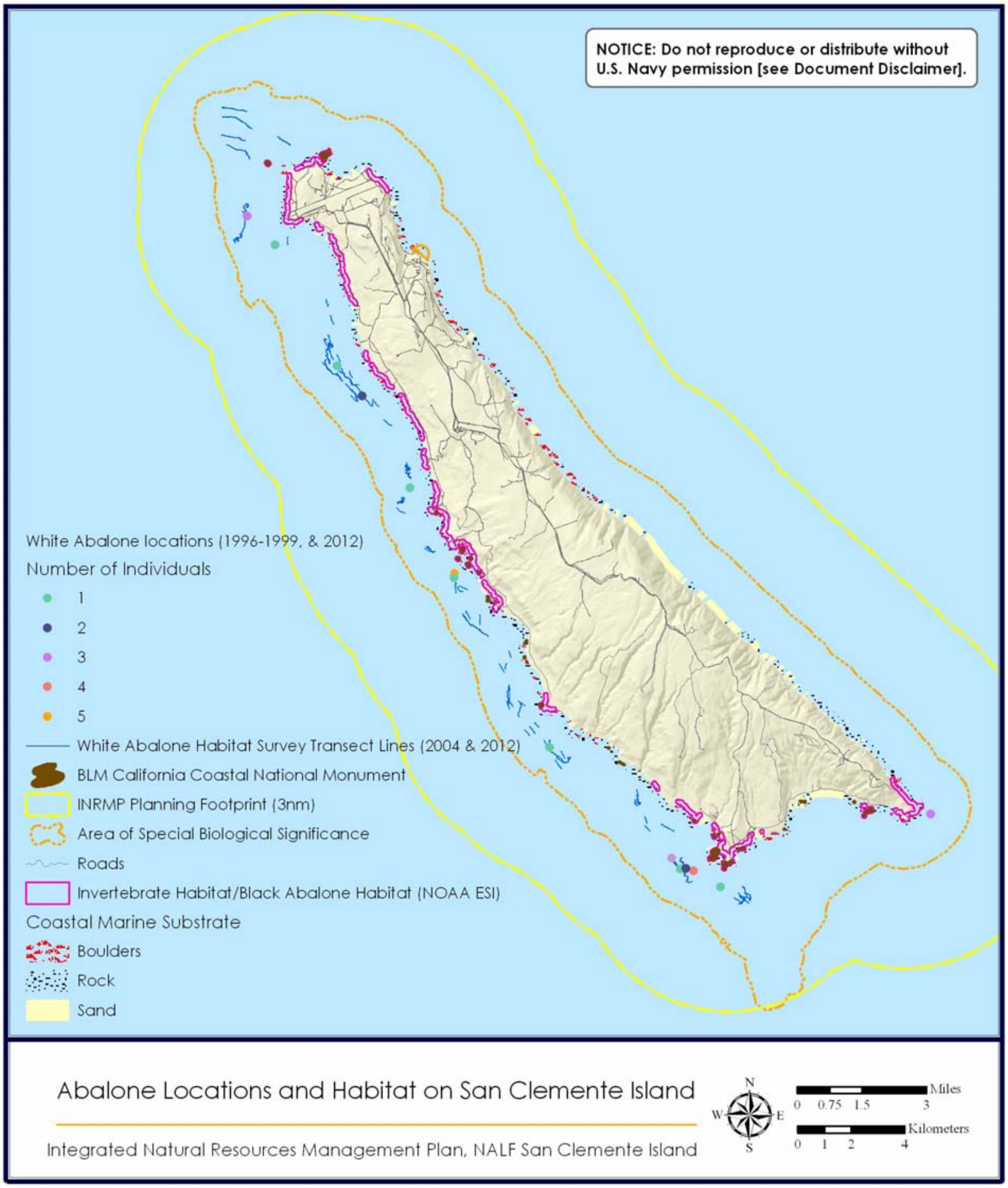
White abalone habitats along the west shore of SCI visited in 2004 were surveys again in July 2012 (NMFS, unpubl.). A total of 48 remotely-operated vehicle transects were conducted along the west and south edges of SCI using methods from the 2004 surveys. A total of five white abalone were observed in all transects. One white abalone was observed at 100 to 130 feet (30–40 m) and one at130 to 165 feet (40–50 m) depth ranges. Three white abalone were observed at 165 to 200 feet (50–60 m). The abundance of white abalone during this survey (0.25 white abalone per km surveyed) was slightly greater than during the 2004 survey. The average length of all white abalone was 6.9 inches (17.7 cm).

Current Management

White abalone populations in the nearshore waters surrounding SCI are managed and monitored by CDFW; in 2005, CDFW released a Abalone Recovery and Management Plan addressing all species of abalone in California. NMFS is also involved in recovery efforts and continues to conduct research on the species, initiated a captive breeding program, and completed a recovery plan (NMFS 2008b).

CDFW has jurisdiction over the "conservation, protection, and management" of white abalone; the Department "monitors the status of populations and conducts research" (CDFW 2005). However, NMFS is ultimately responsible for the management and recovery of the species; a White Abalone Recovery Plan in 2008 was published establishing recovery criteria and management strategies for the species (NMFS 2008b).

While CDFW and NMFS are the primary agencies involved with managing white abalone, the Navy is actively involved with monitoring and intermittently funds research, as well as supports outside research institutions to work on the species. In October 1999, surveys were conducted by researchers at the University of California at Santa Barbara, where recreational and commercial divers indicated white abalone populations were once abundant. In 2004, the Navy supported surveys by NMFS and California State University at Monterey. Additional white abalone surveys were conducted in Fiscal Year 2012. These surveys occurred on the west coast of SCI.



Map 3-30. White and black abalone habitat in the nearshore waters of San Clemente Island.

Additionally, public access to the NSZs is restricted during specific training exercises and the recreational harvest of fishery resources are prohibited at all times in Safety Zones G and Wilson Cove. These zones were established to enhance public safety; however, access and recreational fishery restrictions are thought to contribute ecological benefits similar to that of an MPA. Surveys of marine species, including white abalone and other marine invertebrates, in NSZs will be conducted in Fiscal Year 2012 and 2013 to establish baseline information of these areas. For details on Safety Zones around SCI, see Section 4.1.3 Safety and Other Restricted Access Zones.

Minimization and mitigation measures have been developed through the SOCAL EIS (Navy 2008) in support of the EFH Assessment. Minimization and mitigation measures that protect invertebrates include: prohibiting detonations within 0.5 nm (1 km) of any artificial reef, shipwreck, or live hard-bottom community; within 1.6 nm (3 km) of shoreline; or within 3.2 nm (6 km) of an estuarine inlet.

Assessment of Resource Management

- Population estimates and completed habitat delineations have added important data to assess the white abalone population around SCI at the time of its listing and has supported the completion of a recovery plan goal.
- Future efforts to conduct additional surveys around SCI is imperative in order to prioritize management decisions and aid in the recovery of the species.
- Regular monitoring will evaluate the status and trends of the population and track the success of recovery efforts, if applicable.
- The continued assessment and monitoring of the white abalone population and its habitat around SCI support recovery strategies listed in the White Abalone Recovery Plan (NMFS 2008a).
- NSZ regulations must be enforced by the U.S. Coast Guard for these areas to have ecological benefits similar to an MPA. It is unknown if these areas are properly enforced and poaching may exist. NSZ monitoring will begin in Fiscal Year 2012 and will establish baseline data of white abalone presence. These surveys will be essential to monitor the effectiveness of NSZs as well as the status and trends of white abalone in these areas.
- Safety Zones will support recovery strategies through monitoring of these areas.
- Recent preliminary surveys show extremely low densities of white abalone in waters surrounding SCI that make natural recovery nearly impossible. The Navy should support efforts designated in the White Abalone Recovery Plan, as feasible, either by facilitating researcher access to SCI or financially to aid in successful recovery of the species.
- Mitigation measures are a proactive method for the protection of deep rocky habitat surrounding SCI. However, the effectiveness of these mitigation measures has not been evaluated.

Management Strategy

Objective: *Assess and promote the recovery of the white abalone population in suitable rocky substrate habitat to maintain a viable population.*

I. Support recovery strategies listed in the White Abalone Recovery Plan (2008).

    A. Review enforcement policies for effectiveness in combating potential illegal take.

   - ***B.*** Continue to monitor the white abalone in waters around SCI.
   - ***C.*** Complete an island-wide survey to assess the present population around the island.
   - ***D.*** Support future recovery efforts to maximize reproductive output of the population.

II. Create a database that will integrate current and historical data sets of abalone around SCI.

   - ***A.*** Share information with the MARINe database.
   - ***B.*** Share data with CDFW to avoid the designation and regulation of nearshore waters as a state MPA, which could constrain military activities or increase the cost of environmental compliance.

III. Work collaboratively with other government agencies to secure financial support that contribute to the recovery and stabilization of the abalone population.

IV. Support species monitoring requirements.

   - ***A.*** Conduct surveys to determine site usage of white abalone in relation to SCI safety zones.
   - ***B.*** Continue to partner with CDFW and NMFS on white abalone surveys around SCI.

V. Investigate the following to support recovery of the white abalone:

   - ***A.*** Factors affecting larval dispersal distances, survival, and recruitment dynamics.
   - ***B.*** Field outplantings for a range of sizes, densities, and spatial scales in both nearshore and island locations.
   - ***C.*** Long-term effects on white abalone from climate change.

3.9.3.12 Black Abalone (*Haliotis cracherodii*)

Black abalone is a large marine gastropod thought to feed primarily on giant kelp and feather boa kelp in southern California (Haaker et al. 1986). They are the shallowest of the abalone species, inhabiting coastal and offshore island intertidal and shallow subtidal habitats on exposed rocky shores where bedrock provides deep, protective crevices for shelter (Leighton 2005). These cracks and crevices in intertidal habitats appear to be crucial for juvenile recruitment and adult survival (Leighton 1959; Leighton and Boolootian 1963; Douros 1985, 1987; Miller and Lawrenz-Miller 1993; VanBlaricom et al. 1993; Haaker et al. 1995). They generally occur in areas of moderate to high surf. The species ranges vertically from the high intertidal zone to a depth of minus 20 feet (6 m) (as measured from the Mean Lower Low Water) and are typically found in middle intertidal zones. Factors, such as wave exposure and distribution of drift kelp, determine whether black abalone will be in high or low intertidal zones.

Historically, black abalone ranged from Crescent City, California to southern Baja California, Mexico (Geiger 2004). Currently, the species range is constricted from Point Arena, California to Bahia Tortugas, Mexico, with sightings rare north of San Francisco and south of Punta Eugenia, Mexico (Neuman et al. 2010).

Black abalone reach a maximum size of about 8 inches (20 cm) in diameter, but typically range from 4.0 to 5.5 inches (10 to 14 cm), and are thought to live 20 to 30 years (NMFS 2012h). They have separate sexes and broadcast spawn, primarily in summer months. The planktonic larval stage will last from about five to 15 days before settlement and metamorphosis (Leighton 1974). Larval black abalone are thought to settle on rocky substrate with crustose coralline algae, which serves as a food source for post-metamorphic juveniles, along with microbial and diatom films (Leighton 1959; Leighton and Boolootian 1963; Bergen 1971).

Photo 3-57. Black abalone at San Clemente Island (Tierra Data Inc. 2008).

Historical overfishing and continuing illegal harvest were threats identified by NMFS that led to the species listing on the ESA. However, the primary threat to black abalone is the disease called withering syndrome. Black abalone populations were abundant throughout the Channel Islands until the mid-1980s when populations began to decline dramatically due to the spread of withering syndrome (Tissot 1995). The disease is caused by a Rickettsiales-like prokaryotic pathogen of unknown origin that invades digestive epithelial cells and disrupts absorption of digestive materials from the gut lumen into the tissues (Gardner et al. 1995). Withering syndrome spread through the Channel Islands from 1986 to the mid-1990s, and consequently, spread to the mainland populations in both California and Mexico. As a result of the disease, most black abalone populations in southern California have declined by 90 to 99% since the late 1980s (VanBlaricom et al. 2009) and have fallen below estimated population densities necessary for successful recruitment (Neuman et al. 2010).

Mortality rates caused by withering syndrome appear to be sensitive to fluctuations in local sea surface temperatures (Friedman et al. 1997; Raimondi et al. 2002; Harley and Rogers-Bennett 2004; Vilchis et al. 2005). Disease transmission and manifestation is increased when local sea surface temperatures increase by as little as 4.5°F (2.5°C) and remain elevated over a prolonged period of time (i.e., a few months or more) (Friedman et al. 1997; Raimondi et al. 2002; Harley and Rogers-Bennett 2004; Vilchis et al. 2005).

On 14 January 2009, NMFS published a final rule (74 FR 1937) listing the black abalone as endangered under the ESA. Critical habitat was designated on 27 October 2011 (76 FR 66806); however, it was determined the Navy's management efforts for black abalone are sufficient to avoid designation of critical habitat at SCI. The Abalone Recovery and Management Plan, adopted by CDFW in December 2005, includes management strategies for the recovery of black abalone in California. Currently, NMFS has not adopted a recovery plan for black abalone.

An intensive survey aimed at recording black abalone distribution at SCI was conducted in January 2008 (TDI 2008a). The survey was performed at 61 locations between Northwest Harbor and Pyramid Head along the west shore, within primary abalone habitat. Ten abalone were recorded, with most occurring at locations previously documented to support abundant populations (e.g.,West Cove, Eel Point, Mail Point; See Map 3-30). All abalone were greater than 4 inches (10 cm), ranging from four to five inches (100 to 130 mm), averaging 4.6 inches (117.4 mm). There were no signs of recruitment (fresh shells), and most were observed on exposed headlands where Navy operations have little potential for interaction. Based on the area surveyed, approximate black abalone density at SCI is one abalone per 2.3 acres (0.9 ha).

In 2011 and 2012, researchers from the UCSC surveyed between 13.6% and 20.7% of the rocky coastline on SCI, with sites located on all sides of the island. A total of 47 black abalone were found, and it is estimated that a total of 187 black abalone are located in the nearshore waters of SCI. The average size was about 4.7 inches (119.5 mm), which is similar to the average size of black abalone measured in the 2008 surveys. There were no individuals smaller than 3.1 inches (80 mm) found, and individuals were significantly larger in moderate habitat than in good habitat. Black abalone inhabited good habitat disproportionately more than moderate habitat, and no abalone were found in poor habitat. The quality of habitat is measured by the amount of fouling organisms located on potential black abalone habitat, such as algae, sponges, tunicates, and barnacles. Extensive colonization by these organisms may dramatically decreases the utility of the rock surfaces for recruitment of black abalone. Rocky intertidal surveyed at SCI contained more poor habitat than good and moderate habitat combined.

Current Management

Black abalone in waters around SCI are managed by CDFW and NMFS; however, the Navy is actively involved in the recovery and monitoring of the species at SCI. The Navy is a participating member of the NMFS Black Abalone Recovery Team.

CDFW has jurisdiction over the "conservation, protection, and management" of black abalone; the Department "monitors the status of populations and conducts research" (CDFW 2005). However, NMFS is ultimately responsible for the management and recovery of the species.

NSZs were developed and implemented through informal consultation with CDFW to restrict public access to these areas during specific training exercises. Access to Safety Zones G and Wilson Cove is prohibited at all times due to military activities. NSZs were established for the public's safety; however, access restrictions prevent fishing activities and are thought to contribute ecological benefits similar to that of a MPA. Biological surveys will be conducted in NSZs, which will capture the status and abundance of black abalone and other marine invertebrates, in Fiscal Year 2012 to establish baseline information of these areas.

The Navy funded an initial black abalone population assessment at SCI in 2008. In 2011, researchers from UCSC conducted surveys to estimate the population size of black abalone around SCI. Additionally, density and size in relation to habitat quality were analyzed. Black abalone monitoring in Fiscal Years 2012 and 2013 will consist of habitat characterization to evaluate the quality of habitat available to black abalone on SCI.

Other future management efforts include updating natural resources education and outreach material to include information on black abalone. Black abalone interpretive signs and brochures will be produced and placed in the island's air terminals and other common areas.

Additionally, the Navy completes in-house surveys at rocky intertidal monitoring sites every spring and fall. These surveys capture a portion of potential black abalone habitat on the island and contribute to assessing the population status and trends around SCI. See Section 3.8.1.2 Rocky Intertidal and Surfgrass for more information on rocky intertidal monitoring sites on SCI.

Assessment of Resource Management

- NSZs are thought to provide benefits similar to MPAs in the waters surrounding SCI, helping to preserve black abalone populations. However, it is unknown if NSZs are properly enforced by the U.S. Coast Guard and poaching of black abalone could exist.
- Ongoing monitoring efforts at multiple locations on SCI, in conjunction with long-term monitoring at the other Channel Islands, have provided federal and state agencies invaluable data on the trends of the black abalone population over the central portion of its range (TDI 2008a).
- Proactive management at SCI has also allowed the island to avoid a critical habitat designation for the species.
- Continued monitoring of the status and trends of the black abalone population at SCI is needed since it is unknown if the population can recover without captive propagation, due to reproductive failure as the population density has decreased.
- Future management efforts discussed in the CDFW Abalone Recovery and Management Plan should be supported, if feasible, by the Navy with in-kind or financial support, which include monitoring, culturing withering syndrome-resistant black abalone for release into the wild, research of withering syndrome on abalone species, and outplanting.

Management Strategy

Objective: *Continue to monitor and support the recovery of the black abalone population in suitable rocky intertidal habitat to increase the population at SCI.*

I. Properly monitor and engage the U.S. Coast Guard to enforce NSZ closures.

II. Develop a database that would provide data from all current and historic rocky intertidal information and locations of incidental sightings.

- ***A.*** Share information with the MARINe database.
- ***B.*** Share data with CDFW as to avoid the designation and regulation of nearshore waters as a state MPA.

III. Develop education and outreach material to promote black abalone recovery and conservation at SCI.

IV. Continue to refine knowledge and monitor the black abalone population and density at SCI.

- ***A.*** Continue to survey intertidal rocky habitat biannually to adequately track the population and examine seasonal fluctuations.
- ***B.*** Conduct habitat characterization to evaluate the quality of habitat available on SCI.

V. Stay informed on the status of black abalone recovery efforts.

- ***A.*** Support efforts to investigate the effects of climate change on withering syndrome in populations of wild black abalone.
- ***B.*** Investigate the feasibility of supporting future outplanting efforts at SCI.

VI. Investigate the following to support the recovery of black abalone:

A. Factors affecting larval dispersal distances, survival, and recruitment dynamics.

B. Field outplantings for a range of sizes, densities, and spatial scales in both near-shore and island locations.

C. Population structure of black abalone at SCI.

D. Movement patterns of post-metamorphic juvenile black abalone.

3.9.3.13 Sea Turtles (Superfamily Chelonioidea)

Four species of sea turtles occur at sea off the coast of southern California: the leatherback, loggerhead, eastern Pacific green, and olive ridley turtles. Due to the primarily pelagic oceanic distributions of the leatherback, loggerhead, and olive ridley turtles off southern California, Pacific coastal waters out to the central Pacific Ocean are designated as an area of primary occurrence for all sea turtle species (Navy 2005). However, there are no known sea turtle nesting beaches on the west coast of the United States and SCI is not a concentration area or destination for sea turtles (P. Dutton, pers. com. 2000).

Seasonal Distribution

The distribution of sea turtles is strongly affected by seasonal changes in ocean temperature (Radovich 1961). In general, sightings increase during summer as warm water moves northward along the coast (Stinson 1984). Sightings may also be higher in warm water years (e.g., El Niño) in comparison with cold water years (e.g., La Niña).

Off the west coast of the United States, leatherback turtles are most abundant from July to September, rarely reported during winter and spring. Their appearance in southern California coincides with the arrival of the 64° to 68°F (18° to 20°C) isotherms (Stinson 1984). Stinson (1984) noted that the July appearance of leatherbacks along the west coast of the United States was two-pronged with turtles suddenly appearing in southern and northern California, Oregon, and Washington; however, only a few sightings occurred along the intermediate coastline. Turtles may be moving onshore from offshore areas where the water temperature is 55° to 59°F (13° to 15°C) (Stinson 1984). Morreale et al. (1994) found that migrating leatherback turtles often travel parallel to deep water contours, ranging in depth from 650 to 11,500 feet (200–3,500 m). Leatherback turtles could pass through offshore waters near SCI during migration; they could pass through as groups of a few adults and not as large concentrations (P. Dutton, pers. com. 2000).

Juvenile loggerhead sea turtles are common year-round in the coastal waters of southern California (Stinson 1984), while adult loggerheads are rarely seen. Sightings are most common during July to September (Stinson 1984). The juvenile loggerheads off southern California may represent the fringe of large aggregations that occur off the west coast of Baja California, Mexico (Bartlett 1989; Pitman 1990). Juvenile loggerheads would be the most common sea turtle present in offshore waters of SCI (P. Dutton, pers. com. 2000). An aggregation could pass through in waters adjacent to the island; it is possible that a few could stop and feed in nearshore SCI waters.

The east Pacific green sea turtle is the most commonly observed hard-shelled sea turtle on the Pacific coast from northern Baja California, Mexico to Alaska (Stinson 1984) and is the only sea turtle species with a confirmed sighting in nearshore waters of SCI (D. Lerma, pers. com. 2011). Most of the sightings (62%) were reported from northern Baja California, Mexico and southern California. Green sea turtles are sighted year-round in the waters off southern California with the highest frequency of sightings occurring during the warm summer months of July through October (Stinson 1984). In waters south of Point Conception, Stinson (1984) found this seasonal pattern in sightings to be independent of inter-year temperature fluctuations. The year-round presence of green sea turtles off southern California likely represents a stable northern Mexican population. Green sea turtles feed on seagrasses in nearshore waters; therefore, this species could be found in nearshore waters of SCI (P. Dutton, pers. com. 2000). However, the waters of SCI are colder than those preferred by green sea turtles, making concentrations of this species unlikely in nearshore waters of SCI.

A small population of olive ridley sea turtles nest along the Pacific coast of Baja California, Mexico, which is the northernmost known nesting area in the eastern north Pacific (Fritts et al. 1982). Outside of the breeding season, olive ridleys disperse, and little is known of their behavior. Individuals exhibit a nomadic pattern, occupying a series of feeding areas in oceanic waters (Plotkin et al. 1994).

Abundance of Sea Turtles

Sea turtles typically remain submerged for several minutes to several hours, depending upon their activity state (Standora et al. 1994). Long periods of submergence hamper detection and confound census estimates.

Pitman (1990) presents data on relative densities off Baja California, Mexico and Stinson (1984) presents data on relative abundance of turtles off the U.S. Pacific coast. However, there are no data on absolute densities or abundance of sea turtles on the U.S. Pacific coast.

Rare, Threatened, and Endangered Species

All four species of sea turtles with a potential to occur in SCI's surrounding waters are federally-listed as endangered or threatened. The leatherback turtle is listed as endangered throughout its entire range (34 FR 8491). Both the olive ridley (32 FR 32800) and green sea turtles (43 FR 32800) are listed as threatened, while at sea, and nesting populations on the Pacific coast of Mexico are endangered. The loggerhead sea turtle is listed as threatened throughout its range (43 FR 32800).

Current Management

The NMFS ESA Section 7 Consultation Programmatic Final BO currently provides measures to avoid and minimize impacts to sea turtles from Navy training and operations. These measures were implemented to prevent sea turtles from being exposed to potentially harmful levels of active sonar and underwater donations in nearshore waters. These measures rely primarily on Navy watchstanders, helicopter pilots, and other Navy assets detecting sea turtles visually, resulting in appropriate action taken by the Navy.

A detailed analysis of the potential effects and mitigation measures are discussed in the SOCAL EIS (Navy 2008). Step-by-step instructions for marine mammal monitoring during Navy exercises is located in the Final BO (NMFS 2009).

The Navy also developed a SOCAL Monitoring Plan to monitor sea turtles. The plan is in support of the Final BO and LOA on the Navy's Training in the SOCAL Range Complex. Through the plan, aerial, vessel, and shore-based surveys are conducted to provide sea turtle monitoring as required under the ESA. For a description of the monitoring protocols see the SOCAL Monitoring Plan (Navy 2009c).

Assessment of Resource Management

- Measures to protect sea turtles in the nearshore waters of SCI is properly addressed in the most current NMFS Programmatic BO on Navy activities in the SOCAL Range Complex. Compliance with these measures will help to ensure uninterrupted continuation of the military mission on SCI.
- Since sea turtle sightings occur on a very infrequent basis at SCI, it is difficult for natural resources managers to manage this species aside from the reporting of sightings to NMFS.
- SCI NRO should integrate the importance of reporting sightings into current educational material of on-island personnel.

Management Strategy

Objective: *Assess and sustain sea turtle populations to identify their distribution and frequency in SCI waters and conserve associated habitat to maintain viable populations and minimize conflicts with military operations and activities.*

I. Follow mitigation measures as follows in NMFS Final Programmatic BO on Navy activities in the SOCAL Range Complex.

  A. Survey for sea turtles before, during, and after conducting exercises.

II. Continue to monitor sea turtle populations around SCI in according to the Navy's LOAs associated with activities in the SOCAL Range Complex.

III. Encourage on-island personnel to report sea turtle sightings to the NRO office through education and outreach material.

IV. Report all sea turtle sightings to the Southwest Fisheries Science Center, include species, if possible, and area of siting.

V. Track long-term movements of green sea turtles and leatherback turtles in nearshore waters of SCI to determine usage.

3.9.3.14 Marine Mammals (Order Cetacea and Family Mustelidae and Pinnipedia)

Cetaceans

Cetacean species are known to occur or potentially known to occur within the SCI footprint while migrating to and from breeding and feeding areas. There are six federally-listed cetacean species with the potential to occur within the SCI management footprint: blue whale, fin whale, humpback whale, North Pacific right whale, sei whale (*Balaenoptera borealis*), and sperm whale.

Blue Whale (Balaenoptera musculus)

The blue whale was listed as endangered on 02 December 1970 (35 FR 18319). They are the largest animal in the world, measuring at about 88 feet (27 m) in the northern hemisphere (NMFS 2012a). They have long and slender bodies with various shades of bluish-grey above and lighter beneath. The blue whale is a baleen whale, filter feeding on small crustaceans known as krill. Many of the life history characteristics of blue whales are still unknown. Most reproductive activity occurs during the winter. The North Pacific population of blue whales occurs from Kamchatka to southern Japan in the west, and from the

Gulf of Alaska and California south to at least Costa Rica in the east. Individuals are found primarily south of the Aleutian Islands and Bering Sea. The primary threats currently facing blue whales are vessel strikes and fishery interactions.

Fin Whale (Balaenoptera physalus)

The fin whale, listed as endangered on 02 December 1970 (35 FR 18319), is the second-largest species of whale with a maximum length of about 75 feet (22 m) in the northern hemisphere (NMFS 2012b). Fin whales have a sleek, streamlined body with a v-shaped head. The species' back and sides are black or dark brownish-gray, and the underside is white. During the summer, fin whales filter feed on krill and squid. Little is known about the social and mating behavior of fin whales. Threats to the species include: vessel collisions, entanglement in fishing gear, reduced prey abundance due to overfishing, habitat degradation, and disturbance from low-frequency noise.

Humpback Whale (Megaptera novaengiliae)

The humpback whale was listed as endangered on 02 December 1970 (35 FR 18319). Humpback whales are a baleen whale and can reach lengths of up to 60 feet (18 m) (NMFS 2012c). Their body coloration is primarily dark grey, but individuals have a variable amount of white on the pectoral fins and belly. In the summer, humpback whales are found in high latitude feeding grounds in Alaska. They filter feed on crustaceans, plankton, and small fish. During the winter months, individuals will congregate for mating activities. Humpback whales travel long distances during their seasonal migration; the longest of any other mammal. Current threats to the species include: entanglement in fishing gear, ship strikes, whale watch harassment, habitat impacts, and proposed harvest.

North Pacific Right Whale (Eubalaena japonica)

The North Pacific right whale is a State Fully Protected species (Fish and Game Code § 4700) and was listed as endangered on 02 December 1970 (35 FR 18319). Right whales are large baleen whales, measuring between 45 and 55 feet (13 and 16 m) (NMFS 2012d). The right whale has a stocky body, generally black in coloration, with no dorsal fin, a large head (about ¼ of the body length), strongly bowed margin of the lower jaw, and callosities (raised patches of roughened skin) on the head. They feed primarily on copepods, euphausiids, and cyprids from spring to fall. Unlike most baleen whales, which are filter feeders, right whales are skimmers. Right whales are rarely observed due to their low population numbers. Known threats include ship strikes and entanglement in fishing gear.

Sei Whale (Balaenoptera borealis)

The sei whale, listed as endangered on 02 December 1970 (35 FR 18319), is a member of the baleen whale family. They can reach lengths of about 40 to 60 feet (12 to 18 m) (NMFS 2012e). Sei whales have long, sleek bodies that are dark bluish-gray to black and pale below. They are usually observed alone or in small groups, but are occasionally found in larger (30-50) loose aggregations. Sei whales feed on copepods, krill, small schooling fish, and cephalopods. Current threats to the species include ship strikes and interactions with fishing gear.

Sperm Whale (Physeter macrocephalus)

The sperm whale was listed as endangered on 02 December 1970 (35 FR 18319). Sperm whales are the largest toothed whale. They feed on large squid, sharks, skates, and fishes (NMFS 2012f). Sperm whales are sexually dimorphic, with females at 36 feet (11 m) and males reaching 52 feet (16 m). The sperm whale is distinguished by its extremely large head, which is about 25 to 35% of its body length. They are mostly dark gray, but some whales have white patches on their belly. Sperm whales spend most of their time in deep water. Current threats to the species include: ship strikes, entanglements in fishing gear, disturbance by anthropogenic noise, and accumulation of pollutants in body tissues.

For detailed information on each of the above species, see the SOCAL EIS (Navy 2008) and/or the Hawaii-Southern California Training and Testing Activities EIS (Navy 2012).

The Navy conducted marine mammal surveys in the SCB between October 2008 and April 2012 (Smultea and Bacon 2012), as required by NMFS under the MMPA and ESA (for more details Section 3.9.2.8 Marine Mammals). For the warm-water season in 2008 through 2012, the estimated average number of individuals present was 317 fin whales, 41 blue whales, and 18 humpback whales. During the cold-water season, the estimated averages were 246 fin whales, and 50 humpback whales. Blue whales were not observed during the cold-water season. There were not enough sperm whale sightings (n=1) to estimate numbers present, and there were no sightings of the North Pacific right whale and sei whale. See Smultea and Bacon (2012) for more information on cetacean presence in the SCB during 2008 and 2012. For details on cetacean movement and potential presence in nearshore waters of SCI, see Section 3.9.2.8 Marine Mammals.

Steller Sea Lion (*Eumetipias jubatus*)

The Steller sea lion is the largest member of the Otariid family (eared seals). The eastern stock is listed as threatened under the ESA (55 FR 49204); however, the NMFS published a proposed rule to delist the stock based on recovery on 18 April 2012 (77 FR 23209). They exhibit extreme sexual dimorphism with adult males 10 to 11 feet (3 to 3.4 m) in length and 2,500 lbs (1,120 kg) and adult females 7.5 to 9.5 feet (2.5 to 3 m) in length and 770 lbs (350 kg). The coats of adult females and males are light blonde to reddish brown. There are two stocks of Steller sea lions: the eastern and western. The western stock includes individuals that reside in the central and western Gulf of Alaska and along the Aleutian Islands. The eastern stock is distributed from southeast Alaska along the coast to California.

Steller sea lions are capable of traveling long distances in a season and can dive to approximately 1,300 feet (400 m) in depth (NMFS 2012g). Males have a higher tendency to disperse from rookery and haul out sites since they lack the responsibility of taking care of a pup. They prefer the colder temperate waters of the Pacific Ocean. Steller sea lions breed in rookeries, similar to other members of the Otariid family, where males establish and defend territories to mate with females. Males establish territories as early as May and females will haul out on rookeries beginning in June. Territories will start to break down in early August after all pups are born.

There has not been a sighting of a Steller sea lion on SCI since the 1920s (M. Lowry, pers. com. 2011). Contrary to the western stock, the eastern stock has observed an overall decline. The eastern United States stock is increasing throughout the northern portion of its range (Southeast Alaska and British Columbia), and is stable or increasing slowly in the central (Oregon through central California). In the southern end of its range (Channel Islands), it has declined considerably since the late 1930s, and several rookeries and haul outs have been abandoned. Oceanographic changes, particularly increasing sea surface temperatures, may be factors that have favored California sea lions (NMFS 2008b). Current threats to Steller sea lions include: fishery interactions, illegal shooting, and salmon farming interactions (NMFS 2008b).

Guadalupe Fur Seal (*Arctocephalus townsendi*)

The Guadalupe fur seal is a State Fully Protected species (Fish and Game Code § 4700) and were listed as threatened under the ESA in 1985 (50 FR 51252). They are non-migratory pinnipeds and exhibit sexual dimorphism, with males reaching an average of 7 feet (2 m) and weighing about 400 lbs (180 kg) while females are much smaller at 5 feet (1.5 m) and 110 lbs (50 kg), respectively. Their coloration is dark brown to black with adult males having tan or yellow hairs on the back of their mane. Guadalupe fur seals are solitary, non-social animals. Guadalupe fur seals can be found from lower Baja California, Mexico to Washington State.

Males form small territories during the breeding season from June through August. Males are polygamous and may mate with several females in one breeding season. Guadalupe fur seals pup and breed, mainly at Guadalupe Island, Mexico. In 1997, a second rookery was discovered at east Benito Island, Mexico (Maravilla-Chavez and Lowry 1999) and a pup was born at San Miguel Island, California (Melin and DeLong 1999). When ashore during the breeding season, Guadalupe fur seals favor rocky habitats near the water's edge and caves at windier sections of coastlines (Reeves 2002).

The Guadalupe fur seal has rarely been sighted at SCI in recent years (1975, 1991, 1997). Several sightings of a male Guadalupe fur seal were made on SCI beginning in July 1991 near Mail Point. This fur seal (if it is the same individual) has not been sighted since the onset of the 1997-1998 El Niño event (J. Carretta and M. Lowry, pers. com. 2002).

Commercial sealing during the 19th century reduced the once abundant Guadalupe fur seal to near extinction in 1894 (Townsend 1931). However, the population is currently growing at approximately 13.7% per year (NMFS 2000).

The state of California lists the Guadalupe fur seal as a fully protected mammal in the Fish and Game Code of California (Chap. 8, § 4700, d.), and it is listed as a threatened species in the Fish and Game Commission California Code of Regulations (Title 14, § 670.5, b, 6, H). The Guadalupe fur seal is also listed as a threatened species under the ESA. Current threats to Guadalupe fur seals include entanglement in fishing gear and potential death from injuries sustained from fishing gear (Hanni et al. 1997).

Current Management

The NMFS ESA Section 7 Consultation Programmatic Final BO provides measures to avoid and minimize impacts to marine mammals from Navy training and operations. These measures are implemented to prevent marine mammals from being exposed to potentially harmful levels of active sonar and underwater donations. The Navy also developed a monitoring plan and currently surveys for marine mammals in the SCB through their SOCAL monitoring program in accordance with the Navy's LOA (See Section 3.9.2.8 Marine Mammals). Marine mammal surveys are conducted along pre-determined aerial survey track lines and include waters within the SCI management footprint.

Measures are take during military operations to avoid disturbing pinnipeds. Prior to helicopter training exercises, aircrews are briefed by SCORE and told to avoid flying over Mail Point and Seal Cove, which are population pinniped haul out locations.

Additional management of the Steller sea lion and Guadalupe fur seal at SCI also occurs through surveys conducted of other more common pinniped species. NMFS completes annual pinniped surveys to monitor the California sea lion, harbor seal, and northern elephant seal; these surveys could capture incidental presence of Steller sea lions and Guadalupe fur seals.

Assessment of Resource Management

- Measures to protect marine mammals in the nearshore waters of SCI are properly addressed in the most current NMFS Programmatic BO on Navy activities in the SOCAL Range Complex. Implementation of these measures on the island will sustain current populations of marine mammals utilizing habitats within the SCI footprint.
- Marine mammal surveys in the SCB increase the Navy’s understanding of presence and abundance of marine mammals within the SCI footprint. This information will help to avoid and minimize impacts to threatened and endangered species.
- Although the Steller sea lion and Guadalupe fur seal are rare on SCI, monitoring and management for other more populous pinnipeds and marine mammals could capture incidental presence.

Management Strategy

Objective: *Continue to assess marine mammal populations to capture their potential presence on SCI and in nearshore waters and conserve occupied habitat to maintain current viable populations.*

I. Continue to support annual pinniped surveys conducted by NMFS.

II. Comply with mitigation measures of the NMFS Final Programmatic BO on Navy activities in the SOCAL Range Complex.

III. Continue to monitor marine mammals populations around SCI according to the Navy's LOAs associated with training activities in the SOCAL Range Complex.

3.9.4 Other Special Status Species

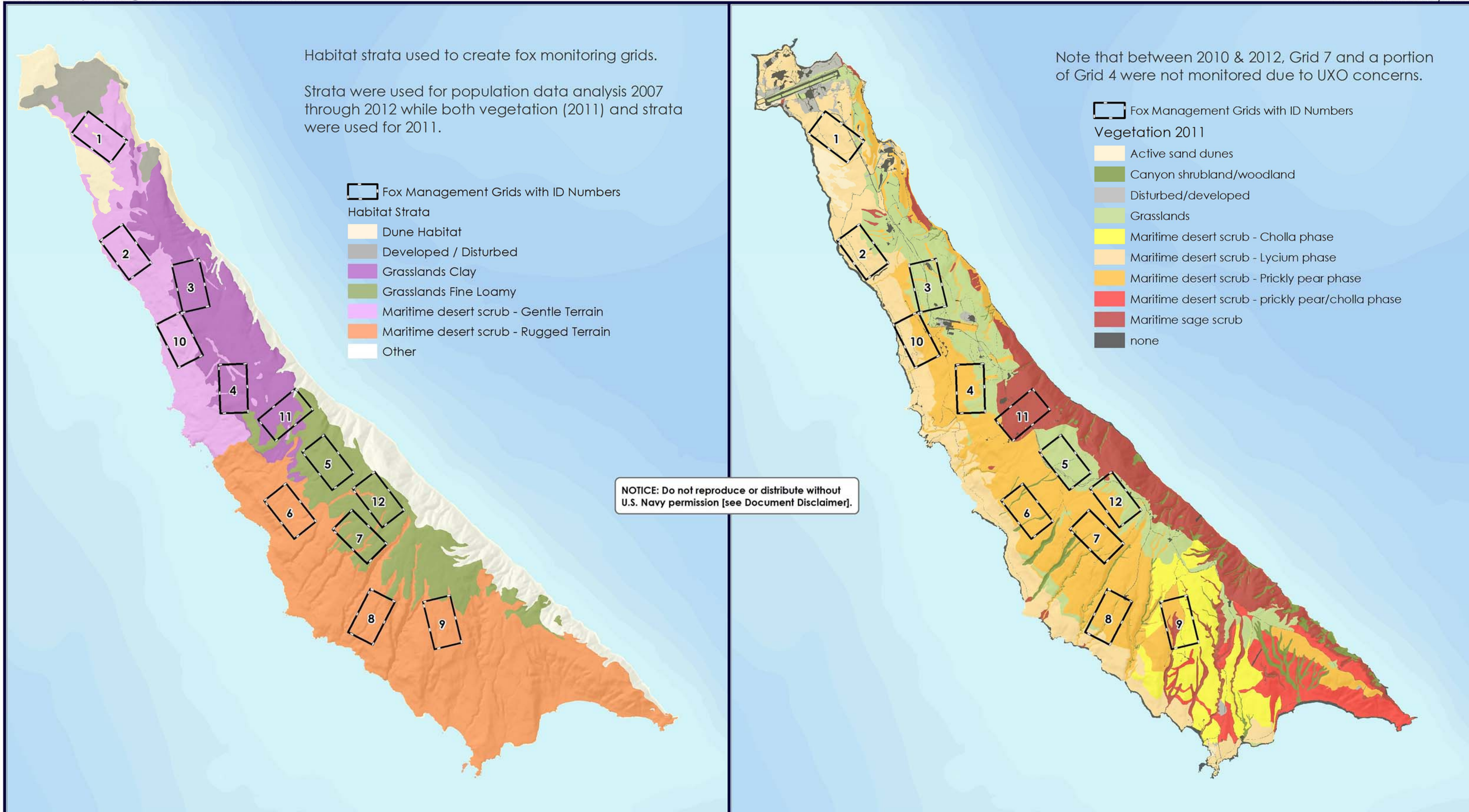
3.9.4.1 San Clemente Island Fox (*Urocyon littoralis clementae*)

The San Clemente island fox (Photo 3-58), a small canid endemic to California’s Channel Islands, is approximately 25% smaller than its mainland relative, the gray fox (*Urocyon cinereoargenteus*). Six subspecies are recognized, each limited to a single island. The species is listed as threatened under the California Endangered Species Act; the subspecies occurring on Santa Catalina, Santa Cruz, Santa Rosa, and San Miguel Islands are listed as endangered under the ESA (USFWS 2004). In January 2003 the Navy entered into a Conservation Agreement (CA) with the USFWS to identify and implement proactive measures for the San Clemente island fox with the intent of avoiding population declines, which might lead to federal listing under the ESA (USFWS 2003a). To date, the CA has proven successful; the San Clemente island fox is not federally-listed.

Photo 3-58. San Clemente island fox juvenile on the west shore of San Clemente Island (Navy 2012).

While populations on many islands suffered drastic declines, prior to listing, the population on SCI declined more gradually (USFWS 2004). Most recent estimates, using mark-recapture methods, estimate total SCI population size between 981 to 1,274 foxes (Garcia and Associates 2011). Previous studies found higher fox densities in boxthorn habitat (Vissman 2004); however, in recent years, grasslands, particularly in clay substrates, support the highest density of foxes (Garcia and Associates 2011). Dune habitats were not specifically sampled until 2011-2012. The 2011-2012 results revealed very high fox densities (29.08 [26.77–35.43] foxes/km^2) in dune habitats (Gregory et al. 2012). Apparent annual survival of foxes from 2007 to 2010 was high; apparent survival of pups was 48–72% and survival of adults was 76–84% (Garcia and Associates 2011). True survival and cause specific mortality was assessed through radio-telemetry studies, which found that a random sample of foxes on SCI had a high rate of annual survival (0.90). Foxes with home ranges that encompassed a primary road had a lower annual survival rate (0.76) than foxes with home ranges that did not encompass primary roads (0.97) and about 23% of foxes that lived near roads were killed by collision with vehicles, representing the main cause of mortality (Snow et al 2012). See Map 3-31 for the fox monitoring grids at SCI.

The island fox is primarily nocturnal, with most activity occurring in the early morning and before sunset. Island foxes are also active during daylight hours, which may lead to increased predation risk compared to other mammals (Coonan et al. 2005). Foxes were more likely to utilize urban areas at night (Hamblen et al. 2011). Annual home ranges of foxes averaged 0.79 km^2 with home ranges of females averaging larger than males; annual and seasonal home ranges were 77% larger for foxes near roads (Resnik 2012).



San Clemente Island Fox Monitoring Grids on San Clemente Island

Integrated Natural Resources Management Plan, NALF San Clemente Island

N W E S

0 0.5 1 2 3 4 5 6 7 8 9 10 Miles

0 0.5 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 Kilometers

Map 3-31. San Clemente Island fox monitoring grids on San Clemente Island.

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Pair bonding typically starts in January with breeding occurring from late February through March; pups are born from late April through May (Moore and Collins 1995). During a recent study, earlier observations of pregnant and lactating females have occurred (Hamblen et al. 2011). There is some evidence that foxes that spent more time in urban areas were more likely to reproduce than those that utilized urban areas less frequently, although urban foxes also frequently selected den sites near roads, which may increase their risk of mortality (Gould and Andelt 2011). Foxes frequently use canyons, drainages, and rock piles as den sites, particularly in areas with westerly-facing aspects and slopes of 15–20 degrees (Gould and Andelt 2011).

Although the fox can be found in a variety of habitat types on the island, it prefers areas with burrows, dense shrubs, and rocky areas for protective cover. Additionally, it prefers areas with a relatively complex vegetation layer composed of woody, perennial, and fruiting shrubs. An opportunistic omnivore, the island fox feeds on a variety of fruits, rodents, birds, invertebrates, and carrion (Laughrin 1977; Cypher et al. 2011). Foxes display seasonal dietary preferences with deer mice, beetles and beetle larvae being important components of the diet across all seasons (Cypher et al. 2011). Feral cat and island fox diets have a high degree of overlap (Phillips et al. 2007) and competition for food between the two species may have led to declines in the fox population (USFWS 1984). More importantly, habitat degradation on the island from overgrazing by feral goats may have contributed to the decline of foxes on SCI.

Efforts to protect and recover the San Clemente loggerhead shrike between 1999 and 2002 may have affected the San Clemente island fox population through both direct (killing of foxes) and indirect (ingestion of rodenticide, starvation of pups) effects (Roemer and Wayne 2003; Garcia and Associates 2011). Euthanasia of foxes occurred only in 1999; however, foxes were held in captivity during the shrike breeding season in 2000 and 2001 (Roemer and Wayne 2003). In the late 1990s, shock collars were used to discourage foxes from shrike nest locations, without removing the foxes from their territories (M. Booker, pers. com. 2011). Beginning in 2003, the Navy, with support from USFWS, discontinued all manipulation of foxes (M. Booker, pers. com. 2011). At the same time as fox manipulations occurred, SCI experienced drought conditions, which may have contributed to the population's decline.

Collisions with vehicles are a concern for this subspecies (Photo 3-59). A minimum of 68 roadkills were documented in 2010 in the island-wide fox mortality database maintained by the IWS; results from the same database document an average of 45 foxes killed per year from vehicle collisions between 2008 and 2010 (IWS, unpubl. data). This represents an increase in numbers over previous years; however, this may be attributable to the increase in population size. Prior estimates indicate a 3–8% mortality rate due to vehicle collisions for the population (Snow et al. 2012); numbers for 2010 fall within the same range. There was no clear relationship between the number of foxes in an area and their proximity to roads (Garcia and Associates 2011).

Disease and predation have not had a significant impact on San Clemente island fox, but are considered major threats due to impacts to other island fox subspecies that highlight vulnerabilities species-wide. Predation by golden eagles (Roemer et al. 2001) and disease (Timm et al. 2009) have been implicated in the population declines of island foxes on other Channel Islands. Golden eagles are not present on SCI.

Photo 3-59. Signs are posted around San Clemente Island to encourage awareness of island fox presence (Navy 2012).

Current Management

Table 3-44. Conservation measures for San Clemente island fox.

Conservation Measure AVMC-M-8. The Navy will enforce the existing 35 mph speed limit on Ridge Road. The Navy will post signs, continue public awareness programs; mow roadside vegetation; and monitor roadways for kills of protected or conservation agreement species, including San Clemente loggerhead shrike, San Clemente sage sparrow, and San Clemente island fox.
Provide fox monitoring reports and reports of Veterinary & Pathology Services work to USFWS and CDFW on an annual basis.
The DoD shall, to the best of its ability, implement conservation and management efforts to further the conservation of state-listed species when such action is practicable and does not conflict with legal authority, military mission, or operational capabilities (DoDINST 4715.03).

Monitoring of the fox population under the current sampling plan has occurred annually, since 2007, by trapping foxes in 12 predefined grids over a variety of habitats. In 2010 one of the grids could not be trapped and another had a smaller number of traps placed, due to UXO concerns in the vicinity. The objectives of this project were to monitor the population, assess road effects, and track trends as well as identify important areas considered important fox habitat. A project is underway to analyze cumulative trapping results from 2007 to 2011 and to investigate less field-intensive methods for future monitoring. In addition to annual monitoring, the Navy implemented a number of measures to address the primary causes or potential causes of mortality in this population. Many of the measures are identified in the CA (USFWS 2003a), which the Navy and USFWS are currently working together to update (M. Booker, pers. com. 2011).

The Navy has funded a substantial amount of research on fox ecology. One recently completed project on fox denning behavior found that foxes selected areas with 15–20 degree slopes and primarily westerly-facing aspects for denning sites, and most (61%) of the observed dens were between Wilson Cove and the airfield (Gould and Andelt 2011). These findings could lead to better avoidance planning in the future for facilities and maneuvers.

Currently, death due to vehicle collisions represents the highest source of known mortality in the fox population. However, mortality levels have not risen above 3–8% of the population and survivorship remains high. Mitigation measures identified in the 2003 CA to reduce vehicle-related mortality have been implemented, including reducing the speed limit from 45 mph (72.4 kph) to 35 mph (56.3 kph). Regular mowing of road shoulders has increased fox visibility to motorists. A study examining road characteristics influencing vehicle collisions found a correlation between reduced visibility of the road and increased vehicle collisions (Snow et al. 2012); curves were found to be the most common factor reducing visibility. To help increase visibility, the Navy is continuing the practice of mowing vegetation on road segments where the Navy's mortality database reveals high incidence of road kills, including San Clemente Ridge Road, from Naval Auxiliary Landing Field to the SHOBA gate, and Perimeter Road around Naval Auxiliary Landing Field. In 2010 and 2011, respectively, 108 miles (173.8 km) and 80.1 miles (128.9 km) of road shoulders were mowed. In addition, the Navy installed signage and painted warnings on roads to alert motorists to fox presence (Photo 3-59). The Navy also installed posters in high human traffic areas, such as the air terminal, to heighten awareness of foxes on the island and to instruct people how to avoid hitting them on roadways. Lastly, the Navy provides fox handouts on the island encouraging drivers to “Give Foxes a Brake.”

In addition, foxes have been known to become entrapped and die within a variety of structures at SCI, including airfield arresting gear boxes, open trash containers, unattended camo netting, drains, and other sunken structures of unknown origin/purpose. NRO, in conjunction with various SCI entities, has worked to identify and remediate such fox hazards to reduce future impacts to the fox population. Of particular note are the drains between the runways at the SCI airfield. A number of these drains are covered with chain link fence cages of approximately 2 feet (0.61 m) in height. Presumably these were installed in the past to prevent foxes from falling through the drain grids that are too wide to preclude foxes. At the time of writing, these standing cages have been deemed an airfield safety hazard, slated for removal, but a suitable cover, flush to the ground, will replace them to ensure continued fox protection.

The Navy recently implemented an ambassador program after an emaciated and injured pup required surgery and was not a good candidate for release into the wild following medical treatment. The fox, Waynuk, currently lives at the NRO, where used in outreach activities, meeting island visitors and residents in reference to education about island foxes and the importance of their conservation. In addition, a veterinary hospital (“foxpital”) is operated to care for sick and injured foxes and a database of documented mortalities is maintained.

The Navy has also signed a Cooperative Research Agreement with the Santa Barbara Zoo supporting the transfer of a limited number of San Clemente island foxes to the zoo. This partnership supports conservation of the island fox species as a whole through educational outreach and research opportunities that can only be realized in a captive setting. However, policy issues at CDFW currently limit the Navy's ability to transfer additional foxes to Santa Barbara Zoo and preclude the breeding of transferred animals. Additional partnering work is necessary to alleviate this hindrance to establishment of a mainland/zoo population that can support island fox conservation and recovery research and environmental education.

Epidemic outbreaks pose a serious threat to isolated populations, evidenced by the drastic decline of the Santa Catalina island fox population during an outbreak of canine distemper virus (Timm et al. 2009). One study suggested that the lack of canine distemper virus antibodies in young foxes on SCI may indicate young foxes are not exposed to the virus and a larger portion of the population is susceptible to an outbreak (Clifford et al. 2006). As a precaution, foxes captured as part of a vaccination program, annual fox population monitoring, or accidental capture as part of non-native predator control have been inoculated with a canine distemper and rabies vaccine. In 2009, 94 foxes were vaccinated and in 2011, 48 foxes received an initial vaccination while 16 received a booster. The Navy funded a study in 2011 to investigate vaccination methods and their effectiveness at controlling disease spread of canine distemper and rabies virus (Sanchez and Hudgens 2011). The study proposed random vaccination of foxes, rather than a firewall-type pattern, across the island to minimize the potential for a catastrophic outbreak of either disease. An Epidemic Response Plan was approved in 2011 outlining a multi-tiered methodology for detecting and responding to rapid changes in the fox population (Hudgens et al. 2011).

Assessment of Resource Management

- The 2010 population estimates were the highest since monitoring began indicating that management of the island fox has been effective in conserving this population.
- Monitoring from 2007 through 2012 has effectively tracked an increasing population trend that has allowed the Navy to analyze options for reduced monitoring in the future.
- The Navy has taken steps to minimize the largest known source of mortality (roadkill) by utilizing a wide range of methods to inform residents and visitors of the risk of vehicle collision with foxes.
- Through cooperative research agreements, completed in recent years, a better understanding of fox ecology has been gained, which informs future management with recommendations to protect the fox population, while allowing for expanding military usage of SCI.
- Research results from projects conducted by Colorado State University have been effectively used to guide management, including initiation of roadside mowing and creation of road signage, a DVD, and pamphlets educating personnel about foxes (Hamblen et al. 2011).
- Waynuk, the captive fox on SCI at the NRO, appears to serve as an effective outreach and educational ambassador.
- The Navy has proactively managed the island fox to protect the population and its habitat.
- The Navy is a member of the Island Fox Working Group, a partnership comprised of federal and state regulators, the Navy, non-government organizations, and the National Park Service, bringing together natural resource managers from each of the Channel Islands with foxes to work in collaboration to conserve island foxes.

Management Strategy

Objective: *Conserve and monitor population to avoid a significant disease impact and potential federal listing of this subspecies.*

I. Continue implementing measures to conserve the island fox population and support ecosystem balance.

- ***A.*** Continue annual monitoring of the population.
- ***B.*** Enforce the existing 35 mph (56.3 kph) speed limit on Ridge Road and post additional signs, as needed, to increase public awareness of foxes near roads.
- ***C.*** Maintain and analyze data in the fox mortality database documenting known causes of fox mortality on SCI.
- ***D.*** As funding allows, mow vegetation along roadsides when it exceeds 4.5 inches (12 cm) in height (average chest height of an island fox; Snow et al. 2011) to improve the visibility of foxes near roads.
- ***E.*** Continue to restrict dogs from SCI, except military working dogs in compliance with the Military Working Dog Policy (SCI Instruction 5585.2).
- ***F.*** All future construction and training on SCI should take steps to prevent fox entrapment in temporary or permanent structures. Any hazards identified should be reported to NRO for review and remedy as needed.

II. Improve resident awareness of the island fox and its importance using a survey of island residents as to education; evaluate existing attitudes regarding foxes. Based on survey results, implement a training program and evaluate its effectiveness in increasing knowledge and concern towards the fox.

III. Implement the Epidemic Response Plan and randomly vaccinate foxes across the island to the extent feasible to minimize the likelihood of a catastrophic disease outbreak.

IV. Continue the sentinel fox monitoring program that was implemented in 2012 for early detection of epidemic disease outbreaks or other significant mortality threats to allow for rapid response to population level threats.

V. Transfer a small number of foxes to Santa Barbara Zoo to be used for educational and research purposes and to provide a genetic reservoir for the sub-species.

VI. Work with CDFW to support delisting of the San Clemente island fox subspecies as current population numbers and Navy conservation indicate that state listing may no longer be warranted.

3.9.4.2 Southern Sea Otter (*Enhydra lutris nereis*)—California Stock and Experimental Population (South of Point Conception)

The population of southern sea otters, a State Fully Protected species (Fish and Game Code § 4700), historically ranged from northern California or southern Oregon to approximately Punta Abreojos, Baja California (Wilson et al. 1991). Harvests of sea otters in the 18th and 19th centuries nearly exterminated the species (Orr and Helm 1989) leading to their listing of threatened under the ESA on 14 January 1977 (42 FR 2965). Currently the southern sea otter's primary range is restricted to the coastal area of central California, from Half Moon Bay to Gaviota, located just south of Point Conception (Orr and Helm 1989), plus a small translocated population (currently about 46 animals) around SNI (USFWS 2011).

Sea otters prefer rocky shorelines with kelp beds and water depths of about 66 feet (20 m) deep (USFWS 2003b). Most sea otters in California tend to be active at night and rest in the middle of the day (Loughlin 1979; Garshelis 1983), but there is extensive variation in the activity of individuals, both among and within age and sex classes (Ralls and Siniff 1990).

Sea otters feed on or near the bottom of shallow waters, often on benthic invertebrates in kelp beds. However, individual sea otters exhibit differences in prey choice, method of tool use, forage area, and water depth (Riedman and Estes 1990; Estes et al. 2003b). Sea otters spend a majority of time foraging to meet metabolic needs, diving to the bottom to collect crabs, clams, urchins, and mussels, returning to the surface to open and consume prey. Tinker et al. (2007) collected dive and forage data through time-depth recorders on otters in California. Their data found that 36–52% of time was spent at the surface between dives, depending on the size and type of prey being consumed. Sea otters, in California, typically forage in waters with a bottom depth less than 82 feet (25 m), though individuals have been sighted foraging in waters as deep as 118 feet (36 m) (Riedman and Estes 1990; Ralls et al. 1995).

Sea otters breed throughout their range, most births in California occur from late February to early April (USFWS 2003b). Long-term records from marked individuals established that most adult females give birth to a single pup each year (Siniff and Ralls 1991; Jameson and Johnson 1993). Females attain sexual maturity after three years; however, weaning success by primiparous females (females with their first litters) is relatively low (Riedman et al. 1994; Monson et al. 2000). The age of sexual maturity in males is less well known but appears to be about five years (USFWS 2003b).

Acanthocephalan parasites (worms) in the intestines, *Toxoplasma gondii encephalitis* (single cell parasite), and shark attacks are the main cause of mortality for sea otters (Kreuder et al. 2003), likely responsible for slow growth and periods of decline in the sea otter population (Estes et al. 2003a). Currently, population counts indicate that the southern sea otter population is in a period of decline (USGS Western Ecological Research Center 2010). The 2010 spring survey recorded a 2.4% increase from the 2009 count, but 1.5% lower than the 2008 count and 11.6% lower than 2007 (USGS Western Ecological Research Center 2010). Scientists have long noted that population growth for the southern sea otter is somewhat stagnant since the population has never experienced a growth rate increase of more than 5% (USFWS 2003b).

The southern sea otter is rarely observed at SCI, no breeding activity has been observed near the island. Individuals with potential to occur around the island are most likely subadult males, as younger males are known to make long-distance movements (Tinker et al. 2008). During the NMFS 1998 and 1999 aerial surveys, three otters were observed on the west coast of the island (Carretta et al. 2000). However, abundance was not estimated, due to an insufficient number of sightings (n=3) (Carretta et al. 2000). Since the implementation of the Navy's marine mammal monitoring program in 2008, no sighting of sea otters have been documented at SCI (Navy 2009b, 2010, 2011).

In addition to the translocated otters to SNI in 1987, the USFWS designated a *no-otter* zone south of Point Conception (except SNI), where otters found would be moved back to SNI or central California. Although this management strategy is still in place, otters have not been removed from the *no-otter* zone since 1993 (USFWS 2011).

In 2011, the USFWS published a revised Draft Supplemental EIS regarding the translocation of southern sea otters (including the *no-otter* zone) in which the impacts of alternatives to the current translocation program, including termination of the program or revisions to it, were evaluated. The Draft Supplemental EIS includes considerable discussion of the forecasted range expansion of southern sea otters if the translocation program were terminated. The expansion model predicts over ten years approximately 73–299 independent sea otters will expand their range along the mainland south of Point Conception between Carpinteria and Oxnard (Map 3-32).

The simulation model used in the Supplemental Environmental Impact Statement does not include predictions of whether or when sea otter range expansion to the Channel Islands will occur, due to a lack of data in island dispersal rates. Although it is conceivable that range expansion to the northern Channel Islands could begin in the short term, several factors suggest that this scenario is not likely. Tinker et al. (2008) demonstrated that range expansion rates south of Point Conception are driven primarily by female dispersal and survival. Although male sea otters are known to make long-distance movements, female sea otters (particularly reproductive-age females) exhibit much greater site fidelity and are less likely to make long distance movements (Tinker et al. 2006). Because population growth and subsequent re-colonization of unoccupied habitat requires the presence of reproductive females, range expansion to the islands is limited by female movement patterns. If recolonization occurs, it is expected to occur gradually over the course of many decades.

Map 3-32. Coastal area projected to be affected by sea otter range expansion within the ten-year time horizon (Navy 2011).

Although the recolonization of sea otters at SCI is unlikely in the foreseeable future, if a persistent population does inhabit SCI, management efforts would be put into place to comply with the MMPA and ESA. Additionally, an official amendment to the sea otter management section will be made to capture those required efforts.

3.9.4.3 Special Status Plant Species

SCI supports numerous species that are endemic to SCI or the Channel Islands. These species are recognized by authorities, such as the CNPS, as sensitive. Table 3-45 lists species, occurring within the action area on SCI, that have been recognized by the CNPS as rare or endangered in California and elsewhere (CNPS List 1B species).

Table 3-45. Sensitive plant species known or with potential to occur on San Clemente Island (Junak and Wilken 1998; Junak 2006, 2010; Soil Ecology and Restoration Group 2012).

Species Name	Sensitivity Status	Plant Communities	Status Trend	Distribution and SCI Localities/ Abundance
Aphanisma (*Aphanisma blitoides*)	CNPS Rank 1B.2	Maritime cactus scrub around the perimeter of the island, mostly at elevations between 33 and 650 feet (10-40 m). Occurs near coastline, on flats immediately inland from beach.	Increasing	Coastal California and Baja California, Mexico, including several of the California Channel Islands and islands off Baja California. On SCI, documented from between China Point and China Cove, Seal Cove, North Head, Whale Point, between "Spray" and Eel Point, and between Randall and Chamish Canyons. SCI estimated population: 175 occurrences with 31,400 individuals.
San Clemente Island milkvetch (*Astragalus nevinii*)	CNPS Rank 1B.2	Stabilized dunes and coastal flats between 33 and 650 feet (10-70 m) in elevation. A few populations found in caliche soils on the east side of the island at elevations up to 394 feet (120 m) (Junak and Wilken 1998).	Increasing	SCI Endemic Documented from several locations at the north end of the island (e.g., Sand Dunes area, the vicinity of the airfield and southward to Chamish Canyon), also at point south of Eel Cove on the west shore and Horse Beach Canyon on the southern end of the island. SCI estimated population: 205 occurrences with 36,100 individuals.
Coulter's saltbush (*Atriplex coulteri*)	CNPS Rank 1B.2	Coastal bluff scrub, coastal dunes, coastal scrub, grasslands (CNPS 2008).	Stable	Known from several California Channel Islands and adjacent mainland, including Baja California, Mexico. Few recent sightings. Found on Whale, Pyramid and Graduation points, West Side between Tombstone and Norton Canyons, especially on upland trails and eroded areas. 22 locations, ca. 100 plants.
south coast saltscale (*Atriplex pacifica*)	CNPS Rank 1B.2	Coastal flats and bluffs, open slopes and ridge tops. Gentle slopes or flats with south exposures at elevations between 49 and 1,476 feet (15–450 m).	Increasing	Known from California Channel Islands except San Miguel Island and on adjacent mainland from Ventura County southward into northern Baja California, Mexico. Sonoran Desert localities in Arizona and Sonora, Mexico. Appears rare throughout range. On SCI, documented from Chukit Canyon, Box Canyon, Norton Canyon, Eel Cove Canyon, Seal Cove, Middle Ranch Canyon, Snake Cactus Canyon, and Pyramid Target and on west shore lower terraces. SCI estimated population: 153 occurrences with 700 individuals.
San Clemente Island brodiaea (*Brodiaea kinkiensis*)	CNPS Rank 1B.2	Grasslands, primarily in the central portion of the mesa between 850 and 1,854 feet (300–565 m).	Increasing	SCI Endemic Documented from Waynuk Canyon, Wall Rock Canyon, Tota Canyon, Lemon Tank Canyon, Twin Dams Canyon, Norton Canyon, flats along Horton Canyon Road, near junction of Horton Canyon and Ridge Road. Thousands of individuals were observed during spring 2003 surveys conducted for the P-493 Project. SCI estimated population: 142 occurrences with 64,015 individuals.

Table 3-45. Sensitive plant species known or with potential to occur on San Clemente Island (Junak and Wilken 1998; Junak 2006, 2010; Soil Ecology and Restoration Group 2012).

Species Name	Sensitivity Status	Plant Communities	Status Trend	Distribution and SCI Localities/ Abundance
Nevin's woolly sunflower (*Constancea nevinii*)	CNPS Rank 1B.3	Canyon woodland, sea bluff succulent scrub, maritime sage scrub.	Increasing	CI Endemic (SCI, Santa Catalina Island, and Santa Barbara Island) On SCI it is very abundant and widespread, found on canyon walls, sea bluffs, and rocks. Not mapped by Junak and Wilken (1998) or Junak (2006). No exact locality information available. SCI estimated population: abundant and widespread.
island appleblossom (*Crossosoma californicum*)	CNPS Rank 1B.2	Rocky coastal slopes, canyon walls on west side of SCI. Flats and west- and south-facing slopes at elevations between 59 and 1,345 feet (18–410 m) in maritime desert scrub.	Decreasing?	Occurs on SCI, Santa Catalina Island, Guadalupe Island, and the Palos Verdes Peninsula (Los Angeles Co.). On SCI, documented from Horse Beach Canyon, Seal Cove, Tombstone Canyon, Warren Canyon, Eel Cove Canyon, Chenetti Canyon, Wall Rock Canyon, Terrace Canyon, Bryce Canyon, China Canyon, Mail Point, West Cove, Middle Ranch Canyon, and near Camera Pad "Frank". SCI estimated population: 49 occurrences with 68 individuals. SERG found 34 locations, 72 individuals. Of those, 44 were relocated from Junak's surveys, 18 new locations. Many of Junak's are single individuals, could be natural senescence. We did find some larger populations that appear healthy, so overall population may be stable. Further surveys required.
Trask's cryptantha (*Cryptantha traskiae*)	CNPS Rank 1B.1	Primarily at the north end and along the west side of the island. Sandy coastal flats and partially stabilized sand dunes near the coast, at elevations between 33 and 230 feet (10–70 m).	Decreasing?	CI Endemic (SNI, SCI) On SCI, documented from Northwest Harbor, near BUD/S Camp, sand dunes near Flasher, between Eel Cove and Seal Cove, and China Cove. SCI estimated population: 25 occurrences with 25,800 individuals.
Thorne's royal larkspur (*Delphinium variegatum* subsp. *thornei*)	CNPS Rank 1B.1	Grassy, north-facing slopes, often near the heads of canyons of the east side of SCI, or associated ridges or swales, mostly in southern portion of SCI between 1,312 and 1,804 feet (400–550 m).	Decreasing?	SCI Endemic Documented from escarpments near Mosquito Canyon, Bryce Canyon, Eagle Canyon, and Vista Canyon, and escarpments near Camera Pad "Male." SCI estimated population: 39 occurrences with 8,659 individuals. SERG found 53 occurrences, expanding in range onto the West Side canyons, possibly stable to increasing. Further studies required to determine number of individuals
Channel Island tree poppy (*Dendromecon harfordii* subsp. *rhamnoides*)	CNPS Rank 1B.1	Chaparral, canyon woodland, maritime desert scrub, and maritime sage scrub.	Presumed to be extinct on SCI	Santa Catalina Island Endemic Historical locations on SCI are from near Northwest Harbor and some precipitous cliffs near the south end of SCI. SCI estimated population: no current occurrences known.
California dissanthelium (*Dissanthelium californicum*)	CNPS Rank 1B.2	Maritime desert scrub.	Increasing?	CI Endemic Thought to be extinct throughout its range (SCI and Santa Catalina Island) until rediscovered in March 2005 on Santa Catalina Island and in 2010 on SCI. It was not seen in surveys on SCI between 2003 and 2006. About 1.000 plants were detected in the population on 20 April 2010 in SWAT 1 (E. Howe, pers. com. 2013). The population north of the airfield was not estimated. Populations are very dependent on rainfall, and in dry years, no plants are expected to be seen. Habitat area, rather than population size, is a more important factor. The two populations located in 2010 are presumed extant, 300-2,000 individuals depending on rainfall.

Table 3-45. Sensitive plant species known or with potential to occur on San Clemente Island (Junak and Wilken 1998; Junak 2006, 2010; Soil Ecology and Restoration Group 2012).

Species Name	Sensitivity Status	Plant Communities	Status Trend	Distribution and SCI Localities/ Abundance
bright green dudleya (*Dudleya virens* subsp. *virens*)	CNPS Rank 1B.2	Coastal bluffs on steep, rocky canyon walls at elevations between 33 and 1,739 feet (10–530 m).	Increasing	SCI Endemic Documented from escarpments near Camera Pad "Male," Cave Canyon, Mosquito Cove, Burns Canyon, Middle Ranch Canyon, Bryce Canyon, Thirst Canyon, Chamish Canyon, Snake Cactus Canyon, Norton Canyon, Eagle Canyon, Knob Canyon, Lemon Tank Canyon, Wall Rock Canyon, Twin Dams Canyon, Tota Canyon, Chenetti Canyon, Vista Canyon, Waynuk Canyon, Larkspur Canyon, Chukit Canyon, Horse Beach Canyon, Horse Canyon, Box Canyon, China Canyon, and numerous unnamed escarpments and bluffs. SCI estimated population: 511 occurrences with 20,425 individuals. Junak (2006) did not quantify its occurrences in recent surveys, due to its increasing abundance and widespread distribution on SCI.
San Clemente Island buckwheat (*Eriogonum giganteum* var. *formosum*)	CNPS Rank 1B.2	Coastal slopes and flats on steep canyon walls and in canyon bottoms at elevations between 33 and 1,500 feet (10–455 m).	Increasing	SCI Endemic Documented from Eagle Canyon, Snake Cactus Canyon, Chamish Canyon, Mosquito Cove, Mosquito Canyon, China Canyon, Waynuk Canyon, Thirst Canyon, Twin Dams Canyon, Middle Ranch Canyon, Vista Canyon, Kinkipar Canyon, Matriarch Canyon, Horse Beach Canyon, Horse Canyon, Box Canyon, and Chukit Canyon. SCI estimated population: 270 occurrences with 19,870 individuals.
showy island snapdragon (*Gambelia speciosa*)	CNPS Rank 1B.2	Common on canyon walls and in woodlands.	Unknown	CI Endemic (San Clemente, Santa Catalina, and Guadalupe Islands) On SCI, documented from Knob Canyon, Tota Canyon, Warren Canyon, Eel Cove Canyon, Cave Canyon, Chukit Canyon, Box Canyon, Horton Canyon, Twin Dams Canyon, Burns Canyon, Mosquito Canyon, Chenetti Canyon, Horse Beach Canyon, China Canyon, Kinkipar Canyon, and Eel Point. Not mapped by Junak and Wilken (1998). SCI estimated population: abundant and widespread.
San Clemente Island hazardia (*Hazardia cana*)	CNPS Rank 1B.2	Steep canyon walls and in canyon bottoms on west-, north-, and east-facing exposures between elevations of 230 and 1,214 feet (70–370 m).	Stable to Increasing	CI Endemic (SCI, Guadalupe Island) On SCI, documented from Middle Ranch Canyon, Mosquito Canyon, escarpments near Camera Pad "Male," Eagle Canyon, China Canyon, Chenetti Canyon, Twin Dams Canyon, Matriarch Canyon, Cave Canyon, Bryce Canyon, Norton Canyon, Horse Canyon, Horse Beach Canyon, and Box Canyon (Junak and Wilken 1998). SCI estimated population: 153 occurrences with 5,200 individuals. Numerous juvenile plants, recorded during the 2003–2006 surveys.
pygmy linanthus (*Leptosiphon pygmaeus* subsp. *pygmaeus*)	CNPS Rank 1B.2	Grassland	Unknown	CI Endemic (SCI, Guadalupe Island) No specific locality information, but fairly frequent on SCI in purple needlegrass grasslands. SCI estimated population: abundant and widespread; no specific location data or population numbers in Junak and Wilken (1998) or Junak (2010).
San Nicolas Island lomatium (*Lomatium insulare*)	CNPS Rank 1B	Sea bluffs	Presumed extinct on SCI	CI Endemic (SCI, SNI, Guadalupe Islands)

Table 3-45. Sensitive plant species known or with potential to occur on San Clemente Island (Junak and Wilken 1998; Junak 2006, 2010; Soil Ecology and Restoration Group 2012).

Species Name	Sensitivity Status	Plant Communities	Status Trend	Distribution and SCI Localities/ Abundance
Guadalupe Island lupine (*Lupinus guadalupensis*)	CNPS Rank 1B.2	Slopes and flats in grasslands and open flats in maritime cactus scrub at elevations between 40 and 1,300 feet (12–400 m).	Increasing	CI Endemic (SCI, Guadalupe Island, Baja California, Mexico) On SCI, documented from Norton Canyon, near Eel Point, Eel Cove Canyon, Wall Rock Canyon, escarpments near Camera Pad "Male," near West Shore Road, Tota Canyon, near Camera Pad "Pebble," near Camera Pad "Bud 3," near Camera Pad "Darter," Eel Cove Canyon, Warren Canyon, near Triangulation Station "Arizona," Kinkipar Canyon, Wilson Cove, Box Canyon, Middle Ranch Canyon, coastal flats between "Spray" and Eel Point, near Camera Pad "Wing," and near Chamish Canyon. SCI estimated population: 356 occurrences with 65,902 individuals.
Santa Catalina Island desert thorn (*Lycium brevipes* var. *hassei*)	CNPS Rank 1B.1	Coastal slopes below 197 feet (60 m) in elevation.	Presumed extinct on SCI	Historic range included SCI, Santa Catalina Island, and the Palos Verdes Peninsula (Los Angeles Co.).
Santa Cruz Island ironwood (*Lyonothamnus floribundus* subsp. *aspleniifolius*)	CNPS Rank 1B.2	Steep north-facing canyon walls on the east escarpment at elevations between 984 and 1,608 feet (300–490 m). Occasionally present in canyon bottoms and on the west side of the island at elevations as low as 295 feet (90 m).	Unknown, possibly declining. Genetic studies required to determine number of individuals vs. number of clones.	CI Endemic (SCI, Santa Cruz, and Santa Rosa Islands) Reproduces vegetatively by stump sprouting so that an individual "stand" may be one genetic individual. On SCI, documented from Mosquito Canyon, Vista Canyon, Eagle Canyon, near Camera Pad "Male," Bryce Canyon, Matriarch Canyon, Thirst Canyon, Canchalagua Canyon, Horse Canyon, and near Knob Canyon. SCI estimated population: 153 occurrences with 569 individuals. Not included in Junak (2006).
island mallow (*Malva assurgentiflora*)	CNPS Rank 1B.1	Swales in northern and central portions of the island on west- and north-facing slopes between elevations of 70 and 500 feet (21–152 m). Also on stabilized and active dunes. Commonly used as a landscape plant around Wilson Cove.	Decreasing?	CI Endemic (SCI, Santa Catalina Island) On SCI, documented from near the west end of the airstrip, the south side of the airstrip, the vicinity of Flasher, and from Chamish Canyon. Survey reports from the mid-1800s suggested that it was formerly abundant and widespread, even dominant at many locations. SCI estimated population: 32 occurrences with 276 individuals. Junak's 32 occurrences include planted populations in Wilson Cove, wild populations are producing seedlings at two, not at the other 2. Extensively planted in SERG outplantings, these are well established and beginning to recruit.
Blair's wirelettuce (*Munzothamnus blairii*)	CNPS Rank 1B.2	North- and west-facing, very steep and very rocky canyon walls with little vegetative cover in the central and southern portions of SCI at elevations between 16 and 1,804 feet (5–550 m).	Unknown	SCI Endemic Documented from Middle Ranch Canyon, Twin Dams Canyon, Eagle Canyon, Tota Canyon, Burns Canyon, Bryce Canyon, Warren Canyon, Tombstone Canyon, Thirst Canyon, Mosquito Canyon, Vista Canyon, Waynuk Canyon, Horse Canyon, Mosquito Cove Canyon, and Box Canyon. SCI estimated population: 296 occurrences with 6,150 individuals.
San Clemente Island phacelia (*Phacelia floribunda*)	CNPS Rank 1B.2	Loose talus slopes with large angular rocks or on rocky flats in canyon bottoms at elevations between 10 and 1,220 feet (3–370 m).	Decreasing?	CI Endemic (SCI, Guadalupe Island, Baja California, Mexico) On SCI, documented from the southeast end of SCI near "Guns," Middle Ranch Canyon, Seal Cove, near "Jack," Norton Canyon, Wall Rock Canyon, Horse Canyon, Cave Canyon, North Head, Whale Point, near Pyramid Point, and Wilson Cove. SCI estimated population: 52 occurrences with 2,983 individuals.

Table 3-45. Sensitive plant species known or with potential to occur on San Clemente Island (Junak and Wilken 1998; Junak 2006, 2010; Soil Ecology and Restoration Group 2012).

Species Name	Sensitivity Status	Plant Communities	Status Trend	Distribution and SCI Localities/ Abundance
Santa Catalina figwort (*Scrophularia villosa*)	CNPS Rank 1B.2	Primarily on open north- and east-facing slopes and canyon bottoms along the eastern escarpment between elevations of 20 and 1,400 feet (6–425 m).	Increasing	CI Endemic (SCI, Santa Catalina Island) On SCI, documented from Stone Canyon, Burn's Canyon, Horton Canyon, and Thirst Canyon. SCI estimated population: 47 occurrences with 1,432 individuals.
San Clemente Island triteleia (*Triteleia clementina*)	CNPS Rank 1B.2	Primarily on north-facing canyon walls of the eastern escarpment of SCI at elevations between 30 and 1,500 feet (10–460 m).	Decreasing?	SCI Endemic Documented from Eagle Canyon, Lemon Tank Canyon, Knob Canyon, Wall Rock Canyon, near Camera Pad "Male," Bryce Canyon, escarpments near Mosquito Canyon, Mosquito Canyon, Box Canyon, near Nanny Canyon, near "Male 1," near Tota Canyon, and near Camera Pad "Snapper." SCI estimated population: 88 occurrences with 8,430 individuals.

CNPS Rank 1B Species "are rare throughout their range with the majority of them endemic to California." Threat Ranks: 0.1–seriously threatened in California (over 80%) of occurrences threatened/high degree and immediacy of threat), 0.2–fairly threatened in California (20–80% occurrences threatened/moderate degree and immediacy of threat), and 0.3–not very threatened in California (<20% of occurrences threatened/low degree and immediacy of threat or no current threats known).

3.9.5 Management Focus Species

3.9.5.1 California Dissanthelium (*Dissanthelium californicum*)

California dissanthelium (Photo 3-60) is an annual grass that grows up to 11.8 inches (30 cm) tall with leaves 3.9–5.9 inches (10–15 cm) long and 0.08–0.16 inches (2–4 mm) wide (Baldwin et al. 2012). The spikelets are 0.12–0.16 inches (3–4 mm) with two florets each and generally flowers from March through May. The species occurs in sage scrub and boxthorn scrub habitats up to 500 feet (150 m) in elevation. California dissanthelium is currently ranked as 1B.2 species in the CNPS Inventory of Rare Plants (8th edition). California dissanthelium was known to occur historically on SCI, Santa Catalina Island, and Guadalupe Island. It was collected for the first time on SCI by Blanche Trask, in June 1903 but then was not seen on any of three islands thereafter and was presumed extinct until rediscovered in 2005 on Santa Catalina Island and in 2010 on SCI. It was rediscovered in a monitoring transect on SCI and a larger population was found about 330 feet (100 m) from the transect (E. Howe, pers. com. 2012). The populations were found in boxthorn habitat on the north end of the island, moderately disturbed by fire and training activities (B. Munson, pers. com. 2011).

Current Status and Trends

California dissanthelium is currently mapped at two point locations at the northern tip of SCI (Map 3-33) totalling 1,100 individuals (SERG, unpubl.). In 2011, only one of the populations was relocated, with 277 individuals counted (E. Howe, pers. com. 2012). SERG botanists on SCI have continued to monitor the two known populations on SCI. The status and trends of this species on SCI are difficult to assess given individuals occur intermittently, which is expected given the species' dependency upon certain climatic conditions, particularly higher rainfall.

Photo 3-60. California dissanthelium.

Current Management

Since California dissanthelium was rediscovered in 2010, management is still in the early stages of planning. California dissanthelium benefits from the control and erosion and habitat enhancement activities.

Map 3-33. Existing locations of California dissanthelium (Dissanthelium californicum).

Assessment of Resource Management

- Local extinction is a realistic possibility, since there are only a few occurrences known on SCI, but monitoring and seed collection will help to minimize this risk.
- Small populations, small numbers, in a training area.
- Since the rediscovery of the species on SCI, NRO contractors have closely monitored known populations. This is imperative to avoid an ESA listing, which would potentially impact the military mission on the island.
- Funding is needed to develop a long-term management plan for the species on SCI.

Management Strategy

Objective: *Maintain and enhance existing populations of California dissanthelium on SCI to support healthy, self-sustaining populations and to avoid a federal listing of the species.*

I. Understand propagation techniques of California dissanthelium.

- ***A.*** Monitor conditions in which the species grows successfully.
- ***B.*** Identify techniques to grow the plant successfully to produce seeds. Seeds will be used for banking and, potentially, for future restoration or enhancement.

3.9.5.2 Island Mallow (*Malva assurgentiflora*)

The island mallow (Photo 3-61) occurs on both the southern and northern Channel Islands (Baldwin et al. 2012). It is a 1B.1 species on the CNPS 8th edition Inventory of Rare Plants and is currently listed as a special status plant by CDFW. Recent taxonomic revisions now place what were formerly considered two subspecies of *Lavatera assurgentiflora* (subspecies *glabra* on the southern islands and *assurgentiflora* on the northern islands) into a single species designation (*Malva assurgentiflora*). The island mallow is a suffrutescent perennial (forming woody branches near the base of the plant) with showy purple-pink flowers, 3–13 feet (1–4 m) high. Flowers of island mallow are bisexual and generally appear between March and July (but can flower year round) and are most likely self-compatible. The species relies on insect pollination; honey bees as well as the native Megachilidae have been recorded as visitors. Flowers produce between six and eight seeds (Baldwin et al. 2012). Evidence suggests rodents may forage on fruits, which have been found gnawed on the ground beneath the parent plant (Junak and Wilken 1998). Rodents also appear to feed on the seedlings, and plants only seem to recruit when there are high numbers of adults to produce a lot of seeds and seedlings (B. Munson, pers. com. 2011).

Photo 3-61. Island mallow on San Clemente Island.

This species has decreased dramatically in the last 100 years, now known from only two small populations on offshore rocks on Santa Catalina Island, the few populations on SCI, and diminished populations on Anacapa, San Miguel and Santa Rosa Islands. Historical records describe the distribution of the island mallow on SCI as widespread and relatively abundant (Trask 1904).

Current Status and Trends

Map 3-34. Existing locations of island mallow (Malva assurgentiflora).

The island mallow (Map 3-34) is found on north- and west-facing slopes toward the northern portion of the island, growing from 70 to 500 feet (21–150 m) in elevation, mostly associated with recently stabilized or Pleistocene (ancient) dunes. Surveys on SCI in 1996 and 1997 recorded it in five locations, with 78 individuals (Junak and Wilken 1998). More recent surveys performed between 2003 and 2006 recorded six locations with a total of 173 individuals; populations ranged from seven to 55 plants (Junak 2010). There are numerous SERG outplanting sites, including two historical outplanting sites near Flasher Road. USGS survey marker sites (seven markers exist across the north end of the island) noted the existence of 'malva rosa' (another common name for island mallow) plants targeted for outplantings; currently, four out of the seven sites have been successfully re-established as island mallow sites (B. Munson pers. com.). Based on existing surveys and monitoring of outplanting sites, many of the outplanted populations have been observed producing seedlings and recruiting into the wild population (B. Munson pers. com. 2011).

Current Management

The island mallow is maintained at the NRO nursery and in landscaped areas throughout Wilson Cove. These outplantings included the non-glabrous variant (native to SNI, Anacapa, San Miguel, and Santa Rosa Islands, but not to SCI). Due to the uncertainty of the effects of hybridization on the native glabrous variant (native only to SCI and Santa Catalina Island), efforts to eradicate the tomentose-leafed variant are on-going (B. Munson, pers. com. 2011).

Populations of the island mallow are monitored during sensitive species surveys. Additionally, restoration sites are monitored annually with invasive species control, as necessary.

Assessment of Resource Management

- Because of the taxonomic revisions estimates of range-wide numbers within the species are difficult to estimate.
- The NRO has been proactive and successful with increasing the population of the island mallow on SCI.
- Recruitment has been observed at native and outplanted sites on the island, as well as at long distances from existing sites. This recruitment requires a re-evaluation of the population on SCI.

Management Strategy

Objective: *Identify and restore native occurrences of the island mallow and habitat to increase abundance on the northern portion of the island.*

I. Implement measures to protect the island mallow from road erosion and fire.

II. Continue annual cultivation efforts and conduct periodic outplantings to suitable areas.

III. Monitor taxonomic status.

 A. Consider genetic studies to confirm taxonomic status.

3.9.5.3 Santa Cruz Island Ironwood (*Lyonothamnus floribundus* subsp. *aspleniifolius*)

The genus *Lyonothamnus* is endemic to the Channel Islands. The Santa Cruz Island ironwood (Photo 3-62) occurs on San Clemente, Santa Cruz, and Santa Rosa Islands. It is an evergreen with gray to reddish brown bark that peels in strips. The species has round, white bell-shaped flowers that generally bloom from May to August (Hickman 1993). Flowers are bisexual. Current populations may be relictual occurrences of a more widely distributed species (Bushakra et al. 1999).

Photo 3-62. Santa Cruz Island Ironwood (Tierra Data Inc. 2006).

The number of fruits (mean=0.85) and seeds (mean=0.47) per flower are much lower than might be expected. There are no records of seedlings observed on SCI in recent decades (E. Kellogg, pers. com.). Junak and Wilken (1998) note several incidental observations of insect visitation, suggesting it may be high for this species.

The ironwood prefers rocky slopes and canyons in oak woodland and chaparral habitats (Hickman 1993). On SCI, most groves are found on the eastern escarpment in steep canyons, although they can also be found in two large canyons on the western slope. The species prefers north facing slopes and, occasionally, canyon bottoms (Junak and Wilken 1998).

This species is known to vigorously resprout after fire (E. Kellogg, pers. com.). However, individuals have been known to not survive extremely hot or frequent fires.

Current Status and Trends

Surveys indicate the population of the Santa Cruz Island ironwood is decreasing. Surveys in 1986 found 927 individuals while surveys completed in 1996 and 1997 found only 425 individuals. Surveys in 1996 and 1997 do not contain a count of individual trees (Junak and Wilken 1998). Long-term recruitment has not been detected from seedlings and it is possible the species will decrease as older individuals are removed from the population.

Current Management

There is currently little direct effort of the Santa Cruz Island ironwood. Three long-term monitoring plots surveyed by TDI are the only surveys to consistently capture a portion of the population. Outplantings of this species has occurred. Outplantings in 2008 at the Boulders planting exceed 10 feet (3 m) in height, and plants surviving past their first several years appear to show good growth and continued survivorship. The species has been difficult to propagate in the island nursery, although occasional high rates of germination have been observed. New seedlings are extremely weak and damp-off prone, but older plants survive in higher numbers once transplanted into larger pots.

A genetics study was conducted on the Santa Cruz Island ironwood in Fiscal Year 1999. This study showed little to no recruitment occurring on SCI or any of the other Channel Islands where it is found.

Assessment of Resource Management

- Surveys of the ironwood have not occurred on a consistent basis, making it difficult to draw a comparable trend. Surveys of the population should be completed on a regular basis to properly monitor the population on SCI. Future sensitive species surveys should include monitoring of the Santa Cruz Island ironwood.
- Results from past genetic studies show genetic variation is low for the species. Additional genetic studies to determine the distribution of genetic variation and structure of the species should be conducted.
- Monitoring of the SCI populations, as well as collaboration with botanists from other Channel Islands, should occur to understand the lack of recruitment of this species.

Management Strategy

Objective: *Maintain and enhance existing occurrences of the Santa Cruz Island ironwood groves to prevent their listing under the ESA and promote biodiversity function of the canopy and understory vegetation layers.*

I. Foster recruitment and improve age structure of the Santa Cruz Island ironwood.

- ***A.*** Investigate the feasibility of outcrossing SCI populations with populations from other islands.
- ***B.*** Identify priority outplanting sites within gaps of existing groves or in historic groves.
- ***C.*** Conduct non-native flora control in ironwood groves to reduce potential seedling competitors.

II. Monitor the status and trends of the Santa Cruz Island ironwood on San Clemente Island.

- ***A.*** Use vegetation monitoring plots to support the understanding of a reference condition for appropriate habitats.
- ***B.*** Include the Santa Cruz Island ironwood in future sensitive species surveys.

III. Identify the use of prescribed fire and other fire management strategies to protect from the catastrophic loss of entire groves, to improve seedbed conditions, and reduce invasive species.

IV. Conduct additional genetic studies to determine the genetic variation of the species to secure its persistence from disease and other threats.

3.9.5.4 Peregrine Falcon (*Falco peregrinus anatum*)

Peregrine falcons, a State Fully Protected species (Fish and Game Code § 4700), were initially listed in 1970 as part of the Endangered Species Conservation Act of 1969 (U.S. Department of the Interior 1970) due to significant population declines associated with the environmental effects of DDT (USFWS 1999). Today, they are found within most of their original distribution (USFWS 1999) and are widely distributed across most habitats (White et al. 2002). The successful recovery of the peregrine falcon is due in large part to the ban of DDT and the initiation of a captive breeding and reintroduction program (USFWS 1999). The peregrine falcon was removed from federal protection in 1999 (USFWS 1999) and from the California list of endangered species in 2008 (Comrack and Logsdon 2008). However, the species is included in the California list of fully protected animals and is federally protected under the MBTA.

Peregrines are a medium to large falcon that are agile, aerial hunters. They primarily prey upon other birds, although they also occasionally eat invertebrates, fish, and mammals (White et al. 2002). They frequently nest on cliffs near open areas for foraging (White et al. 2002). They have also been known to utilize urban areas to nest on power poles, bridges, and even building ledges (Comrack and Logsdon 2008). Peregrines do not build a nest, but rather scrape a depression on the ground or occasionally reuse abandoned nests of other birds (White et al. 2002). Pairs are generally widely-spaced with approximately one pair per 2.2 square miles (3.6 km^2) (Comrack and Logsdon 2008). The timing of nesting is dependent on location; in southern California, monogamous pairs usually begin laying the first egg of their three to four egg clutch in mid- to late-February (White et al. 2002). Breeding is dependent on the ability to secure a territory. Individuals may pair for the first time at two years of age, although three to four years is more common (White et al. 2002)

Once a rare resident on SCI, the last confirmed observation of resident peregrine falcons was in 1915 (Kiff 1980). DDT poisoning was the primary reason attributed to the extirpation of peregrines from SCI and throughout their range (Kiff 1980). In 2011 a nestling was discovered in a cave on a cliff in Cave Canyon (M. Booker, pers. com. 2011); this chick successfully fledged. This is the first documented case of peregrines breeding on SCI. The island was thought to have one or two nesting pairs in earlier years; however, nesting was never confirmed (Jorgensen and Ferguson 1984). The nesting in 2011 also represents the first evidence that peregrine falcons have returned as residents to SCI after nearly 100 years.

Current Management

Prior to 2011, the last resident peregrine falcon observation on SCI was in 1915 (Kiff 1980). The Montrose Settlement Restoration Program funded the first comprehensive survey of peregrine falcons on the Channel Islands in 2007. The survey of 35 peregrine falcon territories found 25 active territories with resident breeding pairs, including seven pairs on San Miguel Island, eight pairs on Santa Rosa Island, seven pairs on Santa Cruz Island, two pairs on Anacapa Island, and one pair on Santa Barbara Island. In addition, 16 pairs successfully hatched eggs, producing 35 young (National Oceanic and Atmospheric Administration 2012b).

Egg shell fragments were retrieved by the USFWS from the 2011 nest found on SCI. Fragments were sent to Western Foundation of Vertebrate Zoology for thickness examination. Results of egg shell testing indicated shell thickness within normal parameters in all but one fragment (M. Booker, pers. com. 2011).

A third bird, a male, was confirmed at SCI during the breeding season. However, the bird was found electrocuted by an electrical pole near a Construction Battalion facility located mid-island; it is unknown if that individual was part of a second breeding pair. The electrocuted bird had been banded in 2010 near Sausalito, California, just north of San Francisco. The bird was given to the Western Foundation of Vertebrate Zoology for curation (M. Booker, pers. com. 2011).

In 2012, peregrine falcons nested again in Cave Canyon, although at a different location, and three chicks were banded by USFWS with support from the Navy and their contractors (Photo 3-63). In addition, at least one peregrine falcon was observed in SHOBA near Pyramid Head during the breeding season in 2012. It is suspected that this individual is part of a second breeding pair (J. Stahl, pers. com.).

Photo 3-63. Peregrine falcon chicks in Cave Canyon, San Clemente Island in 2011 (Navy 2012).

Assessment of Resource Management

- The Navy's partnership with USFWS and IWS in 2011 and 2012 successfully confirmed nesting and provided important information (egg shell thickness, prey remains, banding data) necessary for successful management of this species at SCI.
- Following the electrocution of the male peregrine falcon, the Navy initiated a project to identify factors such as pole location, configuration, and surrounding habitat that may affect the potential for raptor electrocution by power poles throughout the island. This project will be completed in 2012. Results of the project will provide management recommendations to protect avian species on SCI.

Management Strategy

Objective: *Monitor re-establishment of the peregrine falcon at SCI and avoid population-level conflicts with listed species.*

I. Conduct surveys during the breeding season to monitor nesting activity throughout the island and determine the number and status of nesting pairs.

II. Assess factors affecting the potential for electrocution of raptors on power poles.

III. To the extent feasible and in alignment with military operations, implement recommendations from the electrocution hazard assessment.

3.9.5.5 Bald Eagle (*Haliaeetus leucocephalus*)

The bald eagle is a State Fully Protected species (Fish and Game Code § 4700). They are the second largest bird of prey in North America and are widely distributed throughout the continent, generally preferring aquatic habitats (Buehler 2000). Initially listed as endangered in 1967 under the Endangered Species Preservation Act (U.S. Department of the Interior 1967), the entire species was listed under the ESA due to declines linked to DDT poisoning, reductions in bird populations, shooting, and habitat loss (U.S. Department of the Interior 1976). Since receiving federal protection, the population has recovered and was delisted in 2007 (USFWS 2007e). They currently remain protected under the Bald and Golden Eagle Protection Act and the MBTA. They are opportunistic foragers that will eat carrion, reptiles, birds, mammals, and fish depending on availability. However, whenever available, fish comprises a large part of their diet (Buehler 2000).

Bald eagles have a long lifespan and do not reach maturity until their fifth year (Buehler 2000). Monogamous pairs raise a single clutch of one to three eggs each year and may replace it if the nest fails early in the season (Buehler 2000). Nests are commonly built in tall conifers, although where trees are absent they may be placed on cliffs or ridges on the ground (Buehler 2000). Home ranges vary, but average 0.386–0.772 square miles (1–2 km^2) (Stalmaster 1987).

Although the bald eagle was a common breeder on SCI in the early 1900s, the last known breeding record was in 1927 (Kiff 1980) and the species was extirpated from SCI at some point in the 1950s (Jorgensen and Ferguson 1984). Historically, bald eagles on the Channel Islands subsisted on a diet primarily of fish and seabirds, which are resources that have decreased in abundance in more recent years (Newsome et al. 2010). The reduction in food availability, coupled with the effects of DDT may have led to the extirpation of bald eagles from SCI (Kiff 1980). Attempts were made in the 1970s to re-establish the population (Jorgensen and Ferguson 1984). Ultimately, these re-introductions failed. In recent years, re-introduction efforts have been focused on nearby Santa Catalina Island, which have been successful (M. Booker, pers. com. 2011) and Catalina-origin birds are infrequently sighted on SCI throughout the year (J. Stahl, pers. com.). In 2011, a pair was observed on SCI and was suspected of nesting (M. Booker, pers. com. 2011).

Current Management

Although a bald eagle pair was observed on SCI in 2011 (M. Booker, pers. com. 2011), nesting of the bald eagle has not been confirmed despite searches of the island by helicopter. The presence of at least two birds during the breeding season likely indicates that at least an attempt at nesting occurred somewhere on the southern end of the island. This would represent the first attempt at nesting on SCI since 1927 (Kiff 1980).

Assessment of Resource Management

- Boat surveys should be conducted to search for nesting bald eagles.
- The Navy has been proactive in attempting to confirm nesting of the bald eagle on SCI. Efforts should continue if sightings of individuals continue to occur.

Management Strategy

Objective: *Monitor the re-establishment of bald eagle at SCI and avoid population-level conflicts with listed species and the island fox.*

I. Conduct surveys during the breeding season to determine the number of bald eagles using SCI and their nesting status.

A. Complete boat surveys around the island to identify potential bald eagle nests.

3.9.5.6 White-Tailed Kite (*Elanus leucurus*)

The white-tailed kite, a State Fully Protected species (Fish and Game Code § 4700), is a medium to small-sized (32 to 38 cm in length) hawk that is white underneath with a gray back and red eyes. Threatened with extinction in North America in the early part of the twentieth century, they have since recovered. Kites have a conspicuous hunting style whereby they hover approximately 16–82 feet (5–25 m) above ground while searching for prey, primarily small mammals (Dunk 1995). Kites inhabit a variety of habitats, primarily grasslands, savannahs, and oak woodlands. During the breeding season, they build nests in the upper third of trees from 10–164 feet (3–50 m) tall (Dunk 1995). Nest building begins in January, although pairs may be found together year round. Three to six eggs are laid in a clutch and a pair may lay up to two clutches in a single year (Dunk 1995).

The white-tailed kite is a rare but nearly annual migrant to SCI and an occasional breeder. Migrants usually occur September to January, but there are now four breeding records: fledged in May 2000, failed in April 2003, fledged in February 2004, and fledged in May 2008 (Sullivan and Kershner 2005; IWS unpubl. data). In the first three instances, breeding took place in the eucalyptus tree north of the landfill. In 2008, the birds were seen copulating in the eucalyptus in February, but then went undetected until reappearing with two juveniles in May (J. Stahl, pers. com.). While not present every year, this species is prone to invasions, likely tied to rodent abundance on SCI, with up to 50 recorded in some years. When present in large numbers, this species tends to concentrate on the Tota Canyon plateau north of Stone Road, but smaller groups can be found hunting throughout the island, most often near Ridge Road (J. Stahl, pers. com.).

Current Management

There is no direct management of white-tailed kite on SCI. However, surveys of other avian species may result in observations of this species, contributing to knowledge of its use of the island.

Assessment of Resource Management

- The removal of feral herbivores and control non-native species and predators have benefited this species as evidenced by the establishment of (infrequent) breeding on the island.
- Previous management actions to modify power pole configurations likely benefited white-tailed kites since individuals are frequently seen resting on power lines.

Management Strategy

Objective: *Monitor the winter population of the white-tailed kite at SCI.*

I. Continue to record observations of white-tailed kite during surveys of other species and within the avian database.

II. Continue to control non-native predators and invasive species to conserve the white-tailed kite population on SCI and their foraging habitat.

III. Assess factors affecting the potential for electrocution of raptors on power poles.

IV. To the extent feasible and in alignment with military operations, implement recommendations from the electrocution hazard assessment.

3.9.5.7 Murrelets (*Synthliboramphus spp.*)

In July 2012, the two subspecies of the Xantus's murrelet were split into separate species (Chesser et al. 2012) under the support of the American Ornithologists' Union. The Scripps's murrelet is now the name of the former Xantus's murrelet, which nests throughout the Channel Islands. The Guadalupe murrelet is now the name of the former Xantus's murrelet, which predominately breeds off Baja California, Mexico but may breed in very low numbers on SCI.

Before the split, the Xantus's murrelet was known as one of the rarest seabirds in the North Pacific (Gaston and Jones 1998), having declined from historic levels (CDFW 2003). The CDFW reviewed the available information on their abundance and concluded that there were only 3,460 breeding birds under California's jurisdiction (CDFW 2003). The Xantus's murrelet was listed as threatened by the State of California on 22 December 2004.

The two subspecies were long recognized; however, a recent study by Birt et al. (2012) found little evidence for hybridization or genetic introgression. This contradicted previous interpretations on interbreeding due to intermediate facial plumage at the San Benito Islands (Jehl and Bond 1975). Estimates of gene flow were essentially zero, and no evidence for interbreeding was found. Genetic samples of individuals from SCI were not used in Birt et al. (2012) since its breeding status on the island is unknown. However, Birt et al. (2012) concluded that the population found on SCI may be more resilient to the effects at any one breeding area because of its high dispersal between breeding areas. Nevertheless, this species is still vulnerable to threats, which are discussed below.

Prior to the split into separate species, USFWS received a petition to list the Xantus's murrelet under the ESA. Substantial declines had been documented in both subspecies, and they were assigned federal candidate status. The Xantus's murrelet had a listing priority of 5, priority numbers range from 1 to 10 with the lower number having a higher priority listing. The listing was warranted but precluded in 2011 (76 FR 66370) because of the higher listing priority of other species. If the USFWS accept the subspecies split, the Guadalupe murrelet is likely to have a higher listing priority number due to a more limited breeding distribution. Additionally, the acceptance of a subspecies split is expected to make the listing of each new species imminent due to the lower population numbers than originally thought with the former subspecies petitioned as one species.

Scripps's Murrelet (*Synthliboramphus scrippsi*)

The Scripps's murrelet is a small seabird with a wingspan of 15 inches (38.1 cm). They measure just under 10 inches (25.4 cm) in length and weigh 6 ounces (0.17 kg) (Drost and Lewis 1995). They breed from the northern Channel Islands south to the San Benito Islands in Baja California, Mexico (Jehl and Bond 1975; Drost and Lewis 1995). Its range overlaps with the similar Guadalupe murrelet at the San Benito Islands and SCI. These species are most easily distinguished by facial plumage with the Scripps's murrelet having black feathers above and in front of the eye.

Murrelets spend the majority of their lives at sea, only coming to land to nest. The Scripps's murrelet has high fidelity to natal breeding colonies, returning to the same off-shore island or rock where they were born. Timing of breeding of alcids in California is related to prey availability within the California Current and is strongly influenced by oceanographic conditions (Ainley and Boekelheide 1990). They typically begin arriving in the vicinity of breeding colonies in December and January (Murray et al. 1983; Gaston and Jones 1998). Egg-laying is unsynchronized but typically peaks from mid-March to mid-April (Gaston and Jones 1998). Nesting occurs on offshore rocks or islands in rock crevices or small caves along or near cliff edges but can also occur under shrubs and ground vegetation (Hunt et al. 1979). During the breeding season, individuals will arrive or depart their nest at dusk or dawn to avoid avian predators (Murray et al. 1983). During daylight hours, individuals spend most of their time foraging and resting at sea. Chicks are highly precocial and fledge at one to two days after hatching. By the end of July, murrelets are uncommon on or near offshore breeding areas, as adults with newly hatched young disperse rapidly (Hunt et al. 1979; Murray et al. 1983).

Takekawa et al. (2004) found at-sea densities of murrelets in the Southern California Bight were the greatest during May with few birds observed during January or September. The largest Scripps's murrelet breeding colony in southern California is located at Santa Barbara Island (Murray et al. 1983; Burkett et al. 2003) and is considered the most important breeding colony in California. Additional sightings and nests exist on San Miguel, Santa Cruz, San Clemente, and Anacapa Islands (Jensen et al. 2005). SCI currently supports one of the smallest Scripps's murrelet colonies in the world (Carter et al. 2009).

Spotlight surveys in 2008 confirmed that about ten to 25 pairs attend at-sea congregations at SCI (Carter et al. 2009). In 2012, six spotlight surveys were conducted between Eel Point and Mail Point in April and May (Whitworth et al. 2012). Low overall counts (≤12 birds) were likely a result of extensive kelp beds that prevented surveys in higher density areas inside Seal Cove. At-sea captures increased from to 2012 (Table 3-46; Carter et al. 2009; California Institute of Environmental Studies, unpubl.). In May 1994, seven Scripps's murrelets were captured with no evidence of breeding. A total of 24 Scripps's murrelets were captured with 17 (61%) exhibiting brood patched, which suggest breeding activity.

Table 3-46. Scripps's murrelet at-sea captures to 2012.

Date	Captured	Breeding
May	7	0
July	0	0
May 1996	5	1
April 2008	6	1
April 2012	14	4
May 2012	28*	17
*Includes four recaptured murrelets		

The majority of this population appears to breed in the Seal Cove area. However, isolated breeding pairs may also nest in small pockets near Castle Rock, Wilson Cove area, China Point areas, and between Mosquito Cove and Pyramid Head (Carter et al. 2009). Only three nests were found at SCI in 2012; one on an offshore rock in Seal Cove and two at the base of the shoreline cliffs in Seal Cove (2012) (M. Booker, pers. com. 2012). Adult murrelets were not seen at the nests and eggs were not identified to the species level. Small numbers of Scripps's murrelets (< 50 pairs) currently breed at SCI. However, trends of murrelets on the island need to be assessed and all breeding locations should be identified.

The breeding population of Scripps's murrelets on SCI is most likely limited due to the lack of space on offshore rocks and terrestrial predators, such as foxes, feral cats, black rats (Hunt et al. 1979), and barn owls (Birt et al. 2012). Historical data are lacking to suggest murrelets have bred on the island in other than small numbers or isolated breeding pairs since the introduction of the island fox by native people likely within the last 10,000 years (Hunt et al. 1979; Carter et al. 1992; Drost and Lewis 1995; Rick et al. 2009). Long-term population trends at SCI are impossible to assess with the available data.

The USFWS Species Assessment and Listing Priority Assignment Form for Xantus's murrelet addresses Threats and Recommended Conservation Measures that are expected to apply to both Scripps's and Guadalupe murrelets. Threats include oil spills/pollution, light pollution, human disturbance at nesting colonies, non-native and native predation at nesting colonies, and reduced prey availability (USFWS 2011). Recommended USFWS Conservation Measures that may be applicable at SCI include control of non-native mammals (i.e., cats and rats), avoiding artificial lighting and human disturbance at nesting colonies, oil spill planning to protect colonies, and restoration of nesting habitats (USFWS 2011).

Guadalupe Murrelet (*Synthliboramphus hypoleucus*)

The Guadalupe murrelet is a small seabird, 9 to 10 inches (23 to 25 cm) in length and weighs approximately 5 to 7 ounces (Drost and Lewis 1995). The species has a geographically restricted global breeding distribution and small numbers (Karnovsky et al. 2005). The Guadalupe murrelet breeds primarily at Guadalupe Island and the San Benito Islands off Baja California, Mexico (Jehl and Bond 1975; Drost and Lewis 1995), but nesting is suspected on SCI and San Martín Island. Its range overlaps with the similar Scripps's murrelet and both have been documented at SCI. The two species are most easily recognized by facial plumage; the Guadalupe murrelet has a distinctive face pattern, with white above and in front of the eye.

As with the Scripps's murrelet, Guadalupe murrelets spend the majority of their lives at seas, arrive at nesting colonies in December and January (Murray et al. 1983), exhibit high breeding site fidelity (Murray et al. 1983), and nest in small caves or rock crevices on offshore islands or associated rocks (Hunt et al. 1979). For more details on the Guadalupe murrelet's life history, see the species description of the Scripps's murrelet.

At-sea captures showed a slight increase from 1994 to 2012 (Table 3-47; Carter et al. 2009; California Institute of Environmental Studies, unpubl.). In April 2012, four Guadalupe murrelets were captured with one (25%) exhibiting brood patched. Small numbers of Guadalupe murrelets (< 20 pairs) currently breed at SCI. However, more surveys are needed to obtain reliable population estimates, examine trends, and identify all, if any, breeding locations on the island.

The Guadalupe murrelet faces similar threats to the Scripps's murrelet (USFWS 2011). Please refer to the species description of the Scripps's murrelet for details.

Table 3-47. Guadalupe murrelet at-sea captures 1994 to 2012.

Date	Captured	Breeding
May	2	0
July	1	0
May 1996	1	0
April 2008	6	0
April 2012	4	1
May 2012	0	0

Current Management

The Scripps's and Guadalupe murrelet have a combined management section since both species currently have similar management strategies. However, through adaptive management, the Navy may modify future management to focus on the species separately.

The Navy supports seabird monitoring efforts through regional avian research partnerships and records current sightings of this species on the island and in adjacent nearshore waters. The Navy conducts annual aerial photographic surveys for ground nesting seabirds and boat and ground surveys for murrelets.

The USGS and Humboldt State University conducted a research project to study the at-sea distribution and abundance of seabirds off the coast of southern California from 1999 to 2003. Aerial surveys were conducted for seabirds during January, May, and September from May 1999 to January 2002. Fixed transect lines were located both at sea and along mainland and island coastlines, including two transect lines immediately above and below SCI.

From 1991–1996, Humboldt State University conducted two major studies that involved monitoring on SCI. The first included a survey of seabird breeding populations and colony distribution at all southern Channel Islands in 1991 (Carter et al. 1992). Then, a region-wide studies in –1996 of breeding population and distribution of a select few seabirds, including the ashy storm-petrel (Carter et al. 2008).

Annual aerial surveys for ground nesting seabirds in the Channel Islands (including SCI) have been conducted almost continuously since 1979 (Capitolo et al. 2010). These surveys have been useful for tracking population trends, developing oils spill response strategies, assessing anthropogenic impacts, and measuring climatic condition effects (Capitolo et al. 2010). Funding for the surveys at SCI has been provided by the Navy since 2010.

In 2008, Carter Biological Consulting and the California Institute of Environmental Studies conducted murrelet surveys and obtained blood samples at SCI as part of a range-wide assessment of population size of breeding colonies and genetics.

Most recently, six spotlight surveys were conducted between Eel Point and Mail Point in April and May 2012 (California Institute of Environmental Studies, unpubl.).

Assessment of Resource Management

- The Navy continues to be proactive and support efforts to identify and monitor population baseline levels and trends at SCI. Direct Navy support for SCI seabird monitoring increased starting in 2010, with the funding of aerial surveys. Monitoring became more comprehensive in 2012 the addition of monitoring for seabird species (e.g., murrelets) not detected in the aerial survey work.

- Surveys conducted by Humboldt State University (1996) and the California Institute of Environmental Studies (2008, 2012), the later through funding from the Navy, provide important baseline records necessary for effective management of the Scripps's murrelet.
- Long-term, continuous non-native predator control has likely suppressed predation pressure on nesting seabirds.
- The continuation of seabird monitoring on SCI will add to knowledge of seabird habitat and use of the island. These surveys will continue to track trends over time and with climatic shifts, allow for the refinement of oil spill response plans, and potentially provide an indication of the level of anthropogenic effects to nesting species.

Management Strategy

***Objective:** Assess and sustain the use of SCI by the Scripps's and Guadalupe murrelet to continue unconstrained use of the SCI Range Complex.*

I. Avoid fixed high-intensity artificial light near murrelet breeding sites.

II. Continue to conserve offshore rocks and other areas where murrelets are known to breed.

III. Continue to resolve baseline biological data gaps to support conservation of the species.

- ***A.*** Identify all occupied and suitable nesting habitat.
- ***B.*** Support ongoing and new research on distribution and ecology of murrelets.
- ***C.*** Conduct nest searches and monitoring to identify all breeding areas and, to the extent possible, determine hatching success.
- ***D.*** Assess the potential impacts of barn owl predation on nesting murrelets.
- ***E.*** Record all sightings of murrelets and develop a database to track numbers of individuals, time of year, and location.
- ***F.*** Conduct round-island spotlight surveys to obtain better knowledge of the murrelet outside of the Seal Cove area.

IV. Evaluate oil spill response plans for SCI to assess how they address seabird nesting and modify, if necessary.

V. Continue non-native predator control efforts in support of native avian species nesting.

3.9.5.8 Ashy Storm-Petrel (*Oceanodroma homochroa*)

The ashy storm-petrel is a smoke-gray, medium-sized seabird with long slender wings, a long forked tail, and webbed feet (Ainley et al. 1995). Their range extends from northern California to central Baja California, Mexico.

They nest in crevices of talus slopes, rock walls, sea caves, cliffs, and driftwood (James-Veitch 1970). The breeding season can occur year-round, although it primarily takes place from February through October, with courtship lasting up to three months (Ainley et al. 1995). Egg-laying extends from late March to October with a peak in June and July (James-Veitch 1970).

Adults will feed their chicks, on average, every one to three nights (James-Veitch 1970). Fledging occurs at night, from late August to January (Ainley et al. 1974). Once the chicks leave the nest, they are completely independent of their parents (Ainley et al. 1974).

No data is currently available regarding life span, survivorship, and age at first breeding (Ainley et al. 1995). However, as with other storm-petrels, ashy storm-petrels are long-lived (Warham 1996), with some reaching 25 years old (Sydeman et al. 1998).

They are non-migratory and forage primarily in the Pacific Ocean's California Current in areas of upwelling, seaward of the continental shelf, near islands and the coast (Mason et al. 2007). Their diet consists of larval fish, squid, and zooplankton (Ainley et al. 1990; Ainley et al. 1995; McIver 2002). Ashy storm-petrels will scavenge for food and are frequently seen around fishing vessels (Ainley et al. 1995).

The majority of the population breeds in coastal areas and on islands off central and southern California (McChesney et al. 2000). The largest breeding colonies are on the Farallon and Channel Islands (San Miguel, Santa Barbara, Santa Cruz and Anacapa Islands), which together support approximately 98% of the global population (Carter et al. 1992).

Aggregations of ashy storm-petrels were observed during surveys from 1999–2002 between Santa Cruz Island and SNI, in the western Santa Barbara Channel, and 6 to 43 miles (10–70 km) offshore from San Miguel Island to Point Buchon (Takekawa et al. 2004). At-sea densities were greatest during May and September, and densities were greater from 1999–2002 than densities from 1975–1983 throughout the entire study area. Ashy storm-petrels were not observed at any time along the coastal survey area.

About five to 50 breeding pairs or ten to 100 breeding individuals were estimated on SCI in 1994. Observations of ashy storm-petrels during spotlight surveys in 2008 indicated continued attendance of this colony (Carter et al. 2009). Ashy storm-petrel population trends at SCI were not determined due to the lack of current data (Carter et al. 2009). However, no information is available to suggest that ashy storm-petrels have bred on the island in other than small numbers or isolated breeding pairs since the introduction of the island fox (Rick et al. 2009).

Small population size, restricted distribution, concentration at few colonies, extended chick-rearing period, and low reproductive rates make the ashy storm-petrel especially vulnerable to threats. Predation of eggs and chicks by native deer mice on Santa Cruz Island occurs, although population effects are unknown (Ainley et al. 1990; McIver 2002).

The Center for Biological Diversity petitioned USFWS on 16 October 2007 (73 FR 28080) to list the ashy storm-petrel under the ESA. The Center for Biological Diversity claimed that the ashy storm-petrel need protection due to negative effects associated with El Niño, climate change, research activities, and mortality from native and non-native predators. On the Farallon Islands, the breeding population is estimated to have declined 42% between 1972 and 1992 (Sydeman et al. 1998). The decline is mainly as a result of adult predation by western gulls, burrowing owls, and possibly mice (Sydeman et al. 1998; Mills 2000). Population trends at other colonies are not known.

On 19 August 2009, the USFWS announced a *not-warranted* 12-month finding with regard to listing the ashy storm-petrel under the ESA (50 FR Part 17). The not warranted finding was concluded since the species does not meet the definition of a threatened or endangered species because of the lack of substantial information to suggest that the species may become an endangered species in the foreseeable future. However, in 2012, the USFWS started a status review for a petition to list the ashy storm-petrel as endangered or threatened because of new information (77 FR 70987).

Current Management

Monitoring of the ashy storm-petrel has been completed almost exclusively by outside federal agencies and research institutions.

The USGS and Humboldt State University conducted a research project to study the at-sea distribution and abundance of seabirds off the coast of southern California from 1999–2003. Aerial surveys were conducted for seabirds during January, May, and September from May 1999 to January 2002. Fixed transect lines were located both at sea and along mainland and island coastlines, including two transect lines immediately above and below SCI.

From 1991–1996, Humboldt State University conducted two major studies that involved monitoring on SCI. The first included a survey of seabird breeding populations and colony distribution at all southern Channel Islands in 1991 (Carter et al. 1992). Then, a region-wide studies in –1996 of breeding population and distribution of a select few seabirds, including the ashy storm-petrel (Carter et al. 2008).

In 2008, during murrelet spotlight surveys by Carter Biological Consulting and the California Institute of Environmental Studies, ashy storm-petrels were seen, which provided limited data on their presence and possible breeding activity at SCI. Although this work was not funded by the Navy, it was endorsed by the Navy.

Assessment of Resource Management

- The Navy continues be proactive in supporting efforts to identify and monitor abundance and trends in seabird populations.
- Surveys conducted from 1991–2008 (Carter et al. 2009) provide important baseline records necessary for effective management.
- Long-term, continuous non-native predator control has likely suppressed predation pressure on nesting seabirds.
- Navy funding of seabird monitoring on SCI, beginning in 2011 for cavity nesting seabirds, will add to knowledge of ashy storm-petrel habitat and use of the island.

Management Strategy

Objective: *Further assess and sustain the use of SCI by the ashy storm-petrel.*

I. Avoid fixed high-intensity artificial light near ashy storm-petrel breeding sites.

II. Continue to conserve offshore rocks and other areas ashy storm-petrels are known to breed.

III. Seek opportunities to partner with regional efforts assessing ashy storm-petrel populations and occurrence in the SCB.

IV. As feasible, increase protection of ashy storm-petrel breeding sites on SCI (not including offshore rocks) through control of non-native predators.

V. Evaluate oil spill response plans for SCI to assess how they address seabird nesting and modify, if necessary.

VI. Continue to resolve baseline biological data gaps.

A. Monitor the ashy-storm petrel on SCI to identify all breeding use areas around the island.

B. Support ongoing and new research on distribution and ecology of ashy storm-petrels.

C. Record all sightings of ashy storm-petrels and develop a database to track numbers of individuals, time of year, and location. Use database, if possible, to examine trends with species presence during military training events.

D. As feasible, assess the impact of native avian predation (e.g., western gull, common barn owl, and burrowing owl) on nesting ashy storm-petrels.

3.9.5.9 California Brown Pelican (*Pelecanus occidentalis californicus*)

The California brown pelican, a State Fully Protected species (Fish and Game Code § 4700), is one of the six subspecies of the brown pelican. Adult brown pelicans are a large, dark gray-brown water bird with white on the head and neck. Immature animals are gray-brown above and on the neck, with white on the underside of the body. Brown pelicans measure up to 54 inches (137 cm) long, weigh 8 to 10 pounds (4 to 5 kilograms), and have a wingspan between 6.5 and 7.5 feet (2 to 2.2 m) (Shields 2002). Pelicans are social, congregating in large flocks for most of the year.

California brown pelicans (Photo 3-64) build nests in low shrubbery or on the ground on islands or remote coastal areas. They breed primarily in the spring but breeding is asynchronous, with egg laying starting as early as November and as late as June; most nesting occurs from February to October (Anderson and Gress 1984; Anderson and Anderson 1976; Anderson et al. 1994). They typically begin to breed between three and five years old (Shields 2002). Both females and males will share the responsibility of incubating the eggs and raising the young. They feed almost exclusively on small schooling fish, in particular the northern anchovy and Pacific sardine (*Sardinops sagax caerulea*) (Anderson and Anderson 1984; Anderson et al. 1982).

Currently, there are two main breeding colonies in California: Anacapa and Santa Barbara Islands (Anderson et al. 1994). In 2011 a breeding colony (with a minimum estimate of 197 fledglings) was discovered on SCI (M. Booker, pers. com. 2012). However, in 2012 there was no confirmed breeding on the island despite the year-round presence of this species on SCI (M. Booker, pers. com. 2012).

In general, the California brown pelican migrates northward in July or August after breeding and return in December or January to breed (Shields 2002); however, some individuals are known to forgo migration and are year-round residents in the SCB. Nonbreeding pelicans disperse during late spring, summer, and early fall months as far north as British Columbia, Canada, and south into southern Mexico and Central America.

Photo 3-64. Nesting California brown pelicans on San Clemente Island (J. Stahl, Institute for Wildlife Studies, 2011).

In 2009 the brown pelican was removed from the federal list of endangered and threatened wildlife (USFWS 2009b), based on the recovery of the species; the state of California has also removed the brown pelican from the list of state endangered and threatened animals (CDFW 2009b). A Draft Post-Delisting Monitoring Plan for the brown pelican (USFWS 2009a) was completed to track the status of the brown pelican over time and to verify that the species remains secure from risk of extinction. USFWS proposed monitoring the brown pelican for ten years, mainly through aerial surveys. As of 2012, the final plan has not yet been issued and it is unclear as to wether SCI will be included in monitoring by USFWS.

The USGS and Humboldt State University conducted a research project to study the at-sea distribution and abundance of seabirds off the coast of southern California from 1999–2003. Aerial surveys were conducted for seabirds during January, May, and September from May 1999 to January 2002. Fixed transect lines were located both at sea and along mainland and island coastlines, including two transect lines immediately above and below SCI.

Current Management

Monitoring of the California brown pelican on SCI is completed through Navy-funded aerial surveys and on-the-ground monitoring of the 2011 nesting location for future activity.

Assessment of Resource Management

- The Navy's proactive seabird monitoring contributes to regional knowledge of California brown pelican abundance, trends, and habitat use and allows the Navy to effective manage for this species on SCI.

Management Strategy

Objective: *Continue to assess and sustain the use of SCI by the California brown pelican.*

I. Continue to consider essential pelican roosting habitat in planning decisions.

II. Continue to monitor and report on the status of breeding by the California brown pelican on SCI.

3.9.5.10 Northern Elephant Seal (*Mirounga angustirostris*)

A species description of the Northern elephant seal can be found in Section 3.9.2.8 Marine Mammals.

Current Management

Management of the Northern elephant seal at SCI occurs primarily through annual surveys conducted by NMFS. Additional management occurs through compliance with the NMFS ESA Section 7 Consultation Programmatic Final BO. The Final BO provides measures to prevent marine mammals from being exposed to potentially harmful levels of active sonar and underwater donations. Measures are also taken during military air operations to avoid flying over Mail Point and Seal Cove, which are population pinniped haul out locations.

The Navy developed a monitoring plan and currently surveys for marine mammals in the SCB (See Section 3.9.2.8 Marine Mammals), which includes waters within the SCI management footprint.

Assessment of Resource Management

- SCI NRO has continued to support annual NMFS pinniped surveys on the island, which have captured important population and trends data for the northern elephant seal.
- Measures to protect marine mammals in the nearshore waters of SCI are properly addressed in the most current NMFS Programmatic BO on Navy activities in the SOCAL Range Complex. Implementation of these measures on the island will sustain current populations of marine mammals utilizing habitats within the SCI footprint.
- Additional surveys conducted over the entire SCB increase the Navy’s understanding of presence and abundance of the northern elephant seal within the SCI footprint. This information will help to avoid and minimize impacts to the species.

Management Strategy

Objective: *Continue to assess and avoid disturbance of the northern elephant seal population on SCI.*

Objective: *Conserve occupied habitat to maintain current viable populations.*

I. Continue to support annual pinniped surveys conducted by NMFS.

II. Comply with mitigation measures of the NMFS Final Programmatic BO on Navy activities in the SOCAL Range Complex.

III. Continue to monitor marine mammals populations around SCI according to the Navy's LOAs associated with training activities in the SOCAL Range Complex.

3.9.6 Plants and Animals Believed Extirpated and/or Extinct at SCI

3.9.6.1 Channel Island Tree Poppy (*Dendromecon harfordii* subsp. *rhamnoides*)

The Channel Island tree poppy, a tremendously showy flowering shrub, was last reported to be on the island by Blanche Trask, at the turn of the 20th century; it is endemic to Santa Catalina Island and SCI. The genus *Dendromecon* is comprised of two species occurring in California and Baja California.

3.9.6.2 Santa Catalina Island Desert Thorn (*Lycium brevipes* var. *hassei*)

The genus *Lycium* is inhabits arid and semi-arid regions around the world. The Santa Catalina Island desert thorn (*Lycium brevipes* var. *hassei*) is now thought to be extinct on Santa Catalina Island and SCI, but still exists on the Palos Verdes peninsula on the mainland of California. It once grew on coastal slopes at low elevations on SCI.

3.9.6.3 Bewick's Wren (*Thryomanes bewickii leucophrys*)

The Bewick's wren (*Thryomanes bewickii leucophrys*), a SCI endemic subspecies, was collected and described as distinctive from mainland populations by Anthony in 1895. The course of its decline is not well documented due to the lack of surveys from 1925–1968. The last confirmed record was a specimen collected in 1941 that is now preserved at the Los Angeles County Museum of Natural History.

3.9.6.4 San Clemente Spotted Towhee (*Pipilo erythrophthalmus clementae*)

The San Clemente spotted towhee (*Pipilo erythrophthalmus clementae*), formerly rufous-sided towhee, is of a distinct subspecies endemic to San Clemente, Santa Catalina, and Santa Rosa Islands. It was observed on SCI in the early part of the twentieth century and is still relatively common on the latter two islands. However, the subspecies was extirpated from SCI during the 1970s. Migrant subspecies still frequent SCI in the fall and winter.

3.9.6.5 Song Sparrow (*Melospiza melodia*)

Breeding populations of the San Clemente song sparrow (*Melospiza melodia*) are believed to have been extirpated from SCI for many years, although it breeds abundantly on Santa Cruz Island (Schoenherr et al. 1999), and individual adults are occasionally detected during loggerhead shrike monitoring.

3.9.7 Invasive Species

Invasive species are officially defined as "alien species whose introduction does or is likely to cause economic or environmental harm to human health" (EO 13112, FR 1999). Any species removed from its native range has the potential to become invasive. This is because within its normal range predation, disease, parasites, competition, and other natural controls act to keep population levels in check (Torchin et al. 2003; Wolfe 2002). Once released from these controls, species abundances can reach levels that interfere with or displace local fauna. Such effects may occur immediately, after some period of delay, or never be realized at all depending on the characteristics of the individual species and the conditions into which it is introduced. Successful invaders tend to be abundant over a large range in their native region, have broad feeding and habitat preferences, wide physiological tolerances, short generation times, and high genetic variability (Erlich 1989; Williams and Meffe 1999).

As an island ecosystem, SCI is particularly vulnerable to the introduction of non-native, invasive species. Non-native invasive species are a leading cause of species extinctions. Islands are more prone to invasion by alien species because of the lack of natural competitors and predators that control populations in their native ecosystems. In addition, islands often have ecological niches that have not been filled because of the distance from colonizing populations, also increasing the probability of successful invasions.

Nationwide management of invasive species is focused on non-natives which are presently having obvious and dramatic negative effects. Recent studies revealed that observed effects may range from "relatively large spatial (habitat-wide) and temporal-scale (decades) to small-scale interactions that take place in a matter of weeks" (Crooks 1998; Reusch and Williams 1998). To be effective, management actions need to understand invasions in the context of the existing and historical natural systems (L. Levin, pers. com. 2002). Some species have taken decades since introduction to become a "pest," showing that it is "potentially dangerous" to predict future status of an invader from its current status (Crooks 1998). Timing is of the essence since delays in implementing appropriate control or extirpation measures can cause the measures to be ineffective if the invading population grows too large (L. Levin, pers. com. 2002).

Maintaining native habitat should also help prevent or minimize non-native species invasions. Disturbed sites, even when disturbed temporarily for restoration purposes, show an increased number of non-indigenous species (Crooks 1998).

Once invasive species are established, at least five types of management controls can be used:

- Mechanical (through physical removal)
- Chemical (through conventional pesticides or herbicides)
- Biological (through introduction of known natural predator or parasite or disease)
- Harvest management
- Fire

Each type has associated advantages and disadvantages, and combinations of more than one can be applied.

Targeting control of the most noxious, potentially ecosystem-damaging, species in a timely fashion should also be a high priority.

3.9.7.1 Invasive Terrestrial Plants

Terrestrial plant invasions can alter ecosystems to the extent that they no longer support native ecosystem functions through an invasive species' ability to: alter soil nitrogen cycling, out-compete natives for water and light, and predispose an area to wildfire by providing fuel, among others. These changes can significantly alter vegetation structure, making it unsuitable for many native species; sensitive and declining wildlife and plant species are particularly vulnerable to these changes.

EO 13112 *Invasive Species* directs federal agencies to take actions to prevent the introduction of invasive species, monitor for their presence, and respond rapidly to eliminate them. Additional requirements to control invasives on DoD lands are incorporated in the Presidential Memorandum "Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds" (April 26, 1994). To comply, "each installation shall, to the extent practicable, conserve and protect water resources, use locally adapted native plants, avoid using invasive species, and minimize the use of pesticides and supplemental watering in accordance with the above memorandum" (DoDINST4715.03). Additionally, invasive species control at SCI is an integral part of the pest management program, as guided by the San Diego Metro Area IPMP (NAVFAC SW 2009).

Current Management

The current LCTA monitoring program monitors the status and trends for various plant communities on SCI and invasives species are documented, if identified. Monitoring is also conducted at outplanting sites, intended for habitat enhancement and restoration, and invasive species are documented as part of this effort as well. An island-wide plant list is maintained by the Navy (through SERG) and documents newly discovered non-native flora.

The prioritization of treatment locations is largely based on compliance requirements that are identified in NEPA Categorical Exclusion documents and the BO on SCI Military Operations and Fire Management Plan (2008) (Table 3-48). Annual invasive species pretreatment surveys are conducted to determine where to focus limited funds and prioritize areas in need of treatment based on requirements. Many invasive plant species have been treated for removal on SCI (Table 3-49; Map 3-35). Additional invasive species control occurred in 2011 and 2012 when the Channel Islands Restoration Group volunteered to assist in the removal of iceplant from stabilized dunes.

To prevent the transfer of invasive species from the mainland to SCI, soil and fill brought to the island are treated with herbicide before importation. Further prevention for the transfer of invasive species to the island is established through the *Do Not Plant* list maintained by the NAVFAC Southwest Botanist and Landscape Architect. The NRO also participates in a Channel Islands biosecurity planning group to discuss and develop measures to prevent non-native species from invading Channel Islands ecosystems.

The Installation Biologist and NAVFAC Southwest Botanist are part of the Channel Islands BioSecurity working group. The working groups meets quarterly to discuss issues related to BioSecurity of the Channels Islands as well as to share resources, if feasible, and knowledge of potential threats to the islands.

Assessment of Resource Management

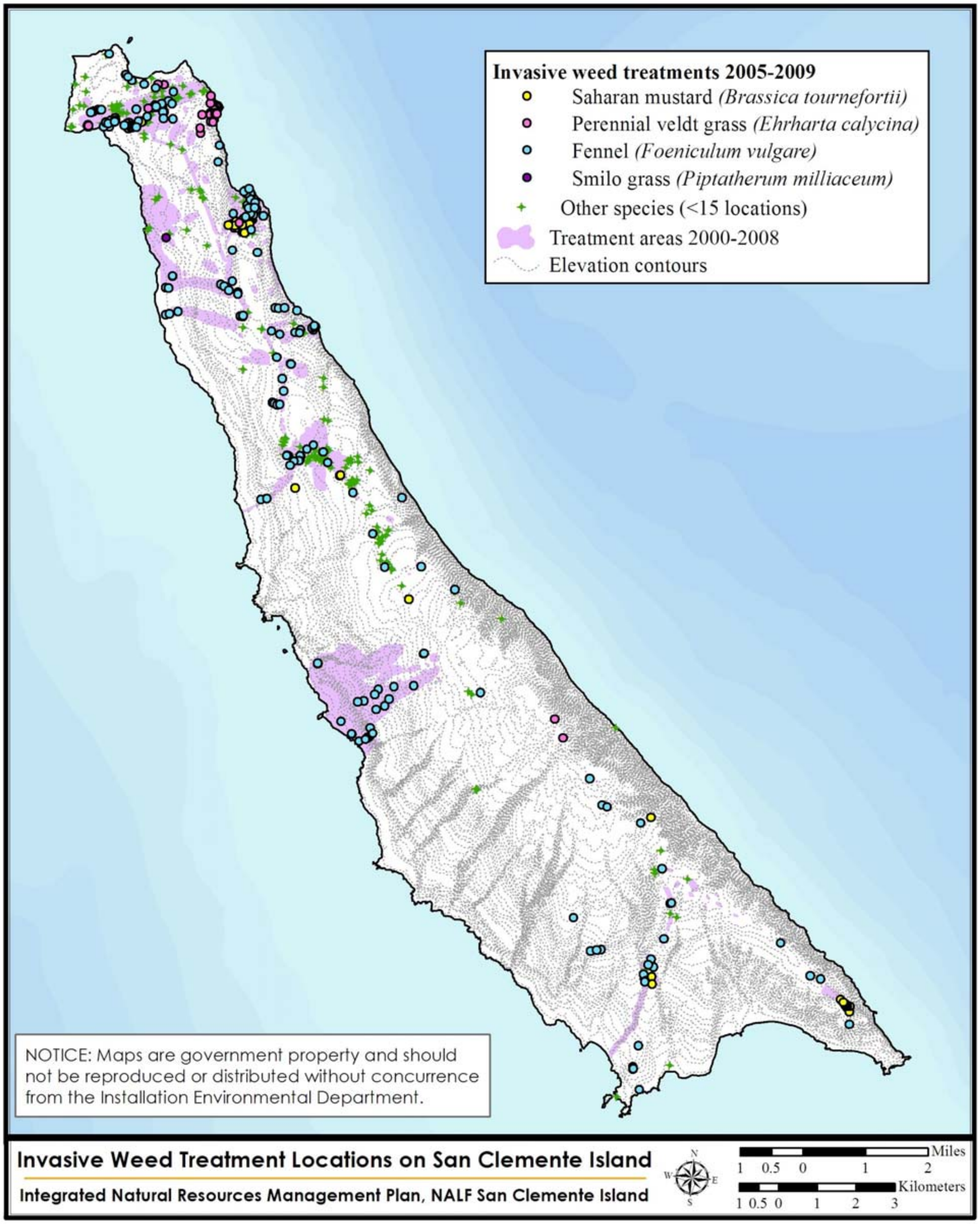
- The control and eradication of invasive, non-native species is of primary importance to natural resources management on SCI and is fundamental for the conservation of the island's ecosystems. The NRO has consistently taken necessary and important steps to develop and implement projects to control non-native flora on the island.

Table 3-48. Conservation measures for terrestrial invasive plants.

Conservation measure FMP-M-10. The Navy will conduct prescribed fire experiments to evaluate their effectiveness in controlling non-native annual plants.
Conservation measure FMP-M-11. The Navy will establish post-fire recovery plots to monitor recovery and identify new infestations of non-native invasive plants associated with both wildfire and prescribed fire.
Conservation measure FMP-M-12. The Navy will evaluate burn areas and prioritize them appropriate for inclusion in the weed eradication program, as appropriate.
Conservation measure G-M-1. The Navy will continue invasive species control on an island-wide scale, with emphasis on the AVMC, IOA, TARs, and other operations insertion areas such as West Cove, Wilson Cove and the airfield. Due to access restrictions, however, invasive species control would not be possible within the Impact Areas except TAR 21, as described in SCBM-M-1. A pretreatment survey to identify areas needing treatment, one treatment cycle, and a retreatment cycle (when necessary) will be planned each year to minimize the distribution of invasive species. The focus of the invasive plant control program will continue to be the control of highly invasive plants that have the potential to adversely impact habitat for federally-listed species in known locations and the early detection and eradication of new occurrences of such species. Where feasible, the Navy will include future construction sites in a treatment and retreatment cycle prior to construction.
Conservation measure G-M-9. The Navy will conduct monitoring and control activities for invasive non-native plant species outside of the Impact Area boundaries. Monitoring and control activities would include the China Point Road and Horse Beach Canyon Road between Impact Areas I and II. In addition, invasive monitoring and control will be conducted in TAR 21. Monitoring and control activities may be intensified as needed to prevent spread of invasive species and effects on listed species outside the Impact Area boundaries attributable to invasive species populations within the Impact Area boundaries. Access to conduct control efforts would not be limited within SHOBA outside the Impact Area I and II boundaries.
Invasive species definition. With respect to a particular ecosystem, any species, including its seeds, eggs, spores, or other biological material, whose introduction or presence may cause environmental or economic harm or harm to human health (DoDINST 4715.03)
Navy installations will prevent the introduction of invasive species and provide for their control per EO 13112. The Navy will identify actions that affect the introduction of invasive species, prevent their introduction, respond rapidly to their control, monitor populations, restore affected native species and their habitat, conduct research and develop technologies to prevent further introductions, and promote public education of the issue.
Conservation measure SCBM-M-1. The Navy will control invasive plant species in TAR 21 within the vicinity of Horse Beach Canyon and in the Infantry Operations Area along Horse Beach Canyon Road in Impact Area I to benefit the San Clemente Island bush-mallow. Specifics of the control will be developed in coordination with the Service and initiated prior to the Navy conducting the new activities proposed in the BA. Control measures will be in accordance with safety requirements.
Conservation measure AVMC-M-7. The Navy will require the following measures to reduce the potential for transport of invasive plants to the island. Prior to coming to SCI, military and non-military personnel will be asked to conduct a brief check for visible plant material, dirt, or mud on equipment and shoes. Any visible plant material, dirt or mud should be removed before leaving for SCI. Tactical ground vehicles will be washed of visible plant material, dirt and mud prior to embarkation for SCI. Additional washing is not required for amphibious vehicles after 15 minutes of self-propelled travel through salt water prior to coming ashore on SCI.

Table 3-49. Invasive species treated on SCI 2000-2009 (Soil Ecology Restoration Group Geographic Information System data, unpubl.).

TAXON	Common Name	Cal-IPC Rating
Acacia cyclops	coastal wattle	
Acacia sp.	wattle	
Acanthus mollis	Bear's breeches	
Anagalis arvensis	scarlet pimpernel	
Anredera cordifolia	mignonette vine	
Malus domestica	apple tree	
Asphodelus fistulosus	asphodel	Moderate
Brachypodium distachyon	false brome	Moderate
Brassica nigra	black mustard	Moderate
Brassica tournefortii	Saharan mustard	High
Cakile maritima	European searocket	Limited
Carpobrotus chilensis	sea fig	Moderate
Carpobrotus edulis	hottentot fig	High
Cenchrus incertus	coast sandbur	
Centaurea melitensis	Maltese star thistle	Moderate
Chamaesyce maculata	spotted spurge	
Glebionis coronaria	crown daisy	Moderate
Cynadon dactylon	Bermudagrass	Moderate
Cynara cardunculus	artichoke thistle	Moderate
Cyrtomium falcatum	Japanese netvein hollyfern	
Datura wrightii	western jimsonveed	native
Ehrharta calycina	perennial veldt grass	High
Ehrharta longiflora	longflowered veldtgrass	Moderate
Foeniculum vulgare	fennel	High
Lathyrus odoratus	common sweet pea	
Lavatera assurgentiflora assurgentiflora	island mallow	
Malva pseudolavatera	Cretan mallow	
Limonium sp.	sea lavender	
Lobularia maritima	sweet alyssum	Limited
Lythrum hyssopifolium	hyssop loosestrife	Moderate
Marrubium vulgare	white horehound	Limited
Medicago polymorpha	bur clover	Limited
Melilotus alba	white sweetclover	
Mesembryanthemum crystallinum	crystalline iceplant	Moderate
Nicotiana glauca	tree tobacco	Moderate
Oxalis pes-caprae	Bermuda buttercup	Moderate
Pennisetum setaceum	crimson fountaingrass	Moderate
Piptatherum miliaceum	smilograss	Limited
Plantago coronopus	buckhorn plantain	
Raphanus sp.	wild radish	Limited
Ricinus communis	castorbean	Limited
Schinus molle	Peruvian peppertree	Limited
Schinus terebinthifolius	Brazilian peppertree	Limited
Schismus arabicus	Arabian schismus	Limited
Silene gallica	common Mediterranean grass	Limited
Sinapis arvensis	charlock	Limited
Sisymbrium orientale	indian hedge mustard	
Tamarix ramosissima	tamarisk	High
Tragopogon porrifolius	purple salsify	
**These are outplanted individuals of the non-native (to SCI) variant of island mallow, which are beeing eradicated to maintain genetic status of native variant*		



Map 3-35. Invasive weed treatments locations 2000-2009 on San Clemente Island.

- Currently, all five strategic goals identified in the 2008–2012 National Invasive Species Management Plan are being implemented at SCI. The basic framework of 1) Prevention, 2) Monitoring and Early Detection, 3) Rapid Response and Eradication, 4) Long-Term Control and Management, 5) Education and Outreach, 5) Restore high-value ecosystems across scales, and 6) Organizational Collaboration is well established on a national level and is also reflected in California's existing Pest Prevention Program and Weed Plan. This prioritization, applied to both species and areas, should be reflected in the amount of resources being requested to support invasive non-native species management at SCI.
- Prevention of invasions is the single most cost-effective and environmentally beneficial management approach. Prevention measures to avoid the invasion of non-native species are implemented at SCI. However, compliance with these measures are unknown. The NRO should focus educating on-island personnel about the importance of complying with conservation measures and BMPS and stay up-to-date on potential regional invasion threats.
- Measures to prevent the introduction of invasive species have been implemented on SCI; however, to add another level of prevention at SCI, the NRO should identify high risk locations and vectors for non-native species invasions. Since it is difficult to predict species that will invade an area and their ecological impact, analyzing the risk of specific vectors represents a critical first step in preventing invasions. Clearly identifying vectors and locations where species arrive and developing Standard Operating Procedures from this information would help to prioritize resources.
- Although invasive species are managed by the NRO, strategies to prevent and control non-native species on SCI are carried out by many departments on the island. Management of invasive species should be discussed among the NRO and other departments on SCI to properly and efficiently manage non-native species invasions on SCI.
- SCI does not currently (2013) have a BioSecurity Plan. Necessary and important efforts are being made by the Installation Biologist to acquire funds for fiscal year 2014 and onward to develop and implement a BioSecurity Plan for the island. The development and implementation of a BioSecurity Plan will help to prevent detrimental impacts to the island ecosystems from non-native plants.
- Future management strategies to control non-native species on SCI should begin to include measures to reduce the impacts anticipated to occur as a result of climate change. Climate change has the potential to interact with invasive species as a stressor to healthy conditions through multiple mechanisms (EPA 2008) and together they may negate improvements from habitat restoration.

Management Strategy

Management objectives and strategies in this INRMP build upon the framework discussed in the 2008–2012 National Invasive Species Management Plan.

Objective: *Minimize the risk of ecological damage to SCI species and habitats through the basic framework of 1) prevention; 2) early detection with rapid response; 3) eradication and control spread, 4) long-term control through integrated planning and restoring natural habitat resilience to invasion, 5) education and outreach, and 6) organizational collaboration.*

I. Prevent the introduction of terrestrial non-native plant species to SCI.

A. Characterize potential non-native species invasions by identifying species that may arrive and pathways that may facilitate their arrival. Include pests such as the gold-spotted oak borer and sudden Oak Death pathogen. Gather descriptions of life histories, invasive range, control options, and cost of control.

B. Prepare and implement a Bio-security Plan to prevent non-native species from invading and spreading on SCI.

C. Ensure compliance with conservation measures to prevent the introduction and spread of non-native species.

D. Implement proposed measures to minimize impacts of AVMC, Assault Vehicle Maneuver Road, AVMA, AFPs, AMPs, IOA, and Amphibious Landing Sites as directed by the BO on Military Operations and Fire Management Plan (2008):

1. AVMC-M-7. The Navy will require the following measures to reduce the potential for transport of invasive plants to the island. Prior to coming to SCI, military and non-military personnel will be asked to conduct a brief check for visible plant material, dirt, or mud on equipment and shoes. Any visible plant material, dirt or mud should be removed before leaving for SCI. Tactical ground vehicles will be washed of visible plant material, dirt and mud prior to embarkation for SCI. Additional washing is not required for amphibious vehicles after 15 minutes of self-propelled travel through salt water prior to coming ashore on SCI.

E. Conduct inspections of gravel and fill materials that are brought to the island to verify that they are not carrying non-native plants or material.

F. Use only native plants grown in the island nursery from seeds collected on SCI for outplanting.

G. Inspect barge and aircraft for non-native plant species material before arriving to and leaving SCI.

H. Periodically update and distribute the list of known invasive non-native species found on SCI. Share list with other Channel Islands natural resources managers.

I. Evaluate the island's list of non-native species for prioritization of their potential to become invasive.

J. Develop, assess, and revise contract scope language to explicitly define measures that prevent the introduction of invasive non-native plant species.

K. Prepare educational materials for SCI military and civilian employees, contractors, and other visitors to prevent the introduction of non-native terrestrial species.

II. Assess the risk of introduction of potentially invasive species and prioritize those that will be targeted for prevention, control, and/or managing the consequences of invasion if established.

A. Understand the basic biology of existing non-native species that have the potential to become invasive or alter habitats. Determine habitat requirements, native predators and parasites, food requirements, and other life history requirements. Analyze native-invasive species interactions. Identify use of non-natives by native wildlife (such as insect use of plants).

B. Identify invasive species that are impacting wildlife species important to key ecosystem processes (such as fire).

C. Establish prevention protocols for each targeted non-native species based on: 1) degree of risk of introduction; 2) degree of potential harm to protected species or habitats; 3) the effectiveness of potential prevention measures; and 4) cost.

III. Use early detection and rapid response to initially address non-native species invasions. Ensure a bio-security plan establishes early detection protocol and rapid response options.

A. Identify vectors and locations of introduction, such as roads and equipment.

B. Implement ongoing natural resources programs and other conservation measures to monitor, avoid, and/or minimize potential impacts to federally-listed species as directed by the BO on Military Operations and Fire Management Plan (2008):

1. G-M-9. The Navy will conduct monitoring activities for invasive non-native plant species outside of the Impact Area boundaries. Monitoring and control activities would include the China Point Road and Horse Beach Canyon Road between Impact Areas I and II.

C. Identify areas that require special management attention, such as those occupied by special status species, outplanting sites, post-construction sites, or those currently not affected by non-native species. Also, these could be likely problem areas, such as areas of soil disturbance, recently burned areas, West Cove, Wilson Cove, or the harbor.

D. Conduct non-native species related inventories to establish a current condition baseline that promotes the analysis of trends. Integrate existing long-term monitoring data. Continue the annual pre-treatment survey.

E. Establish monitoring locations with a high probability to detect invasive species introduction and spread.

F. Continue to use both ongoing incidental observations as well as regular monitoring to identify current and new introductions. Incidental observations should be verified by NRO. Record these data into a GIS database. Record the results of all species monitoring for the presence of new non-native species on an annual basis.

G. Develop a communication network as a rapid response tool to quarantine specific invaders and identify the pathway.

H. Give appropriate personnel (i.e., employees, contractors, lessees) non-native plant recognition training and materials. Prepare invasive species educational materials for SCI users with pictures to appropriately identify those that pose threats.

I. Determine funding sources, contract vehicles, and cooperative mechanisms that can be accessed quickly.

J. Prepare and implement measures to prevent the introduction of non-native species, detect early and respond rapidly to new introductions, and control and monitor established populations.

IV. Provide long-term control and manage the spread and environmental consequences of non-native species invasions.

A. Evaluate an introduced species for its effect on the island's ecosystem. Determine its potential to become invasive, based on case histories in other areas. Determine negative and positive effects on native species and habitat.

B. Identify and prioritize the best available techniques to eradicate or reduce non-native species. Minimize effects to non-targeted species.

C. Control the spread of invasive plants with priority on those with the greatest potential to negatively impact sensitive species or degrade habitat. Follow invasive species control with habitat rehabilitation, where appropriate and feasible.

- ***D.*** Ensure that non-native plant control efforts do not pose a threat to sensitive habitats and species. The scope of work for invasive plant management contracts should include language detailing control activities allowed or not allowed in sensitive species habitat areas. Do not apply pesticides or herbicides in areas with known or potential sensitive wildlife. Update “no-spray” areas, as needed. Provide information on “no-spray” areas as well as current locations and distributions of sensitive wildlife to relevant SCI personnel and contractors. Maps should outline areas that are sensitive or restricted. Non-native plant control that is carried out in areas with sensitive species should be carried out by adequately trained and supervised contractors/personnel to avoid negative impacts to the sensitive species and their habitat. Efforts to control invasive weeds should ideally begin in the fall/winter outside of the breeding season for birds, and at a time when the weed species are in non-growth phases and more susceptible to herbicide application.
- ***E.*** Secure areas of removal to ensure re-growth does not occur.
- ***F.*** Invasive species control measures that involve ground disturbance should take into consideration potential presence of cultural resources. Coordinate with appropriate NAVFAC Southwest cultural resources staff before implementing such measures.
- ***G.*** Pest management and invasive species control practices should not conflict with or counteract benefits achieved from natural resources management activities conducted at SCI.
- ***H.*** Control measures must use Integrated Pest Management approaches and comply with the Metro Area IPMP (NAVFAC Southwest 2009). Ensure the implementation of the pest management program administrative requirements applicable to invasive species and their control as presented in the current IPMP.
- ***I.*** Continue investigating the best methods for removal, control, and timing of removal of invasive non-native plants and ensure compliance with applicable regulations regarding removal.

V. Establish project-level Standard Operating Procedures to manage the potential for invasion and control the spread of existing invasives.

- ***A.*** Include prevention and minimization measures in ground disturbing project plans and associated NEPA documents. In conjunction with the environmental analysis process, assess ground-disturbing projects and any projects that alter plant communities to determine the risk of introducing invasive weeds. For projects having moderate or high risk, provide positive management measures as indicated in a Risk Assessment.
- ***B.*** Ensure funding is secured for non-native species removal during all phases of a project (including post-project), if applicable.
- ***C.*** Monitor projects to ensure personnel are following requirements regarding non-native species.
- ***D.*** Provide oversight to ensure that project personnel are following contractual guidelines identified in the scope of work.
- ***E.*** Enforce invasive species control measures at construction sites or sites of routine ground disturbance that may foster invasions. Restoration, construction, and mitigation plans should include contingencies for removing invasives as they appear and for implementing new control measures as they become available.

F. Promote native perennial species while controlling non-natives species in construction rehabilitation plantings.

VI. Promote invasive species control in the planning and implementation stages of routine maintenance practices in all departments on the island.

A. Manage roads and access routes to minimize the spread of invasive non-native species. Ensure that new road or access routes are not created without authorization and project review approval. Wherever feasible, ensure that maintenance or repair of existing roads remain within established footprints. Schedule roadside mowing to minimize weedy species seed distribution. Clean roadside mowing equipment between mowing cycles.

B. Conduct mowing and grounds keeping to avoid invasions and minimize the spread of invasives. Avoid mowing that cuts vegetation to a height of less than four inches to prevent providing a competitive advantage to invasive species nearby or that are already established in roadsides. Prohibit *scalping* of roadsides, a practice which removes all vegetation and disturbs the soil surface. Manage the Air Operations Area to minimize the spread of invasive non-native species. Clean mowing equipment between mowing cycles.

C. Conduct landscaping practices to avoid invasions and minimize the spread of invasive species. Require that plant species native to and grown on SCI be used for landscapes adjacent to developed areas.

D. Educate SCI personnel and contractors that establish informal gardens in developed areas of SCI about the need for invasive species control, potential for introduction of invasives in seed packets and in the potting soil of container plants, and containment of horticultural plantings. Prohibit the planting of invasive horticultural plants. Produce a brochure and Instruction.

VII. Develop and implement an ecologically-based, integrated, programmatic invasive non-native plant management plan that functions across disciplines and departments and as an element of a bio-security plan described above.

A. Promote practices that protect and enhance terrestrial ecosystems. Control invasive species with restoration techniques and habitat management. Maintain ecological processes, such as disturbance regimes, hydrological process, and nutrient cycles, to the extent practicable (DoDINST 4715.03) by restoring the health of soil, hydrologic cycles, and composition of natural communities.

B. Promote and facilitate management strategies that reduce the long-term dependence on herbicide-based invasive species control programs. Habitat enhancement and restoration should be an integral part of invasive species control in suitable areas.

C. Integrate stormwater, roadside management, invasive species control, and management focus species objectives.

D. Consider beneficial pollinators as part of a broader ecosystem approach. Improve native conditions of managed vegetation, where feasible, to support beneficial pollinators, native wildlife, and reduce and control the spread of invasive species.

E. Control invasive species while planning for an appropriate fire regime. Experiment with prescribed fire as an appropriate and effective tool for controlling invasive annual plants that are pervasive in the environment.

1. FMP-M-10. The Navy will conduct prescribed fire experiments to evaluate their effectiveness in controlling non-native annual plants.

2. FMP-M-11. The Navy will establish post-fire recovery plots to monitor recovery and identify new infestations of non-native invasive plants associated with both wildfire and prescribed fire.

F. Implement ongoing natural resource programs and other conservation measures to monitor, avoid, and/or minimize potential impacts to federally-listed species as directed by the BO on Military Operations and Fire Management Plan (2008).

1. SCBM-M-1. The Navy will control invasive plant species in TAR 21 within the vicinity of Horse Beach Canyon and in the Infantry Operations Area along Horse Beach Canyon Road in Impact Area I to benefit the San Clemente Island bush-mallow.
2. G-M-1. The Navy will continue invasive plant species control on an island wide scale, with an emphasis on the AVMA, the IOA, TARs, and other operations insertion areas such as West Cove, Wilson Cove and the airfield. Due to access restrictions, however, invasive species control would not be possible within the Impact Areas except in TAR 21, as described in measures SCBM-M-1.
3. G-M-9. The Navy will conduct control activities for invasive non-native plant species outside of the Impact Area boundaries.

G. Priorities should be updated on a yearly basis to reflect changes in conditions and effectiveness of previous efforts.

VIII. Continue to update the Invasive Non-Native Plant Management Plan. Evaluate current best practices to assess if they are adequate and enforced. Monitor treated sites by comparing to a control site to determine effectiveness of invasive species control and contribute to adaptive management. The monitoring component should specify an accepted standardized method to ensure accuracy and consistency.

IX. Support partnerships and organizational collaboration to increase the capacity of environmental staff to manage the threats terrestrial invasive plant species pose to the integrity of SCI's terrestrial ecosystems. Support the integration of SCI into the Invasive Species Task Force on Santa Cruz Island and other Channel Islands as opportunities arise. Become a partner in the California Interagency Noxious Weed Coordinating Committee. Coordinate invasive species control actions and consider using volunteer groups like the CNPS and California Invasive Plant Council.

X. Prepare an Instruction to support an adaptive management approach for terrestrial invasive species management.

3.9.7.2 Marine Invasive Species

Common pathways for marine invasive species introduction into non-native habitats include ship ballast water, hull fouling, commercial and recreational fishing, trade in live organisms, construction in aquatic environments, and water delivery and diversion system (CDFW 2008).

Large vessels add or reduce ballast water to improve stability, trim, maneuverability, and propulsion. Marine organisms, including plankton, invertebrate and fish larvae, and algal species, are regularly transported by transiting vessels and released with ballast water (Carlton and Geller 1993; Cohen and Carlton 1995). Estimates suggest that more than 7,000 species are moved around the world in ballast water alone (Carlton 2001). In 2005, 9.1 million metric tons of ballast water was reported to have been discharged in the state of California waters (Falkner et al. 2006).

In addition to ballast water discharge, hull fouling also serves as a pathway for marine invasive species introductions (Thresher 1999; Hewitt 2002). Barnacles, seaweeds, anemones, and sea squirts with sedentary life stages can attach themselves to the hulls of vessels, while more mobile species, such as shrimp, worms, and sea snails, may hide in crevices created by larger fouling species (Takata et al. 2006). These organisms can survive for extended periods of time once secured to the hull of a vessel. In an expansion of California's ballast water management program, recent legislation directed a team of technical advisors to create recommendations to prevent introductions through vessel fouling, among other non-ballast shipping vectors (CDFW 2008).

Fishing is another method of marine invasive species introductions. These introductions can occur when bait buckets and live tank contents are dumped into the water. Gear used for fishing can also spread marine invasive species if used in multiple locations spanning large spatial scales.

The shipment and importation of non-native fishes and invertebrates for live bait, seafood, and aquariums can also cause the introduction of marine invasive species. The importation of live seafood is important to the economy but may result in the intentional or unintentional release of live organisms and possible parasites and pathogens. The aquaculture industry in California is one of the most diverse in the United States; however, there are concerns related to water quality impairment, the growth and distribution of pathogens, the escape of non-native species, and genetic mixing of wild and farm-raised species. Concern regarding the release of aquarium species, which are often times genetically engineered to increase their ability to live in harsh aquarium environments, pose an ecological concern from release, and subsequent competitiveness with endemic marine species. *Caulerpa taxifolia* is perhaps the most recognized example of an aquarium marine invasive species introduction into California waters.

There are many types of in-water construction activities that are employed to support the Navy's mission, most notable are, the rehabilitation or construction of piers. Construction activities and the equipment used can transfer and introduce marine invasive species during these operations. Vessels supporting construction activities are a potential vector for marine invasives species (similar to the previous discussion on ballast water). Also, the building of canals, channels, and aqueducts can create an artificial connection between waters naturally separate by physical barriers; this can lead to species movements from one area to another.

Lastly, water delivery, export, and transfer can move marine invasives species from one area to another. For example, the California Aqueduct has transported a number of species, both native and invasive (CDFW 2008). Due to the distance from other land water sources, this is not an important issue for management. However, treated water is imported to the island for human use and consumption, and therefore poses only a minor threat for marine invasive species introductions.

As movement between oceanic areas become more common, researchers warn that marine invasive species introductions will continue to appear at an ever-escalating rate. To address this, the expansion of California's ballast water management program has directed a team of technical advisors to create recommendations to prevent introductions through vessel fouling, among other non-ballast shipping vectors (CDFW 2008). Furthermore, California

Fish and Game Code § 2271 and § 6400 make it illegal to release invasive organisms into California waters via ballast dumping or any other means, with penalties up to $5,000 and one year in jail for each violation (Cohen and Carlton 1998).

To date, anti-fouling bottom paints rely heavily on copper as an additive to reduce bio-fouling potential. The use of copper in boat paints can have sever effects on surrounding water quality from maintenance activities (e.g., hull fouling) and can contribute to metal accumulation in sediments. A notable example of this problem is evident in Shelter Island, San Diego Bay, which is currently the focus of a total Maximum Daily Load for metals in sediments by the San Diego Regional Water Quality Control Board. However, with the support of paint manufacturers, several agencies are currently working on effective, environmentally safe anti-fouling bottom paint alternatives (e.g., copper free) that could help minimize the attachment of organisms to boat hulls while reducing the potential for metal accumulation in sediments.

Uniform National Discharge Standards are currently being developed for Armed Forces vessels. Phase I (of three phases), published in 1999, determined which discharges will be required to implement control measures, by using a marine pollution control device, and which discharges will not require controls (40 CFR Chapter VII).

In May 2007, Dr. Jack Engle completed a survey in the Channel Islands, including SCI, to investigate the presence of the invasive algal species *Sargassum horneri*. A single mature, 6.5-foot (2-m) long individual was discovered near NOTS Pier, and a large patch of mature plants in a small cove was found just northeast of Pyramid Cove, both on the leeward side of the island (Murray 2007).

Current Management

Marine invasive species are managed on SCI through requirements from: EO 13112, ESA, National Environmental Policy Act, National Invasive Species Act of 1996, and Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990.

The National Invasive Species Act of 1996 mandates the establishment of an Armed Forces Ballast Water Management Program to prevent marine invasive species introduction. OPNAVINST 5090.1C states that “if it is necessary for a surface ship to load ballast water…within 3 nm of shore, the ship shall pump the ballast water when outside 12 nm from shore.”

CDFW is the lead agency for managing marine invasive species occurring in nearshore waters of SCI. CDFW has developed an Aquatic Invasive Species Management Plan (CDFW 2008) that includes management actions and a rapid response plan. The primary authority for state efforts to prevent and manage aquatic invasions are established from California’s Fish and Game Code, the Food and Agriculture Code, and the Public Resources Code. The CDFW has identified the following as regulated marine invasive species: European green crab (*Carcinus maenas*), Asian overbite clam (*Corbula amurensis*), *Caulerpa taxifolia*, and dwarf eelgrass (*Nanozostera japonica*). Emerging species of concern include the invasive algal *Undaria japonica* and pathogens (whirling disease and *Ceratomyxa*, which are associated with disease in fish species).

Past survey efforts have focused on surveying for the aggressive invasive alga *Caulerpa taxifolia* in Wilson Cove as a result of bottom disturbance from vessel traffic. Other invasive alga surveys have identified *Sargassum horneri* and *S. muticum* in nearshore waters of SCI. For more information on rocky intertidal monitoring, see Section 3.8.1.2 Rocky Intertidal and Surfgrass.

Continual intertidal and subtidal monitoring is currently the only method to regularly identify invasive species in nearshore areas of SCI. Safety zone surveys planned for Fiscal Year 2012 to monitor intertidal and subtidal habitat will capture the presence/absence of invasive species.

A project planned for Fiscal Year 2014 will complete an initial study of non-native marine species at SCI. This project will include: scientific literature review of collections records and unpublished biological data, re-examination of collected specimens, and limited field work. Data gathered will be assembled into a regional database for non-native species of SCI. A five-day rapid assessment survey will be conduct around SCI and will be completed every five years. Diving surveys of targeted areas will be conducted annually between the rapid assessment years.

Assessment of Resource Management

- Marine invasive species surveys have focused on identifying marine alga while marine invertebrates have largely been identified only during specific project surveys. Surveys should focus on identifying the European green crab and Asian overbite clam, as well as continue to identify potential *Caulerpa taxifolia* introductions.
- Dwarf eelgrass has been identified as a regulated invasive species with CDFW and should be a focus species for invasive species surveys.
- Monitoring should continue of known invasive *Sargassum* sp. on the island.
- Current monitoring to capture the potential presence of marine invasive species through rocky intertidal monitoring does not adequately and quickly capture introductions due to the limited survey area. Safety zone surveys planned for Fiscal Year 2012 will capture potential invasive species and increase the monitoring footprint to more thoroughly survey nearshore waters for marine invasive species.
- The initial study of non-native species at SCI planned in Fiscal Year 2014 will aid in the establishment of data for marine invasive species in nearshore waters of SCI. This study will also support compliance with EO 13112 through early detection of marine invasive species.

Management Strategy

Objective: *Reduce the introduction of invasive marine species by focusing on early detection and rapid response.*

I. Develop and maintain programs that promote early detection, rapid response, and long-term control of marine invasive species in nearshore waters of SCI.

  A. Monitor progress, evaluate effectiveness, and complete the revision of programs, as needed.

II. Develop a standardized monitoring system focused on early detection and rapid response for marine invasive species.

   A. Determine habitat and food requirements, native predators, and other life history characteristics of marine invasive species.

   B. Analyze native-invasive species interactions.

III. Develop a database for marine invasive species on SCI.

   A. Map the existing problem areas and determine priority sites and control measures.

IV. Conduct marine invasive species surveys on an annual basis to adequately monitor invasions and respond to new invasions quickly.

   A. Focus surveys to identify the European green crab, Asian overbite clam, non-native *Sargassum* spp., and dwarf eelgrass.

V. Develop a means to educate on-island personnel about the common marine invasive species' pathways, including transportation by barge, boat, and humans.

   A. Emphasize the importance of compliance with protocols to prevent the transfer of invasive species by barge.

VI. Collaborate with regional partners to minimize and prevent the introduction and spread of marine invasive species.

VII. Develop efficient and effective methods for detections new marine invasive species.

   A. Integrate invasive species response planning with oil spill contingency plans.

3.9.7.3 Non-Native Terrestrial Wildlife

The introduction of goats, sheep, pigs, and cattle over the past century had a devastating effect on the biological integrity of the entire island. These animals have since been removed from SCI, but some of the island's flora and fauna are still recovering from the effects of these non-native feral grazers. The introduction of feral cats and black rats has hindered population recovery of native fauna. It is thought that the black rat, known nest predators of the loggerhead shrike and sage sparrow, was introduced to SCI after 1941 since intensive trapping efforts from 1939–1941 by the Los Angeles County Museum of Natural History found no individuals on the island (P. Collins, pers. com. 2012). Recent studies demonstrate that rats are having a greater impact on listed bird species than previously thought, particularly juvenile sage sparrows (Docherty et al. 2011). Cats were likely introduced to SCI during sheep ranching and are now found in most habitats (USFWS 1984). Cats consume large numbers of island night lizards and pose a threat to island bird species. Feral cats are thought to have a larger impact on listed species in years with lower rainfall when alternative food sources, including rodents, are not readily available (Biteman et al. 2011, 2012). A policy letter was released (10 January 2002) requiring Navy commands to proactively prevent the establishment of feral cats and dogs (Appendix D). The house mouse, introduced to SCI along with ranching activities (Cohen 1979), may also have an effect on nesting bird species, but the extent to which this occurs is unknown.

Invertebrates also pose a threat to the sensitive island. The Argentine ant (*Linepithema humile*) was conclusively documented during surveys of the island specifically targeted to determine the distribution of this invasive species on SCI (Holway and Ward 2011). While the species appears limited to three distinct areas on the northern tip of the island, there is evidence that the population is expanding in at least one of these. Without safeguards against their establishment and spread into sensitive habitats, they could seriously threaten the persistence of native invertebrates and possibly reduce reproductive success of these two listed bird species. In addition, some mainland snail species may pose a threat to SCI's endemic snail species if they were introduced to the island.

DoDINST 4150.07 establishes the DoD Pest Management Program and describes its general requirements. The Instruction requires a comprehensive Pest Management Plan be completed for each installation and discusses the need to control pest outbreaks, which affect the military mission, damage property, and/or impact the welfare of people. For the purposes of this INRMP, a pest is defined as a domestic plant or animal (including insects) usually found in the urban (built) environment that causes harm to humans or native ecosystems if it escapes. OPNAVINST 6250.4B outlines the Navy's policies and procedures for implementing pest management programs. In addition to policies outlined in the DoD directive, it includes guidelines “to enhance the natural environment…to maintain optimal biodiversity.” This directive, in conjunction with OPNAVINST 5090.1C CH-1, also requires that the use of pesticides comply with applicable regulations to prevent pollution. Additional policies limit the establishment of feral cat and dog populations (Navy Policy Letter Preventing Feral Cat and Dog Populations on Navy Property 5090, Ser N456M/1U595820, 10 Jan 2002) and prohibit cats from running loose on NBC, which includes SCI (NBC Instruction 5100.2G).

Current Management

The San Diego Metro Area IPMP includes SCI as one of the installations covered under this plan (Navy 2009d). In addition, feral cats and non-native rodents are managed as part of the Predator Research and Ecosystem Management project. Efforts to control and suppress these populations are critical for the recovery of the San Clemente loggerhead shrike and San Clemente sage sparrow, as well as the recovery of island ecosystem function. However, access restrictions (for safety) and the need to conserve the island fox makes eradication of rats and cats infeasible with current available technology. Historically, most effort in controlling predation by rats was in areas known to be used by shrikes with limited rodenticide application in sage sparrow habitat. In 2012, efforts were expanded to include sage sparrow habitat as a focus area for rodenticide application. Rodenticides used to control the rat population are also thought to be effective in managing the population of house mice on a local level.

Argentine ants, a non-native species, are another potential nest predator of the San Clemente loggerhead shrike and San Clemente sage sparrow. An opportunity currently exists to eradicate them from the island while their distribution is still limited. Although there is some management in the IPMP addressing control of invasive ants, a project is currently planned for their removal.

Non-native snails, whose distribution on SCI is unknown, may compete with or pose threats to native snail populations. In addition, anecdotal records documented the arrival of a gopher snake in 2006 (IWS, unpubl. data). While these animals do not occur now on SCI, their establishment could be devastating, as has been demonstrated by the brown tree snake (*Boiga irregularis*) in Guam.

Assessment of Resource Management

- Topographic (safety) and access constraints within Impact Areas limit the effectiveness of the Predator Research and Ecosystem Management Program in controlling rats and cats.

- There are still some gaps in SCI's pest and predator management programs, particularly regarding the distribution of non-native snail species.
- Continued studies on feral cat and black rat ecology, including habitat use, movements, and home range size, is needed to assist managers in targeting control efforts.
- Current projects do not adequately assess the impacts of house mice on endemic species.
- Population effects for accidental take of the native San Clemente Island deer mouse during efforts to suppress rat and house mouse populations are not well understood. Studies should be conducted to ensure this native population is not adversely affected.
- Eradication of argentine ant populations may still be possible given their current limited distribution. Planned efforts to eradicate the species will increase ecosystem integrity on the island.

Management Strategy

Objective: *Control non-native predators on SCI to conserve ecosystem balance and minimize impacts to listed species.*

I. Reduce the population of existing pests and prevent the introduction of additional species to the island while avoiding and minimizing impacts to non-target individuals.

II. Support the IPMP's framework to meet the DoD's annual goals or measures of merit. Continue to integrate INRMP activities with guidelines of the IPMP with respect to animal damage control.

- ***A.*** Periodically check that pesticide applicators are appropriately certified. See Section 2.4 of the IPMP for training and certification requirements.
- ***B.*** Maintain regulatory compliance. DoD policy is to ensure pest management programs achieve, maintain, and monitor compliance with all applicable EOs and applicable federal, state, and local statutory and regulatory requirements. When there is a conflict between federal and local regulations, the installation will comply with the more stringent of the two.

III. Minimize, to the greatest practical extent, the introduction of pest species to SCI.

- ***A.*** Continue the prohibition on bringing pets to the island.
- ***B.*** To the extent feasible, require all barge and air cargo shipments implement biosecurity measures to avoid and/or minimize the likelihood of importing non-native animals.
- ***C.*** Establish an enforcement protocol for barge and air cargo shipment inspections. Integrate non-chemical treatments into protocols, consistent with the IPMP. For example, sanitation, traps, and exclusion shall be the primary means of non-chemical control in and around structures. Low toxicity insecticidal baits are used for effective control of cockroaches and ants.
- ***D.*** To the extent feasible, avoid and/or minimize the possible transportation of non-native invertebrates in soil or gravel through treatment and inspection.
- ***E.*** Require refuse and shipping bins to be inspected before transportation to SCI.

IV. Continue to develop and implement a Biosecurity Plan containing specific measures to identify and reduce threats to listed species, reduce the arrival of non-native species, and promote early detection of new arrivals.

V. Conduct a risk assessment of non-native mammals able to survive on CCNM offshore rocks to determine if the islands might serve as unintended refuges for non-native mammals (e.g., black rat) that might undermine efforts to control non-native mammals on SCI.

VI. Continue efforts to suppress feral cat and black rat populations to the maximum extent feasible.

A. Continue existing efforts to control and monitor feral cat and rat populations on SCI.

B. Complete investigations of feral cat habitat use, movements, and home range size utilizing radio telemetry of a small portion of the feral cat population.

C. Document home range size of black rats using radio telemetry. The results of this study will support more effective control of this species.

D. Develop additional methods beyond spotlighting, leg hold trapping, and spot lighting, including but not limited to testing the use of automated camera systems, and Forward Looking Infrared technology for the removal of feral cats.

E. Enforce the policy prohibiting the feeding of feral cats on SCI.

F. Investigate the potential impact of non-native rodent control methods to the San Clemente Island deer mouse.

VII. Quantify populations of the three different rodents (black rat, house mouse, and San Clemente Island deer mouse) on SCI to estimate habitat and species-specific rodent densities. Only the San Clemente Island deer mouse is a native mammal.

VIII. Document the extent of the existing Argentine ant population and take steps to eradicate it before it expands into new areas. Following eradication, implement a surveying and monitoring program to reduce the threat of re-infestation.

3.10 Landscaping and Grounds Maintenance

Current Management

Legal drivers for landscape and grounds maintenance include the Sikes Act (as amended), OPNAVINST 5090.1C CH-1, NAVFAC P-73 Vol. II, EO 13112 (Invasive Species), EO 13514 (Federal Energy Management), EO 13423 (Strengthening Federal Environmental, Energy, and Transportation Management), and the Presidential Memorandum of April 1994 *Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds*. These requirements cover both maintenance of the existing landscape and development of new landscapes; they also intersect with sustainability, water resources management, and climate change. EO 13112, EO 13514, and EO 13423 directs federal agencies to implement landscaping policies that: include the use of native plants, minimize adverse effects to the natural habitat, reduce use of fertilizers and pesticides, and implement water-efficient practices, among others.

Current management of landscaping and grounds maintenance at SCI conforms with guidance from the NBC Landscape Plan and is directed by NBC Public Works Department with input from NRO. Island directives require that all plants used in landscaping must to be native and grown in the on-island nursery from seeds collected on the island. All landscape plans and plants are approved by the NRO botanist.

Landscaping occurs around several facilities on the island, and it is anticipated that future landscaping will be developed to accompany the facility renovations near Wilson Cove.

Assessment of Resource Management

- The implementation of landscaping and grounds maintenance practices at SCI has been inconsistent with Navy requirements and the NRO input or oversight.
- The scope of work within the general NBC landscaping contract defines the working parameters and requirements and does not adequately address SCI vulnerabilities as an ecologically distinct island, nor requirements of EO and DoD guidance.
- Updated landscaping practices should benefit the environment and generate long-term cost savings.
- The use of native plants protects natural heritage and provides wildlife habitat in addition to reducing fertilizer, pesticide, and irrigation demands and their associated costs. However, there is currently no mechanism for funding native landscaping plants produced by SERG.

Management Strategy

Objective: *Improve the visual and aesthetic environment for both civilian and military personnel living, working, or visiting SCI while avoiding the introduction of invasive species, decreasing water use, and improving drought tolerance of plant communities.*

I. Comply with the laws, EOs, and Navy policies regarding landscaping.

- ***A.*** Update Landscaping Plan and Instruction that outlines implementation of an appropriate landscaping and grounds maintenance program consistent with EO 13123 and EO 13112. Implement Low Impact Development projects where feasible and use landscaping in an integrated fashion to reduce energy use and enhance wildlife habitat values where possible.
- ***B.*** Plan new facilities in coordination with existing and new landscaping guidelines and consult with the NRO botanist prior to finalizing planning or cost estimates. Low maintenance plants should be used whenever possible and all landscaping should conform to the Base Exterior Architectural Plan, also known as the Installation Architecture Plan.
- ***C.*** Ensure mowing does not foster weeds due to poor timing.
- ***D.*** Ensure compliance with the Integrated Pest Management principles and the NBC IPMP.
  - *1.* Review the Grounds Maintenance Contract for consistency with recent EOs or Navy policy and this INRMP with respect to:
    - *a.* Animal damage control.
    - *b.* Invasive plant control in wildlands, including the application and reporting of approved pesticides and entering all chemical and manual treatments into the Navy Online Pesticide Record System, and the form for Pesticide Use and Approval.
    - *c.* Integrating non-chemical treatments into invasive species management.
    - *d.* Achieving the IPMP objective to “Enhance the natural and artificial environment through removal of pest plants.”
  - *2.* Ensure that these requirements are communicated to on-the-ground staff.

E. Use landscaping design to benefit the human working environment by moderating environmental influences (e.g., solar heat gain, glare, dust, and wind), conserving energy, protecting water quality, preventing soil erosion, reducing glare, improving visual aesthetics, providing wildlife habitat, and unifying exterior spaces. Where noise buffering is necessary, this should be done with solid material, such as concrete block Sikes Act (as amended).

1. Plant windbreaks and hedgerows for wind deflection and dust control. Innovative landscaping practices, such as planting native shade trees around buildings to reduce air conditioning demands, provides measures to meet the energy consumption reduction goal established in EO 13123.

2. Use landscaping to define edges and buffer areas that are incompatible with the surrounding use.

II. Use native plants propagated from the island's genetic stock.

A. Use plant selection criteria (See Appendix G) that integrate the full range and richness of plants acclimated and appropriate for use.

B. Remove and eliminate invasive plants in landscaping using an integrated pest management approach.

III. Avoid grounds keeping practices that may affect sensitive species, such as mowing natural areas where these species occur.

A. Comply with the MBTA during native vegetation removal.

1. Avoid disturbing nesting native birds.

2. All projects, scopes of works, contracts, and agreements involving vegetation manipulations should have the following language: "If a contractor identifies any bird within the contract area that appears to be attempting to build a nest, utilizing a nest, or laying eggs, the contractor must immediately notify the natural resources manager. If nesting birds or eggs are encountered, the contractor must phase the work to avoid disturbing the birds so the contract can be completed within stated time scheduled and within the contract price. The contractor cannot take action to remove the bird or the nest from the area which is being used. This action must be conducted or authorized by a qualified biologist of the federal government."

IV. Prioritize landscape improvement projects while using the following guidelines for implementation.

A. To the extent feasible, implement projects that will reduce water usage and help meet water conservation goals and develop a plan to capture to 100% of rainwater runoff.

B. Prune only when necessary to remove dead or diseased parts. Develop a set of pruning standards and require that maintenance contractors comply with these standards. American National Standards Institute materials are the bases of a number of local pruning plans.

1. Require that maintenance contractors work toward certification in basic skills of landscape maintenance.

2. Ensure that pruning of trees and shrubs be done to enhance the natural growth form of each species.

C. Use plant material with non-vegetative ground covers, where suitable. Encourage use of mulches, decomposed granites, and other high quality paving materials for areas of high use or prominence. Encourage use of weed-free materials.

V. Enhance quality of life for island personnel through gardens and landscaping.

A. Provide education, coordination, and planning as needed to reduce the threats to native species from introduction of non-native plants, pests, and pathogens.

B. Continue the existing structure in place to provide interested island personnel with island grown plants through the NRO.

C. Avoid the transfer of foreign topsoil to SCI unless treated for invasive species.

3.11 Data Integration, Access, and Reporting

Managers concerned with ensuring the long-term health of SCI ecosystems must be aware of long-term trends and factors affecting those trends (e.g., drought, storm surges, El Niño-La Niña cycles, climatic change, and other human influences).

Current Management

An ongoing effort exists to inventory and record biological field data, as well as develop a computerized retrieval system, such as an archival database. Other agencies and many universities support data collection on SCI. Efforts are made to integrate, access, and report these data. However, resources are not currently available to properly manage and organize a database for all of SCI's natural resources.

Assessment of Resource Management

- The development of an archival database system is needed on SCI. A database would be useful when working with other federal and state agencies and support the use the best available science in adaptive management decisions. The mutual cooperation of SCI NRO with regional land managers, regulators, and scientific groups would help to facilitate regional planning efforts towards common goals to report on regional long-term trends.

Management Strategy

Objective: *Increase effectiveness and efficiency in operations planning by improving natural resources data integration, analysis, and dissemination.*

I. Set up a central clearinghouse for data, reports, and publications on SCI's natural resources that is accessible to a broad range of users, both technical and nontechnical, to be maintained by the NRO.

A. Develop and adopt a means to catalog and access this information that would avoid conflict and dilution of effort.

B. Establish a standardized format for submitting data or reports to the clearinghouse.

C. Provide appropriate data to the California Natural Diversity Database.

II. Seek standardization of how to communicate research and monitoring results so that the format is accessible to a broad audience.

A. Combine appropriate results for reporting to management and the public so that the monitoring results are more comprehensible.

B. Ensure that GIS data are collected and delivered in a standard format so that layers are compatible among studies. Implement U.S. Federal Geographic Data Committee geospatial data standards to enable sharing of spatial data among producers and users and support the growing National Spatial Data Infrastructure (Office of Management and Budget Circular A-16 [1990, 2000]) and EO 12906 as amended by EO 13286. These are the "Tri-Service" compliant standards, also known as the Federal Geographic Data Committee Metadata Standard, and Spatial Data Standard for Facilities, Infrastructure, and Environment.

1. Data should be provided as Arc/Info coverage or as a geodatabase with topology.

2. Convert the GIS coordinate system currently used to State Plane NAD 83 feet California Zone 6 to ensure compatibility with others.

III. Establish a data distribution policy.

A. GIS data may not be distributed until it is in final form and documented. It may not be distributed without a confidentiality agreement from the receiving party.

B. Studies are not distributed outside of the Navy until they are vetted and finalized by the Navy Point of Contact for the work.

IV. Provide credible, applicable, unbiased information for science-based decision-making. Databases, maps, and publications are vital mechanisms for conveying information to users.

3.12 Natural Resources Law Enforcement

Current Management

Enforcement of laws, primarily aimed at protecting natural resources (and recreational activities that use natural resources) shall be an integral part of a natural resources program and shall be coordinated with, or under, the direction of the natural resources manager for the affected area. Per OPNAVINST 5090.1C CH-1, natural resources law enforcement training shall train and budgeted for enforcement personnel.

Table 3-50. Conservation measures for natural resources law enforcement.

Conservation measure G-M-4. The Navy proposes to continue to review and coordinate the dissemination of environmental conservation measures to island users. Conservation measures will be distributed to island military and civilian staff in accordance with Commander's guidelines and with Fleet operations.

Natural resources infractions on SCI are reported to the responsible authority by SCI Navy Security or the NRO. Enforcement of fish and game regulations is the responsibility of the CDFW. SCI promotes the sale of fishing licenses to all participating island personnel to reduce potential infractions; fishing is prohibited at all times in Safety Zones Wilson Cove and G. No hunting of terrestrial game is permitted on SCI.

Management Strategy

Objective: *Provide for enforcement of natural resources laws and regulations by professionally trained personnel.*

I. Commanders shall permit federal and state Conservation Officers access to enforce natural resources laws after taking proper safety and security measures.

II. Conduct training for law enforcement personnel, as needed, to increase their knowledge of natural resources and applicable regulations.

III. Properly monitor and engage the U.S. Coast Guard to enforce NSZ closures.

4.0 Sustainability and Compatible Use at San Clemente Island

This chapter fulfills the Navy's Integrated Natural Resources Management Plan Guidance Template (2006) requirement to address "Supporting Sustainability of the Military Mission and the Natural Environment" by 1) defining the impact to the military mission, 2) discussing the integration of military mission and sustainable land use, and 3) describing the relationship to the Range Complex Management Plan or other operational area plans.

The information contained in this chapter falls either directly under the direction of the Natural Resources Office (NRO) or interfaces with natural resources programs on San Clemente Island (SCI). For those topics that are the direct responsibility of natural resources managers, the sections discuss current management and assessments of resource management with accompanying objectives and strategies. For topics not directly the responsibility of natural resources managers, the integration of NRO and other programs and operations is discussed and objectives and strategies are identified for the subject matter.

4.1 Supporting Sustainability of the Military Mission and the Natural Environment

A successfully implemented Integrated Natural Resources Management Plan (INRMP), as stated in the Sikes Act (as amended, 2012), and emphasized in the U.S. Department of the Navy (Navy) INRMP Guidance (Navy 2006), will meet two basic purposes:

1. Ensure "no net loss of the capability of military installation lands to support the military mission of the installation" into the future; and
2. Ensure that "conservation and rehabilitation of natural resources on military installations" will continue without permanent loss of its function into the future.

These two purposes are closely related but not mutually exclusive. Healthy ecosystems support realistic military training and testing needs by providing large open space, buffers, stable soils, clear air, clean water, and a range of natural conditions that are available for the indefinite future.

The common denominator between national security and public land stewardship is the concept of sustainability. Sustainability is a relative condition of the ecosystem and the military mission that can be measured. The most widely used definition of sustainability was developed by the Brundtland Commission (1987): "Sustainable resource management is…the capacity to meet the needs of the present without compromising the ability of future generations to meet their own needs." Sustainability requires a long-term view of natural resources stewardship, compliance responsibilities, and military mission readiness.

The integration of the military mission and sustainable land use is addressed by activity in Section 4.2 Range Complex Supporting Infrastructure. Natural resources and compliance requirements for a specific species or habitat within the context of supporting the SCI operations and infrastructure are addressed in the objectives and strategies in Chapter 3.

4.1.1 The Impact to the Military Mission

To accomplish the mission of national security, the public has endowed the Navy with an investment in public lands. Proper management of natural resources on SCI, including maintaining or improving ecological conditions and capability of natural landscapes, has numerous effects. For example, the ability to support military training and readiness; an improvement in the quality of life of military personnel; a streamlining of the compliance process and a reduction in conflicts; and a reduction in littering, pollution, and poaching of wildlife and vegetation by limiting access (Keystone Center 1996).

Maintaining compliance with the numerous laws, policies, and regulations that provide protection of environmental elements and guidance for management of natural and cultural resources may affect the military mission. Some of these laws include the Endangered Species Act (ESA), Clean Water Act (CWA), Rivers and Harbors Act, Coastal Zone Management Act (CZMA), and the National Historic Preservation Act. Effects may include limiting access or certain activities to areas. Natural resources management may temporarily preclude use of areas to prevent damage to soils and wildlife during periods required for vegetation recovery or during breeding seasons. Without the management of natural resources, military use could degrade the land and decrease the ability of the island to support the training mission of the installation.

Operational sustainability seeks to keep intact the long-term carrying capacity of the range. SCI lands support the mission by providing:

- Availability of multiple media (e.g., land, air, sea) to coordinate combined exercises
- Availability of sufficient space to conduct training
- Capability of supporting sufficient instrumentation to support training
- Availability of effective infrastructure to support training
- Capability to support live-fire training scenarios on certain properties
- Capability to support essential training tempo and intensity to attain sufficient readiness to deploy
- Capability to successfully coordinate and de-conflict environmental compliance and training requirements to provide realistic warfare training opportunities

For the purpose of this INRMP, an impact to mission accomplishment has occurred when any of the above are constrained or when one of the following conditions occurs:

- Quality of military training is impacted by natural resources restrictions
- Training qualification objectives to deploy are not accomplished without significant delay or conflict
- Scheduled rotations are hampered by environmental issues
- Conflict resolution impacts training intensity or tempo and the target resource condition is impacted

The installation is achieving no net loss of training land through the implementation of this INRMP; this INRMP outlines management strategies that ensure no net loss through listed species recovery, critical habitat exemptions, and avoidance of future listed species listings. Range capacity (in terms of area, uses, and frequency) has expanded since 2008 (Navy 2008; U.S. Fish and Wildlife Service [USFWS] 2008); however, due to the high density of threatened and endangered species, through a failure to delist and downlist federally-listed species, and ranges at SCI, significant work-arounds persist for both operations (training) and facilities.

In Appendix K, Map K-1 through Map K-11 show locations of terrestrial and marine sensitive resources on SCI. The Navy INRMP Template (Deputy Assistant Secretary of the Navy Memorandum, 14 August 2006) requires these *constraints* maps. An *opportunities* map is also required in the Navy INRMP Template (Deputy Assistant Secretary of the Navy Memorandum, 14 August 2006), but is not applicable to SCI since there are no potential encroachment opportunities. NRO staff should be contacted for the most current natural resources maps.

The Navy also sees partnerships as a means to manage encroachment pressure on the Navy mission. The definition of encroachment is defined in Naval Operations Instruction (OPNAVINST) 11010.40 as: “any Navy or non-Navy action planned or executed in the vicinity of a Naval activity or operational area which inhibits, curtails, or possesses the potential to impede the performance of the mission of the Naval activity.” The Instruction also defines encroachment to be any lack of action by the Navy to coordinate with local jurisdictions, monitor the development of plans for adjacent communities, or adequately manage facilities and real estate property. Natural resources encroachment concerns on SCI that constrict the footprint, scheduling, duration, and/or intensity of military operations include: wildland fire management, ESA, Marine Mammal Protection Act, Marine Life Protection Act, and CWA.

The broad conceptual objectives and strategies outlined below were developed to meet the goal of ensuring that SCI sustains the mission while protecting natural resources.

Management Strategy

***Objective:** Achieve no net loss of military value by aligning current and future land and water use (location, extent, timing, and intensity) with environmental value protection into the future while minimizing the cost of environmental conflict resolution and mitigation.*

I. Maintain and enhance existing land use to support the mission through coordination with all SCI Navy stakeholders and tenants.

II. Locate new facilities within existing facility footprints or other previously disturbed areas to the maximum extent practicable.

III. Conduct appropriate environmental surveys on any proposed new land use, within an undeveloped area, to identify sensitive natural and cultural resources, environmental resources, and Installation Restoration sites (hazardous waste cleanups).

IV. Ensure compliance with statutes and regulations to protect sensitive natural and cultural resources, to maintain environmental quality, and to exercise responsible stewardship of public lands.

V. Maintain and enhance coordination and cooperation with neighboring communities, agencies, and organizations to ensure compatibility of natural resources uses with the Navy's mission.

VI. Provide reasonable accommodation of compatible nonmilitary land use to the extent practicable.

VII. Maintain healthy and intact habitats resilient from disturbance, using principles of ecosystem management and sustainability to balance short-term projects with long-term goals.

VIII. Identify and address long-term threats to the stability of the natural environment including but not limited to soil erosion, invasive non-native species, climate change, sea level rise, and habitat fragmentation.

IX. Ensure the Commanding Officer's (CO) preparedness to answer the following questions as part of the INRMP metrics review:

- ***A.*** Does the natural resources team consult with operators when making changes to the INRMP to keep it current? Coordination examples include: maps, signage, pamphlets, other communications, orientations, meetings, training, etc.
- ***B.*** To what level do natural resources compliance requirements support the installation's ability to sustain the operational mission?
- ***C.*** Has there been a net loss of training lands?

X. Promote compatible use and adhere to established conservation measures and terms and conditions defined in the Southern California (SOCAL) Range Complex Environmental Impact Statement (EIS) (Navy 2008) and USFWS Biological Opinion (BO) (FWS-LA-09B0027-09F0040) on SCI Military Operations and Fire Management Plan (USFWS 2008) and/or any additional applicable BOs and National Environmental Policy Act (NEPA) documents for SCI and the Southern California Offshore Range (SCORE).

4.1.2 Offshore, Nearshore, and Onshore Operations Areas and Ranges

Current Management

Operations Areas and Ranges provide a controlled and safe environment with threat-representative targets that enable U.S. forces to conduct realistic, combat-like training as they undergo all phases of the graduated build up needed for combat-ready deployment. See Chapter 2 for a full list of operators and their roles and responsibilities. The range complexes are designed to provide the most realistic training in the most relevant environments, replicating to the best extent possible the operational stresses of warfare. The integration of undersea ranges and Operations Areas with land training ranges, safety landing fields, and amphibious landing sites are critical to this realism, allowing execution of multidimensional exercises in complex scenarios.

Offshore, nearshore, and onshore range access and scheduling is managed by SCORE, which facilitates the coordination and approval of multiple user groups utilizing the various ranges. Compatible range uses are identified to promote access and increase the capacity of individual ranges to support training activities in synergy with natural resources. Managing range sustainability in a long-term, comprehensive, coordinated, and cost-effective manner is pursuant to U.S. Department of Defense (DoD) Directive 3200.15 (Sustainment of Ranges and Operating Areas, 21 November 2003). According to data provided by SCORE for the 2010 Fiscal Year, 3,000 events took place with exclusive use of certain ranges, and 1,781 events took place with co-use, for a total of nearly 4,800 events (R. Tahimic, pers. com. 2012). This comprised 10,063 hours of exclusive use events and 5,859 hours of co-use events by all entities, including the NRO.

Management Strategy

Objective: *Manage natural resources to minimize constraints to operational areas and ranges.*

I. Provide range users with information necessary to ensure compliance with Conservation Measures and Terms and Conditions in the BO on SCI Military Operations and Wildland Fire Management Plan (USFWS 2008).

II. Review all proposed new SCI development to ensure that short-term goals are developed and managed for long-term sustainability.

III. Control invasive non-native species, through introduction and spread, that could hinder threatened and endangered species recovery and delisting or result in new ESA listings.

IV. Ensure compliance with the SCI Wildland Fire Management Plan to minimize the number, size, and severity of fires.

V. Conduct operations and facilities construction and maintenance through project-specific erosion control Best Management Practices (BMPs), Stormwater Pollution Prevention Plans, and/or erosion control plans.

VI. Manage ESA candidate species to avoid ESA listing and Critical Habitat designation.

VII. Manage ESA listed species to achieve recovery, thereby removing operational and facilities constraints.

4.1.3 Safety and Other Restricted Access Zones

Safety and restricted access zones at SCI encompass both marine and terrestrial geographic areas and provide island managers the ability to partition military training operations and deconflict hazards to assure range safety.

Current Management

The largest danger zone is the Shore Bombardment Area, located in the southern third of SCI, which contains two impact areas (Zone C and D) and supports an active live-fire range. Other smaller danger zone areas have been established in various portions of SCI, based on the presence of unexploded ordnance related to historic use.

All access to ranges and danger zones is scheduled and approved through SCORE; safety and restricted zone access is managed by the Navy through Navy Security and SCORE on a real-time schedule. Scheduled training and restricted access announcements are supplied to the general public through a dedicated website.[1] Currently, nearshore waters of

1. Website Address: http://www.scisland.org/. Phone Number: (619) 524-9214.

SCI are partitioned into eight safety zones (Map 4-1) encompassing waters from Mean Higher High Water to 3 nautical miles (6 kilometers); the U.S. Coast Guard (USCG) is responsible for enforcing these Naval Safety Zones (NSZs).

The Navy maintains a dedicated Very High Frequency (VHF) 82A to receive and respond to vessel traffic in safety zones. Currently, in the event of any unauthorized encroachment, SCI Naval Special Warfare notifies a Kracken Watch Commander at Fleet Area Control and Surveillance Facility Naval Base Coronado (NBC) of the vessel's general location and description. The Kracken Watch Commander attempts to contact the vessel by VHF to inform them of their status and request they depart the safety zone immediately. If the Kracken Watch Commander is unable to hail the vessel, or if the vessel fails to depart the area, SCI security is notified. SCI Security attempts to contact the vessel on VHF, or directly by way of an island-dispatched patrol boat. If the vessel remains within the safety zone or refuses to depart, the vessel's identification numbers and description is communicated to the USCG for enforcement action. SCI installed a new radar system capable of monitoring waters from the shoreline to 3 nautical miles (6 kilometers) in the Shore Bombardment Area to complement video monitoring technology. Currently, Safety Zones G and Wilson Cove are permanently closed to public access. The remaining safety zones are closed intermittently, during active military training activities.

Management Strategy

Objective: *Support the efforts of those responsible for scheduling, security, and safety in improving restricted zone management and enforcement so that no net loss to the military mission occurs while providing safety, security, and natural resources protection*

I. Support Navy efforts for surveillance and enforcement of safety zones.

II. Contribute to developing guidelines to proactively address the Regional Water Quality Control Board's projected implementation of new Area of Special Biological Significance standards related to their interpretation of safety zones in relation to the Marine Protected Area process.

III. Adhere to NBC Instructions regarding the delineation, establishment, and removal of unexploded ordnance-driven Restricted Access Areas.

- ***A.*** Determine a process for evaluating natural resources within danger zones and ways to effectively track their population trends or status.
- ***B.*** Attempt to secure funding to remediate danger zones that have high value to military training or natural resources.

4.2 Range Complex Supporting Infrastructure

The Navy is in the process of completing a Range Complex Management Plan (RCMP). It is unknown if this INRMP revision will align with the RCMP. Therefore, this INRMP may need to be updated based on alignment with the RCMP. However, many stakeholders involved in the RCMP were also involved in the preparation of this INRMP, decreasing the likelihood that this INRMP will need to be revised based on the RCMP.

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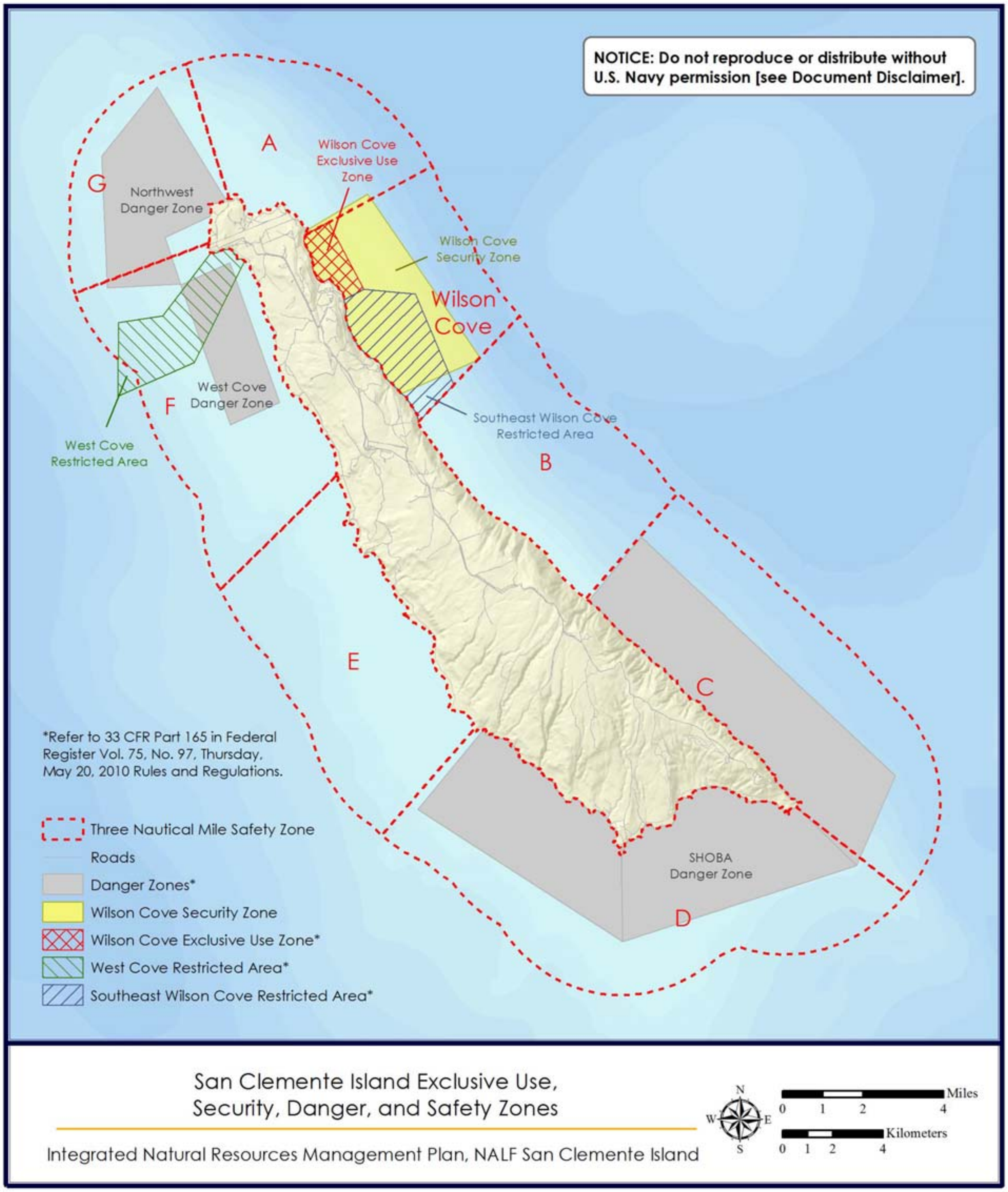


2 *Map 4-1. San Clemente Island Exclusive Use, Security, and Danger Zones.*

Construction and Maintenance of Facilities and Infrastructure

Current Management

Military Construction projects are funded through the U.S. Congress and capture the majority of large scale development projects required to support current and future training activities on SCI. All projects are reviewed by an NBC planner and are subject to the Project Review Process to determine regulatory requirements regarding siting, design, and environmental concerns.

Facility maintenance is primarily addressed through the installation. Project Site Approval Requests are prioritized by the Command and reviewed by the NRO. On SCI, NBC planners and the NRO work together to integrate evolving resources concerns with sustainable infrastructure maintenance and refurbishment requirements. The Facility Engineering and Acquisition Division is the primary oversight for the implementation of established BMPs and serves as a liaison between site crews and natural resources staff. The Facility Engineering and Acquisition Division for SCI is familiar with resource issues and coordinates well with the natural resources staff. However, there is still a needs for the Facility Engineering and Acquisition Division to maintain an open dialog with the natural resources staff. Ongoing upgrades to existing infrastructure components near the airfield, Wilson Cove, Old Airfield (VC-3), and the Naval Special Warfare area near Northwest Harbor attempt to reutilize previously developed areas to reduce resources conflicts.

Planning teams integrate various federal requirements and guidance into infrastructure development and maintenance, including principles from Leadership in Energy and Environmental Design for energy, the Sustainable Sites Initiative program,[2] and Low-Impact Design for water, among others. By Executive Order, the President has directed that federal agencies shall design, use, or promote practices that minimize adverse effects on the natural habitat where cost-effective and to the extent practicable (Executive Order [EO] 13112). Contracts to facilitate construction of SCI infrastructure and utilities are primarily design and build agreements that clearly specify sustainable and compatible use requirements and goals.

Sustainable development is intended to foster high performance buildings, in terms of energy efficiency, that reduce the use of natural resources, decrease pollution, and provide a healthier indoor environment. Such development takes into account the full life cycle cost of a project, including broader concerns, such as its effect on the environment and the community, not just the financial cost. A federal task force agreed to the federally accepted principles for sustainability in the built environment.[3]

A recent EO (13423, January 2007) issued to “strengthen the environmental, energy, and transportation management of federal agencies in the United States” built on previous EOs. Those included EOs on waste prevention and recycling (EO 13101), locating federal facilities on historic urban properties (EO 13006), energy efficiency (EO 13123), bio-products and bio-fuels (EO 13134), environmental management (EO 13148), and fleet and transportation efficiency (EO 13149). To support implementation of this policy, goals to guide energy and water conservation, building design and waste recycling, and procurement procedures were established.

2. See http://www.sustainablesites.org/.
3. Adapted from the Whole Building Design Guide, National Institute of Building Sciences http://www.wbdg.org.

In the Navy, the majority of sustainability planning occurs within the Regional Shore Infrastructure Plan (RSIP) process since it is the tool where facility needs are evaluated and siting options are examined for fulfilling them. One of the stated Navy goals of the RSIP process pertaining to natural resources sustainability principles is (as stated in Naval Facilities Engineering Command [NAVFAC] Instruction 11010.45): "Recognizing the environmental association of all planning recommendations and providing ecologically sustainable solutions that support and enhance the regional shore establishment." Properly following the RSIP process means that a planner is already taking a longer-term approach (NAVFAC Instruction 11010.45). NAVFAC Instruction 11010.45 adds the Leadership in Energy and Environmental Design and National Governors Association New Community Design checklist requirement to the RSIP process. The *National Governors Association Checklist for Better Land* utilizes "smart growth" approaches and is the second set of standards used by the Navy. Their sustainability evaluation includes criterion that addresses protection of open space, natural beauty, and critical environmental areas:

1. Does the project avoid fragmenting existing green space, especially natural habitats and forests?
2. Does the project design protect the local watershed? Water runoff and other factors should be examined to determine whether the development is harming the watershed. To minimize water runoff, the fraction of land paved over for streets and parking typically should not exceed 20% to 30%.
3. Does the project location avoid increasing the risk or negative impacts of natural disasters? Consideration should be given to what kinds of periodic natural hazards exist for the site and whether a specific location is vulnerable, for example, to flooding, wildfires, mudslides, beach erosion, or high winds.

The Navy also integrates Low Impact Development practices into planning and project development. Low Impact Development is a site design strategy with a goal of maintaining or replicating the pre-development hydrologic regime through the use of designs to create a functionally equivalent hydrologic landscape. Hydrologic functions of storage, infiltration, and ground water recharge, as well as the volume and frequency of discharges, are maintained through the use of integrated and distributed micro-scale stormwater retention and detention areas, reduction of impervious surfaces, and the lengthening of flow paths and runoff time. Low Impact Development practices offer an additional benefit that can be integrated into the infrastructure and are more cost-effective and aesthetically pleasing than traditional structural stormwater conveyance systems.

Airfield Operations

Current Management

Airfield operations at SCI are managed and overseen by a Naval Officer stationed at SCI. The Airfield Operations Officer is integrated into daily operations and training requirements of the installation. The Airfield Operations Officer actively participates in a weekly on-island meeting with representatives from SCORE, NRO, Public Works Department, Security, and the CO's office to review current and future ideas, plans, and projects. Airfield concerns and plans are also reviewed at the San Clemente Planning Team meeting which is attended by NRO biologists. Bird/Animal Aircraft Strike Hazard (BASH) reporting through the Web Enabled Safety System requires integrated involvement from the NBC Air Safety Officer. The SCI Airfield Officer-In-Charge is a member of the BASH assessment team in conjunction with the NBC Air Safety Officer. Airfield operations management has been proactive in requesting natural resources and erosion assessments. Management continues to consider emerging training requirements and has secured funding to update and expand fueling operations and storage in a sustainable and compatible use framework.

Waterfront Operations and Shoreline Construction

This section addresses waterfront operations and shoreline activity in the coastal environment including operational use and maintenance of piers, docks, wharves, roads, bridges, and buildings.

Current Management

Waterfront operations and logistics involving provisioning, fueling, mooring, and operational use are managed by the SCI Port Operations Officer-In-Charge and are scheduled by SCORE. The Port Operations Officer-In-Charge participates in weekly on-island meetings with representatives from SCORE, NRO, Public Works Department, Security, and the CO's office that reviews current and future ideas, plans, and projects. Regularly scheduled barge operations occur biweekly and implement environmental and safety standard operating procedures to minimize potential adverse impacts to natural resources and reduce the likelihood of accidents.

Shoreline work at SCI is concentrated in suitable locations within previously utilized areas. This typically involves a Military Construction project managed and overseen through a NAVFAC contract that encompasses advanced environmental planning and oversight. SCI shoreline projects are initially vetted through the Work Induction Board and more comprehensively reviewed during the Site Approval Review. Nearly all shoreline infrastructure or facilities projects, short of basic general maintenance, are evaluated for compliance with Essential Fish Habitat (EFH) conservation requirements under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), ESA-related protection of federally listed species, CZMA consistency, and NEPA. In cases where listed species may be affected informal or formal consultation will be required under the ESA. Above the Mean Higher High Water line, project activities must comply with provisions of the California Coastal Act and are permitted by the California Coastal Commission (CCC). The Navy, for example, has a General Consistency Determination for periodic replacement of piers and shoreline structures dated 1998 (CD-070-98).

Road Maintenance

Current Management

Major road development actions are addressed under the Site Approval and Project Review Process. CWA Section 401 requires a review of federal permits, actions, and approvals that may result in a discharge to waters of the U.S. (including wetlands and many washes) to ensure compliance with water quality standards to “restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.” This permit is necessary when other CWA permits are required. Additionally, Nonpoint Source Discharge Elimination System permits for stormwater discharges require owners/operators grading or disturbing five or more acres to apply for coverage under the U.S. Environmental Protection Agency (EPA) General Permit for stormwater discharges (effective 01 October 1992). Actions that result in a discharge of dredged or fill material into waters of the U.S., including wetlands, most likely will also require a Section 404 permit.

Road development and maintenance is generally performed by the NBC Public Works Department, the Seabees (construction battalions), and private contractors, with funding from various sources. Management of roads includes the maintenance of paved roads, gravel roads, dirt roads, and culverts. SCI road projects are initially vetted to the Work Induction Board and formalized through the Site Approval and Project Review Process to deconflict range uses, safety oversight, and environmental compliance requirements. Road maintenance often occurs within restricted areas; therefore, formal Operations Area requests must be approved prior to the initiation of work. Roadside mowing in grassland habitat is regularly performed, as needed, to reduce impacts to the island fox population.

Communication Towers, Wind Farms, and Power Lines

Current Management

The needs of new projects and routine maintenance of power and communication infrastructure are identified by the NBC Command in conjunction with the SCI planning team. Updated infrastructure (poles) to the D-line (Shore Bombardment Area) is needed to reduce potential failures to mission critical training evolutions. Selected projects are solicited through the SCI Work Induction Board, prior to initiation of the formal Site Approval Request process. Specific impacts associated with communications towers, wind energy facilities, and power lines are generally avoided and minimized through the Site Approval Request Process (NBC Instruction 11010.1). Compliance with regulatory requirements are reviewed by NBC planners and SCI NRO and are overseen by the Facility Engineering and Acquisition Division during implementation. Guidance on communications towers is provided from the USFWS, such as the *Service Guidance on the Siting, Construction, Operation, and Decommissioning of Communications Towers* (USFWS 2000) and the *Land-Based Wind Energy Guidelines* (USFWS 2012).

Water Resources and Water Supply

Current Management

Water resources are managed by NBC Public Works, which supervises the delivery of potable water, waste water, and water quality compliance for SCI. Potable water is delivered weekly by barge from the Sweetwater Water Authority and is tested at Naval Base San Diego prior to shipment. Water stored on SCI is tested daily to comply with drinking water standards. Water resources are expensive and logistically difficult to facilitate. Water is stock-piled on the island in storage tanks to address fluctuations in use requirements and support potential fire fighting activities. Freshwater sources on SCI are scarce and do not provide a reliable source of water for SCI personnel or operations. As a result, NBC has supported the development of an on-island reverse osmosis plant to reduce logistical costs and provide a sustainable alternative to continued barging of water to SCI.

Water storage on the island is monitored daily during compliance testing to evaluate usage and assess potential loss from leaks. Management has addressed the long-term feasibility of barging water to the island through supporting the development of an on-island desalination plant. Water continues to be a sizable expense for the operation of SCI.

Management Strategy

Objective: *Manage natural resources to minimize current and future constraints to operational infrastructure, use, and maintenance.*

I. Consider fish and wildlife conservation in all site feasibility studies and project planning, design and construction. Include appropriate avoidance and minimization measures and associated funding in project proposals and construction contracts and specifications (DoD Instruction [DoDINST] 4715.03).

II. Use the RSIP, master planning, and NEPA processes to bring in interdisciplinary support to decisions early in the project planning phase that include water, engineering, and natural resources professionals.

III. Improve coordination between natural resources staff and other departments with responsibilities for compliance with energy and environmental management EOs (i.e., EO13423 and EO13514).

IV. Develop a list of acceptable annual maintenance practices and BMPs within developed areas that do not require an individual Site Approval Request.

- ***A.*** Incorporate BMPs in the preliminary engineering, design, and construction of facilities involving ground disturbance (OPNAVINST 5090.1C).
- ***B.*** Include erosion control measures and appropriate BMPs before, during, and after construction, use, and maintenance activities, as required by the Stormwater Pollution Prevention Plan in contracts and planning processes.

V. Continue to implement procedures and methods to integrate SCI airfield BASH and safety issues with the managing NBC program.

- ***A.*** Support BASH training scenarios and distribute BASH kits. The distribution of BASH kits and the entry of BASH data into Web Enabled Safety System could be improved to streamline reporting.
- ***B.*** Consider implementing a BASH reassessment every two to four years.
- ***C.*** Work with the NBC Air Safety Officer to improve electronic BASH reporting requirement in Web Enabled Safety System.
- ***D.*** Prioritize erosion issues that may cause delays to the military mission or impact water quality.
- ***E.*** Repair or modify buildings around the airfield that currently provide nesting opportunities for non-native birds. These birds pose a potential BASH concern (See Section 3.9.7.3 Non-Native Terrestrial Wildlife).
- ***F.*** Continue airfield mowing to reduce BASH risk and potential wildlife impacts from the airfield and Perimeter Road traffic.

VI. Support a long-term (five-year) planning and needs process to help determine funding short falls and establish a better schedule for executing waterfront maintenance and construction projects. A proactive approach to integrate Navy natural resources professionals could help identify effective alternatives that avoid and minimize effects to natural resources and minimize regulatory compliance delays.

- ***A.*** Encourage the reuse and refitting of developed shorelines and existing structures to avoid and minimize impacts to sensitive resources, maintain adjacent habitat values, and reduce the cost and level of effort required for environmental compliance. Design shoreline structures to mimic the original habitat structure and function, to the extent possible, to maximize benefits to native SCI species and reduce mitigation requirements.

VII. In advance of project proposals, document and conserve existing shoreline and shallow subtidal habitat within waterfront use areas by collecting baseline inventory data and recommending setbacks for CCC permits for new construction that effectively protect habitat values of sensitive species.

VIII. In advance of project proposals, develop alternative marine recreational use areas and access points that integrate the INRMP's goals and objectives while promoting safe use by island personnel.

IX. Discourage the construction of seawalls, revetments, breakwaters, or other artificial structures used to control coastal erosion, unless each of the following criteria is met (CCC Policy for Shoreline Erosion Protection 14 September 1978):

- ***A.*** No other non-structural alternative is practical or preferable.
- ***B.*** The condition causing the problem is site specific and not attributable to a general erosion trend, or the project reduces the need for a number of individual projects and solves a regional erosion problem.
- ***C.*** It can be shown that a structure(s) will successfully mitigate the effects of shoreline erosion and will not adversely affect adjacent, or other sections, of the shoreline.
- ***D.*** Any project-caused impacts on fish and wildlife resources will be offset by adequate fish and wildlife conservation measures.

X. Promote experimentation and application of alternative shoreline and underwater habitat structures consistent with implementing the Navy's RSIP.

- ***A.*** Develop objective design criteria that incorporate the desired function of the target habitat and promote contingency plans for each design element.
- ***B.*** Identify and prioritize desired ecological function of artificial structures, including: 1) trophic support for native fishes and birds, 2) habitat for migratory birds, 3) nursery/refugia for subtidal species, and 4) habitat for endangered and other special status species.

XI. Develop a programmatic NEPA document for routine road and utility maintenance that addresses natural resources constraints and allows for current and future maintenance activities to proceed without the need for project-by-project NRO review.

- ***A.*** Public Works should provide consistent road naming and footprints of routine repair and maintenance operations to facilitate a comprehensive maintenance schedule and timeline.

XII. Apply principles of Integrated Vegetation Management for roadside maintenance.

- ***A.*** Define and implement a strategy to manage road shoulders that reduces erosion due to stormwater. Prevent sediment from being carried downstream. Consider other benefits of stormwater capture for beneficial habitat uses.
- ***B.*** Consider the possible negative effects to flora and fauna from roadside mowing and spraying while managing roadsides to prevent fox kill.
- ***C.*** Improve the ecological condition of roadsides to enhance biodiversity, reduce the function of roadsides as a vector for non-natives, control stormwater pollutants, and provide cultural and natural resources education (Forman et al. 2003).

XIII. Establish communication tower and power line maintenance corridors to more efficiently facilitate annual maintenance needs and emergency repairs.

- ***A.*** Define a strategy for upgrading existing towers and lines that can expedite compliance approval and avoid impacts to sensitive species.

B. Develop a standard operating procedure for emergency repairs to communication and power lines that takes into account adverse delays to military training and natural resources.

C. To the extent feasible, implement the recommendations of the Avian Protection Plan, once completed.

XIV. Support development of a long-term (five-year) plan addressing power and communication needs of the military mission and design specifications for avoidance and minimization of environmental impacts. This would help determine funding short falls and establish an improved schedule for executing projects required to support the military mission.

A. When feasible, integrate USFWS, California Energy Commission, and California Department of Fish and Wildlife (CDFW) guidance for communications towers and wind energy facilities during planning and project review.

B. Define biomonitoring requirements or conservation measures developed for specific species or habitats, which could provide the installation a procedure that expedites mission critical repairs while maintaining a desired level of protection to the adjacent environment.

C. Develop an avian protection plan using information from the DoD Partners in Flight and the USFWS.

XV. Review military and non-military uses at SCI for ways to contribute to water conservation.

A. Support the consistent implementation of BMP efforts for water conservation and consider increasing water catchment methods (e.g., use of gray water) near facilities for landscape watering.

B. Support expansion of the reclaimed water process on the island to reduce water transportation to SCI.

4.3 Other Land Uses

4.3.1 Real Estate Outgrants

OPNAVINST 5090.1C CH-1 requires the Navy to identify areas that may be suitable and available for agricultural outleasing or commercial forestry. More specifically, the Military Construction Authorization Act provides for the use of DoD lands under lease to an agency, organization, or person for the purpose of agricultural outleasing or the production of and sale of forest products that have commercial value.

However, considering the isolated location, limited water resources, sensitive flora and fauna, and conflicting land use, forestry and agricultural outleases are not viable options for SCI. Additionally, on SCI, there are no forest lands suitable for timber production. Real estate outgrants are incompatible with the military mission at SCI, due to multiple hazards, limited access, safety issues, sensitive cultural sites, and the presence of sensitive environmental habitats and managed species. The Navy has no plans to initiate commercial use, such as grazing, agriculture, or oil exploration at SCI.

4.3.2 Public Access and Outreach

The Sikes Act (as amended) requires that installations provide public access for natural resources use to the extent that it is appropriate and consistent with the military mission, safety, and security. Given its isolated location and the nature of its mission, access to the island itself is restricted to active and retired Navy military and civilian personnel, their immediate families, and guests. Even for permitted personnel, many areas of the island have limited access or are prohibited.

Access is also approved by the NRO; they occasionally invite skilled volunteers (usually professional biologists with an interest in island resources) to participate in intensive, on-island monitoring efforts, such as semi-annual San Clemente loggerhead shrike surveys or occasional long-term vegetation plot surveys.

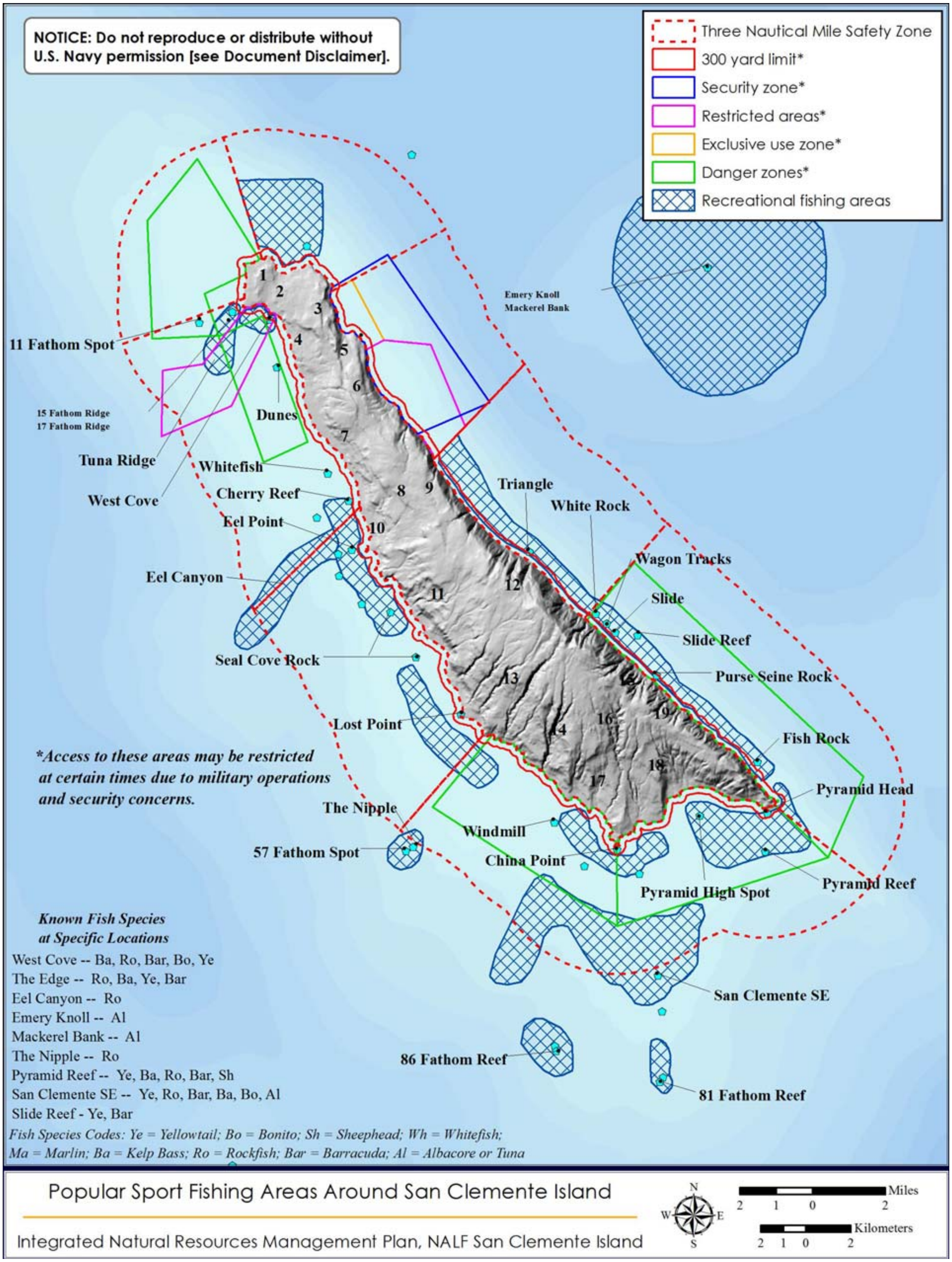
Additionally, nearshore waters are used and visited by a variety of groups, including commercial and sport fishermen, kelp harvesters, SCUBA divers, and recreational boaters. For more information on restricted areas, see Section 4.1.3 Safety and Other Restricted Access Zones.

Commercial and Sport Fishing and Kelp Harvest

Given the highly productive waters surrounding SCI, it has long been a popular spot for fishermen and aquaculturists. Map 4-2 identifies the locations of popular recreational fishing spots around SCI (prior to the implementation of NSZs). The Navy retains no authority over these activities, except for the declaration of restricted areas (see Section 4.1.3 Safety and Other Restricted Access Zones). Since the implementation of NSZs around the island, Safety Zones G, which include Castle Rock and Wilson Cove, have been closed to all non-training human activities.

The east side of the island is a less desirable area for fishing, due to the rough state of the sea as well as the narrow and steep topography of the ocean floor. China Point and Pyramid Cove are desirable anchorages for commercial fishers since these areas are protected from the strong winds characteristic of SCI (P. Halmay, pers. com. 1999). However, these areas are inside a live-fire Shore Bombardment range, which is designated as a Danger Zone (33 Code of Federal Regulations [CFR] § 334.950) and are not open to the public. The Navy notifies the public when NSZs and other restricted areas are closed via the SCORE website, *Notice to Mariners*, and *Notice to Airmen*.

The state of California is the responsible agency for enforcing fishing regulations within three miles from the shore of SCI. The legislature and the Fish and Game Commission set fisheries policy, which is implemented by the CDFW. Lobster fishing season occurs from October to March and is best off the north and west coasts of SCI (V. Jackaloni, pers. com. 1999), where traps are set at depths of 360 feet (110 meters) (J. Guth, pers. com. 1999). Diving for sea urchins occurs on shallow rocky bottoms and at depths of 10 to 100 feet (3 to 30 meters) along the north, west, and south coasts of SCI (R. Fletcher, pers. com. 1999; P. Halmay, pers. com. 1999).

1 

2 *Map 4-2. Popular recreational fishing areas in the waters surrounding San Clemente Island.*

The state monitors the harvest of SCI kelp beds, two of which are currently under lease to Kelco. The beds are tracked by number as follows: Bed 101 (Pyramid Head to China Point), 102 (China Point to Seal Cove), 103 (Seal Cove to Northwest Harbor), and 104 (Northwest Harbor) to Pyramid Head (east side of island).

Kelp is harvested commercially for use as a binder, emulsifier, and molding material in a broad range of products, and a food source in abalone aquaculture operations. The volume and area of kelp harvested each year are currently regulated by the California Fish and Wildlife Commission by leasing of individual beds and licensing of individuals interested in harvest (California Code of Regulations Title 14 § 165 and 165.5).

Recreational Diving

SCI is a very popular recreational diving destination in the southern California region, with its great underwater diversity and high underwater visibility. Map 4-3 identifies the locations of popular recreational diving sites around SCI (prior to the implementation of NSZs).

The leeside of the island has consistently good water clarity, with visibility of 60 to 80-plus feet (18 to 24-plus meters). Navy control over this activity is limited to declaring some areas hazardous to non-participating vessels.

Current Management

Public access to SCI terrestrial resources is restricted at all times with the exception of approved visitors and scientific researchers working conjointly with SCI natural resources staff. Signs are posted on various beaches and headlands suitable for landing ashore, warning the public of safety concerns. Public access to coastal and offshore waters within 3 nautical miles (6 kilometers) of SCI is restricted at all times in Safety Zones G and Wilson Cove. Public access is also prohibited intermittently in other coastal and offshore areas based on safety and security concerns related to military training activities (See Map 4-1).

SCI provides communication outreach tools notifying the public of access restrictions to ranges through a USCG *Notice to Mariners*, directly by phone (619) 545-6536, and through the internet at http://www.scisland.org. Currently, hunting is not authorized on SCI by the general public or military personnel; however, fishing is allowed within approved SCI waters by the general public and military personnel with the appropriate CDFW fishing license. By Navy policy, fishing is prohibited at all times in Safety Zones G and Wilson Cove.

Public outreach for natural resources activities is limited to nearshore coastal and offshore waters, encompassed within various training ranges. Island researchers are encouraged to publish peer review scientific papers, and Navy natural resources staff members and contractors give presentations to various groups upon request. Natural resources staff members attend professional conferences to contribute information on biological community trends and conditions unique to SCI and/or the Channel Islands.

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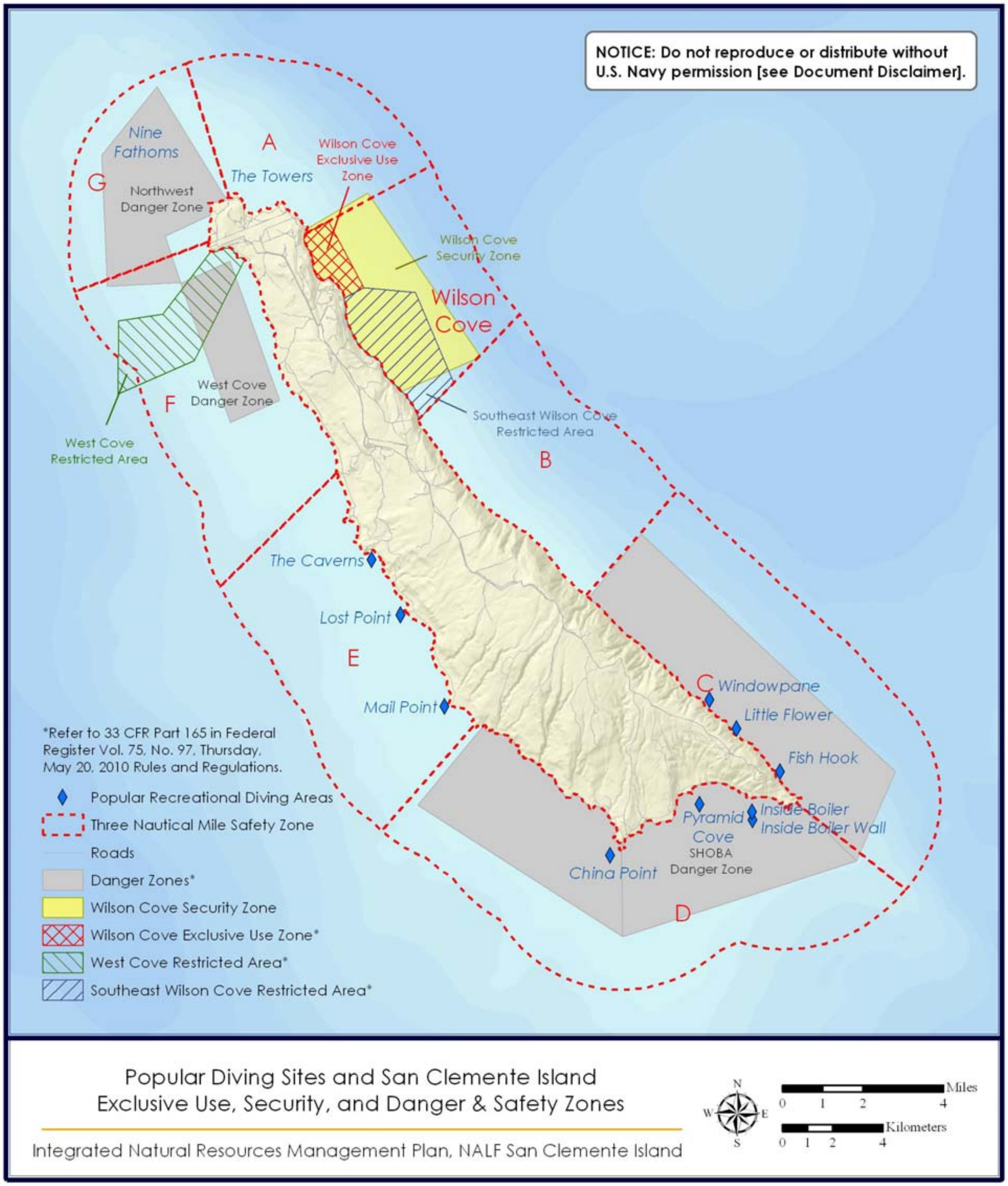

2 *Map 4-3. Popular recreational diving sites in nearshore waters of San Clemente Island.*

Management Strategy

Objective: *Support an integrated public outreach campaign promoting the need to balance military readiness with conservation stewardship of natural and cultural resources in conjunction with other agencies responsible for enforcing safety and security in and around SCI land and waters.*

I. Support those responsible for enforcing public access to SCI for compatibility with mission activities, security, safety, and natural resources sensitivity.

- ***A.*** Support the distribution of accurate and coherent policies and notifications regarding public access and use within SCI safety zones.
- ***B.*** Continue to provide public notices of access restrictions at SCI through the USCG *Notice to Mariners* and online at http://www.scisland.org.
- ***C.*** Consider incorporating links to resources at USFWS, CDFW, and National Oceanic and Atmospheric Administration (NOAA) websites on http://www.scisland.org to inform users of applicable laws, and regulations.

II. Provide access for NRO contracting staff to conduct research to the extent that it does not interfere with the military mission.

III. Support active measures to discourage trespassing.

- ***A.*** Develop maps and other informational material to inform the public of the boundaries of NSZs and other restricted areas at SCI.
- ***B.*** Increase and improve signage at island access points.

IV. Take advantage of opportunities for public outreach, as appropriate.

- ***A.*** Increase effort to educate boaters and fisherman about the island's website (http://www.scisland.org) and its content related to planning and use of SCI.
- ***B.*** To the extent feasible, participate regularly in the Channel Islands Symposium and other various resource related groups to contribute information related to island endemism, disease, and/or invasive species.

4.3.3 Outdoor Recreation and Environmental Education for On-Island Personnel

Outdoor recreation, as defined for this INRMP, is the integration of recreational activities with the island's natural resources for recreation and physical exercise, as well as indoor/outdoor interpretive activities, where the focus is on understanding the natural environment. An education video is shown to all new military and civilian personnel upon arrival. The video educates island users of the sensitive natural resources on SCI, including threatened and endangered species. Natural resources brochures and pocket guides are also distributed for quick reference information.

Recreational opportunities are important at SCI because personnel are often sequestered on the island for long periods of time. SCI currently has a few hiking and jogging trails (above Wilson Cove harbor), picnicking areas, campgrounds, and areas to whale watch, fish, swim, surf, and/or snorkel from certain areas of the shore. Interpretive signs are located at the airport, the hiking trail, and the site of the old downtown Galley, now demolished. Free divers and snorkelers must comply with the regulations contained in reference (b) of Naval Auxiliary Landing Field SCI Instruction 5300.1F (1999). Recreational SCUBA on SCI is strictly prohibited from shore. Outdoor recreation led to the development of the SCI fishing club, which supports EO 12962 Recreational Fishing. The club established acceptable use patterns, safety training, and regulations in coordination with the installation command.

For on-island personnel and visitors, the Americans with Disabilities Act of 1990 (Public Law 101-336) and Disabled Sportsman's Access Act of 1998 (Public Law 105-261) established "a mechanism by which outdoor recreation programs on military installations will be accessible to disabled veterans, dependents with disabilities, and all others with disabilities." This allows all personnel to take advantage of outdoor recreational opportunities on SCI.

Current Management

A Memorandum of Understanding (MOU) between the DoD and U.S. Department of the Interior provides guidance on the management of natural resources for outdoor recreation. This MOU identifies the National Park Service as a cooperator in developing outdoor recreation plans that are consistent with the military mission at SCI. Outdoor recreational opportunities are available to island personnel and are regulated by the installation for safety, security, and the protection of cultural and natural resources.

The NRO established supplemental outreach programs informing on-island personnel of natural resources value and unacceptable activities related to the feeding or disturbance of native species. Standard operating procedures addressing invasive species concerns and their potential impact to native flora and fauna on the island have been developed and distributed. Planned avoidance and minimization measures, within specific sensitive species habitat, are briefed to project managers and contractors by the NRO or Facility Engineering and Acquisition Division for individual projects. Project specific concerns and suitable use areas within project boundaries are discussed and identified.

Assessment of Resource Management

- SCI has a fitness center located in Wilson Cove that could be integrated into outdoor recreational activities, such as hiking, trail running, and wildlife observation. Taking advantage of the established trail system for group outdoor endeavors could increase morale for on-island personnel.
- Jogging is a popular outdoor fitness activity on the island. A system of officially designated and marked (route markers and interpretive signs) hiking/running trails could be augmented in appropriate areas around Wilson Cove. Designated trails would reduce disturbance to sensitive areas, address safety concerns with running on the roads, and provide educational outreach opportunities featuring natural resources.
- Improved use of signs in developed and recreational areas to raise awareness of sensitive resource locations is needed along with educational material regarding all fishing regulations.
- The natural resources interpretive video, which provides education on sensitive resources to island personnel, could be amended to address compatible outdoor recreational activities and define use areas.
- The benefit of developing an SCI Outdoor Recreation Plan should be evaluated to ensure any planned recreational access is compliant with the requirements associated with the provisions of the American with Disabilities Act of 1990, as amended, and the Disabled Sportsman Access Act, as amended.
- SCI provides the basic pathways and information to educate on-island personnel of resource issues and values. The current environmental education program could be

expanded; few understand the regional significance of the natural and cultural resources of SCI and the role of Navy stewardship in preserving valuable native flora and fauna.

Management Strategy

Objective: *Promote compatible, safe, and sustainable outdoor recreation opportunities that enhance the quality of life for military personnel, conserve natural resources, and sustain the military mission.*

I. Develop an updated Outdoor Recreation Plan that seeks opportunities for natural resources-based recreation to improve quality of life for on-island personnel and promote stewardship of natural resources.

- ***A.*** Identify and evaluate suitable outdoor recreation opportunities for installation personnel in developed areas.
- ***B.*** Periodically review and update recreational policies to ensure compliance with environmental management regulations.

Objective: *Promote and reinforce the Navy's commitment to an integrated conservation ethic and foster understanding and commitment to environmental stewardship by all island personnel.*

I. Expand interpretive material and signage with respect to native habitats, sensitive species, and consistency with the military mission.

II. Discourage boat landings on offshore rocks within the SCI footprint.

- ***A.*** Coordinate with the U.S. Bureau of Land Management (BLM), National Park Service, and Channel Islands National Marine Sanctuary to expand educational outreach to military personnel and public boaters to SCI waters.
  - *1.* Use materials developed by the Channel Islands Chapter of the Seabird Protection Network.

III. Improve and expand SCI community environmental outreach through an update of the environmental education video and the development of brochures directed to specific user groups.

- ***A.*** Revise the environmental education video to include marine resources issues.
- ***B.*** Develop brochures for defined groups such as boating and fishing clubs and conservation organizations to improve outreach and build relationships within the community.
- ***C.*** Integrate resource issues on invasive species and marine resources to existing environmental materials or outreach products, such as the island's website (http://www.scisland.org).

IV. Expand existing educational partnerships among nonprofit organizations, government, schools, and businesses that focus on the Channel Islands.

- ***A.*** Foster cooperative agreements with local universities.
- ***B.*** Co-sponsor workshops, seminars, literature, web page, and other outreach activities.

V. Evaluate the effectiveness of existing environmental education programs.

- ***A.*** Compare the before-and-after awareness level of participants through post-orientation discussions along with question and answer sessions to ensure a thorough understanding of the island's natural resources.

B. Develop targets for desired awareness levels of different topics focusing on behaviors that carry risk or liability to natural resources, such as invasive species vectors, road kill of special status species, useful precautions, and the severity of non-compliance.

1. Topics may include invasive species, erosion, native plants and wildlife, disturbance, stewardship, recreational impacts, and historic and current habitats.

VI. Plan for the continuation of, and consider expanding, environmental education programs.

4.4 Natural Resources Documentation and Consultation Requirements

Current Management

National Environmental Policy Act Compliance

INRMPs are a significant source of natural resources baseline information and conservation initiatives used to develop NEPA documents for military readiness activities (Chief of Naval Operations *INRMP Guidance for Naval Installations* April 2006). The following describes the basic process by which NEPA compliance is achieved at SCI and how the public review process works (Figure 4-1).

Proposed special projects are reviewed initially at SCI by the Work Induction Board. The Work Induction Board reviews submitted projects based on their need to fulfill training requirements, potential conflicts, and preliminary impact determination. Proposed special projects on SCI are tracked through the NBC Site Approval and Project Review Process. Projects are submitted directly to the lead NBC planner for evaluation. Project impact consideration is then coordinated through all departments on the installation. Military Construction projects, appropriated by Congress, follow a similar review process through the NAVFAC branch of the Navy. NAVFAC employs planners and subject area experts to work with bases, such as NBC, to develop NEPA documents, facilitate permits, and/or perform consultations. Projects may begin after the completion of NEPA documentation, permit preparations, and consultation with regulatory agencies, if applicable. The Facility Engineering and Acquisition Division is responsible for review and monitoring of projects during construction actions and works closely with SCI NRO to ensure projects comply with natural resources requirements.

State-listed species on military installations need to be identified and considered in the NEPA process. The California Endangered Species Act, similar to the federal ESA, is administered by the CDFW. The law was specifically written for species and subspecies native to California. Section 2080.1 of the California Fish and Wildlife Code provides for the incidental take of an endangered, threatened, or candidate species. If an exemption is obtained from the Secretary of the Interior or the Secretary of Commerce, an incidental take statement pursuant to the ESA authorizes the taking of an endangered or threatened species. If certain conditions are satisfied, the take of an endangered, threatened, or candidate species under the California Endangered Species Act is also covered under this incidental take authorization.

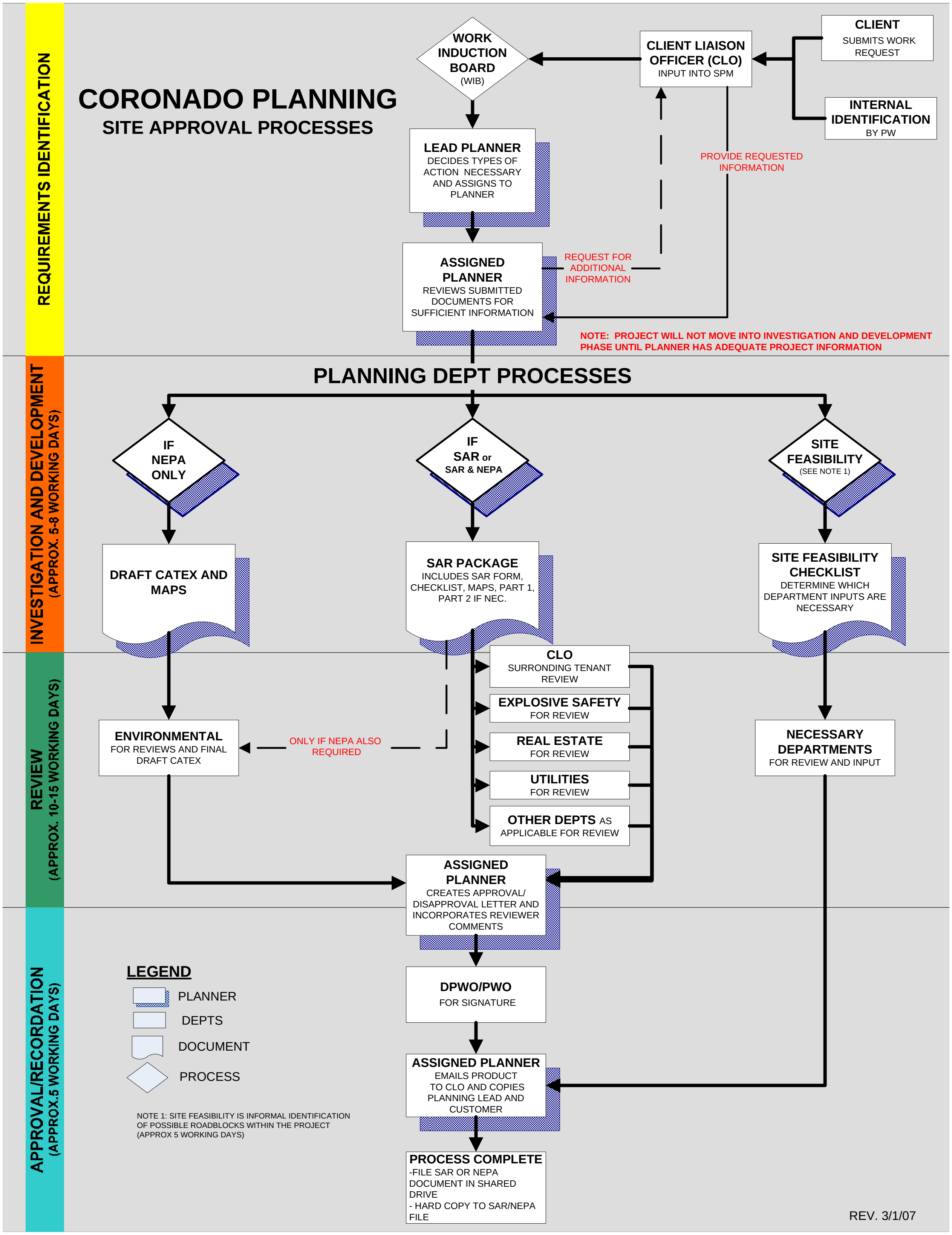

Figure 4-1. Naval Base Coronado Site Approval and Project Review flow chart.

Endangered Species Act Consultation

Section 7(a)(2) of the ESA requires federal agencies to ensure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of a listed species or destroy or adversely modify its designated critical habitat. This is accomplished through consultation with, and assistance from, the Secretary of Interior (through the USFWS or National Marine Fisheries Service [NMFS]) to emphasize identification and resolution of potential species conflicts in the early stages of project planning.

The National Defense Authorization Act of fiscal year 2004, Public Law 108-136, amended Section 4 of the ESA by exempting military lands from critical habitat designation that are subject to an INRMP, if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation. In addition, this law amended Section 4(b)(2) by requiring the Secretary to consider the impact to national security when designating critical habitat.

Informal consultation is an optional process between the USFWS or NMFS; the action agency must determine whether a formal consultation is needed. Circumstances where consultation is not needed include: 1) the action is not anticipated to affect listed species and 2) the action has already gone through the consultation process. Since most habitats on SCI are utilized by federally-listed species, the USFWS (and sometimes NMFS) become involved in almost all SCI projects.

The BO on SCI Military Operations and Wildland Fire Management Plan (USFWS 2008) and NMFS BO on the U.S. Navy's proposal to conduct training exercises in the SOCAL Complex (NMFS 2009) are the products of this interagency consultation, pursuant to Section 7(a)(2) of the ESA. The BO on SCI Military Operations and Wildland Fire Management Plan (USFWS 2008) documents the primary compliance responsibilities for natural resources management on SCI. Other project-level BOs are usually short-term, enforced only for an activity's duration. See Appendix D for more information on laws and regulations applicable to SCI.

Clean Water Act Section 404/401 Permitting and Consultation Under the National Environmental Policy Act

Waters below the marine high tide line (higher high water mark), and the ordinary high water mark on freshwater drainages that connect to the sea, are considered waters of the U.S., regulated for dredge and fill activities under Section 404 of the CWA (See Figure 2-2). A U.S. Army Corps of Engineers permit is required for such activities. These areas also require a Section 401 water quality permit for certain discharges. In addition, wetlands (e.g., salt marsh) and vegetated shallows (e.g., eelgrass and surf grass stands) are considered *Special Aquatic Sites* under Section 404 of the CWA and, therefore, any type of in-water construction that affects substrate or causes discharge of dredge or fill must be permitted and impacts mitigated. The EPA guidelines under the CWA for Special Aquatic Sites, in addition to the broader guidelines for waters of the U.S., apply a burden of proof requirement to demonstrate that no practicable alternatives exist that will meet a project's purpose.

Under Section 404 of the CWA mitigation requirements, eelgrass is also managed in compliance with the California Eelgrass Mitigation Policy, first created in 1991 by USFWS, NMFS, and CDFW. This policy established protocols for mitigating adverse impacts to eelgrass. Project sponsors must follow the guidelines of how and when to survey, map, choose a mitigation site, replant, monitor, and establish success criteria for the eelgrass. Delays in any of these stages can result in financial penalties.

Both NMFS and CDFW comment on U.S. Army Corps of Engineers permits as eelgrass provides forage for fish and migratory birds, as well as federally-listed species. The CCC also regulates coastal and riparian habitats, including a 100-foot buffer on the upland edge of habitat areas (14 California Code of Regulations 13577).

Consultation on Migratory Birds

The Migratory Bird Treaty Act (MBTA) of 1918 is the primary legislation in the United States to conserve migratory birds. The MBTA prohibits the taking, killing, or possessing of migratory birds unless permitted by regulation. The species of birds, and their parts, are protected by the MBTA (50 CFR § 10.13). The USFWS has published the final list of non-native bird species not protected under the MBTA (70 Federal Register 49 [15 March 2005], pp. 28907-28908). The USFWS recently changed the regulations governing migratory bird permitting as outlined in the Federal Register Vol. 72 No.193 56926-56929. These amendments to 50 CFR Part 21 allow removal of migratory birds (other than federally listed threatened or endangered species, bald eagles, and golden eagles) from inside buildings in which the birds may pose a threat to themselves, to public health and safety, and/or to commercial interests.

Migratory Bird Rule. In order to provide guidance for conflicts arising between military readiness activities and the MBTA, the USFWS issued the final rule on *Migratory Bird Permits: Take of Migratory Birds by the Armed Forces* (50 CFR Part 21 in the 28 February 2007 Federal Register, pages 8931-8950). The Migratory Bird Rule authorizes the military to *take* migratory birds during military readiness exercises under the MBTA without a permit. However, if the military determines that the activity will significantly affect a population of migratory birds, the installation must work with the USFWS to implement conservation measures to minimize and/or mitigate the effects. An activity is expected to have a significant adverse effect if, over a reasonable period of time, it diminishes the capacity of a population of a migratory bird species to maintain genetic diversity, to reproduce, and to function effectively in its native ecosystem.

To date, no exemption under the Migratory Bird Rule has been requested for military readiness activities on SCI. No MBTA permits, including for the airfield, are in place except for the shrike recovery program's predator research and management. Further details on the MBTA on SCI are provided in Appendix E.

Other Consultation in Marine Waters

For projects and activities within marine waters key jurisdictions and laws become pertinent based on parameters such as distance from shore, tidal depth, habitat and individual species group (See Figure 2-2). Since the location of a proposed action can trigger different regulations based on these factors, laws and regulations that may apply need to be evaluated for each project independently.

Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) Consultation. The MSA establishes a national program to manage and conserve the fisheries of the United States through the development of federal Fishery Management Plans, and federal regulation of domestic fisheries under those Fishery Management Plans, within the 200-mile U.S. Exclusive Economic Zone (16 U.S. Code [USC] § 1801 *et seq.*).

To ensure habitat considerations receive increased attention for the conservation and management of fishery resources, the amended MSA requires each existing, and any new, Fishery Management Plan to "describe and identify essential fish habitat for the fishery." Guidelines established by the Secretary, under section 1855(b)(1)(A) of the MSA, must minimize "to the extent practicable adverse effects on such habitat caused by fishing, and also must identify other actions to encourage the conservation and enhancement of such habitat" (16 USC § 1853[a][7]).

The Navy is mandated to consult with NMFS (as delegated by the Secretary of Commerce) with respect to any action authorized, funded, or undertaken, or proposed to be, by the Navy that may adversely affect EFH under the MSA. If NMFS determines an action would adversely affect EFH, NMFS subsequently recommends measures to conserve such habitat. The federal action agency receiving the conservation measures must provide a detailed response in writing to NMFS within 30 days. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH.

EFH is designated in waters adjacent to SCI under three Fishery Management Plans: the Pacific Groundfish, Coastal Pelagics, and Highly Migratory Species Fishery Management Plans (Pacific Fishery Management Council 1998a, 1998b, 2011). EFH that is considered to be particularly important to the long-term productivity of populations of one or more managed species, or to be particularly vulnerable to degradation, may also be identified by NMFS as Habitat Areas of Particular Concern. Eelgrass beds, rocky reefs, and kelp forests are also considered Habitat Areas of Particular Concern.

As of the end of 2011, EFH consultation has only been conducted for SCI under the SOCAL EIS (Navy 2008).

Marine Mammal Protection Act. Unlike the ESA, there is no consultation requirement under the Marine Mammal Protection Act. If take (lethal and non-lethal) is reasonably foreseeable, the Navy must obtain a Letter of Authorization (for potential lethal take) or an Incidental Harassment Authorization (no potential for lethal take) from NMFS. Obtaining a Letter of Authorization is a long process (eight to 18 months), while an Incidental Harassment Authorization can take as little as four months. An Incidental Harassment Authorization may be issued if:

- There is no potential for serious injury or mortality; or
- The potential for serious injury or mortality can be negated through mitigation requirements.

A Letter of Authorization was issued as a result of the completed SOCAL EIS (Navy 2008). NMFS subsequently issued a BO on the U.S. Navy's proposal to conduct training exercises in the SOCAL Range Complex (NMFS 2009) that included conservation measures and requirements to avoid and minimize the effects of military training on marine mammals in the Southern California Bight, including SCI nearshore waters.

Coastal Zone Management Act. Two additional federal laws operate in the coastal zone: the CZMA of 1972 and the Coastal Zone Act Reauthorization Amendments of 1990. The CZMA provides that a state that develops a coastal zone management program, approved by the Secretary of Commerce (NOAA), is entitled to federal financial support in administering the program and may apply the program to some areas that otherwise would be subject to only federal regulation (16 USC § 1455-1456). Federal agency activities affecting any land use, water use, or natural resource of the coastal zone shall be carried out in a manner "which is consistent to the maximum extent practicable with the enforceable policies of approved state management programs" (16 USC § 1456). The term "enforceable policies" is defined by regulation as those legally binding laws, regulations, land use plans, ordinances, or judicial or administrative decisions, which are part of a NOAA approved program. The CCC has authority to implement provisions of the coastal zone management program.

Although Navy lands are excluded from the CZMA definition of "coastal zone" as "lands held in trust by or which uses are subject solely to the discretion of the federal government," activities on these lands may require a consistency determination if there are coastal zone impacts. According to OPNAVINST 5090.1C: "federal actions that affect any land or water use or natural resource of the coastal zone must be consistent with the state program to the maximum extent practicable." Federal rules for federal consistency can be found in 15 CFR § 930.35-37.

In conjunction with the SOCAL EIS (Navy 2008) process, the Navy completed a Consistency Determination under the federal CZMA consistency review process. The Consistency Determination found that the Navy was consistent to the maximum extent practicable with the state's enforceable CZMA policies. In particular, the Navy determined that its Proposed Action was consistent with California Coastal Act Article 2 (Public Access), Section 30210 (Access, recreational opportunities, posting); Article 3 (Recreation), Section 30220 (Protection of water-oriented activities); Article 4 (Maritime Environment), Sections 30230 (Marine resources, maintenance), 30231 (Biological productivity, wastewater), and 30234.5 (fishing; economic, commercial, and recreational importance); and Article 5 (Land Resources), Section 30240 (Environmentally sensitive habitat areas). The Navy determined that other policies embodied in the articles and sections of the California Coastal Act were not applicable to the Proposed Action. On 15 October 2008, the Navy appeared before the CCC in Ventura, California. The CCC conditionally concurred with the Consistency Determination.

Assessment of Resource Management

- SCI is proactive and cooperative in regard to the consultation process. Implementation of conservation requirements must be adhered to for the installation to stay in compliance and avoid unintended disruptions to military training activities.
- Future consultation concerns must be given to the priority of the preservation of the military training mission while meeting the requirements and changes in the listing status or conditions of threatened and endangered species and changes in fire management practice.

Management Strategy

Objective: *Implement and apply natural resources documentation and consultation requirements efficiently as an effective means to consider the effect of activities on natural resources and the human environment.*

I. Improve the timeline of environmental review.

- ***A.*** Continue to improve the availability and integration of information into the compliance process to improve project time lines and document choices in compliance with NEPA. Find ways to facilitate internal routing and the signature process at NBC and for improved efficiency and timeliness of USFWS consultations.

B. Facilitate communication with resources and regulatory agencies during INRMP planning updates, NEPA review, and ESA consultations in the development of conservation measures.

C. Integrate NEPA process early in project planning.

D. Implement Environmental Assessments or EISs programmatically, such as for routine maintenance work.

II. Continue to assess consequences of each proposed action and address the significant impact of each action through analysis, planning, and avoidance.

A. Continue to implement the Site Approval and Project Review Process as described above.

B. Evaluate if consultations under specific permitting requirements should start concurrently.

III. Standardize the format by which cumulative effects are discussed in environmental documentation (Intergovernmental Panel on Climate Change 2007). Climate change cumulative effects are determined by counsel. NRO should work with N40 and counsel to incorporate ideas for effective analysis.

A. Ensure climate change scenarios are considered, using a standardized range of possible outcomes over 50-100 years or other defined time period.

B. Ensure standardization of the habitat classification system to be used in cumulative effects documentation.

C. Documentation should be presented at different, nested scales. Properly combine the spatial and temporal extent of projects, such that all other projects overlapping in time and space are considered.

IV. Support research to improve the adequacy of cumulative effects analysis at predicting when habitat or species effects become significant.

A. Promote research on connections among habitats and species, and the relationship between habitat quality and resources use.

B. Support research on the effects of habitat fragmentation.

C. Develop strategic, long-term means to offset cumulative impacts.

V. Project and mitigation planning at SCI will continue to avoid, minimize, rectify, reduce, eliminate, or compensate for any identified environmental impact (Council on Environmental Quality 1978).

A. The following current and standard mitigation measures should be continued for all proposed infrastructure or discretionary actions unless a determination can be made, in consultation with the NRO, that they are not appropriate.

1. *Avoidance First.* Proposed actions must initially include requirements for impact avoidance and minimization measures. Measures which should be considered as applicable are worker environmental protection briefings, signs, markers, protective fencing, biological monitoring, erosion and sedimentation prevention, and temporary impact restoration.
2. *Seasonal Avoidance Measures.* During the active growing and breeding season, many species and habitats are more sensitive to disturbance that may cause harm, harassment, or severe damage.
3. *Minimize Impacts.* Measures must be implemented to minimize potential impacts.

4. *Consider Indirect Effects.* Indirect effects of a project must be considered as part of the initial project and mitigated accordingly.
5. *Survey Protocols.* Federally threatened or endangered species presence or absence determinations must be made using survey guidelines developed by the USFWS, or other means acceptable to USFWS. Where no such guidelines or protocols exist, surveys must be conducted by Navy-approved, permitted persons using methods recognized and accepted by scientific experts.
6. *Use of a Navy-approved Biological Monitor.* A biological monitor or Navy-approved biologist should be retained, in coordination with the natural resources biologists, to educate workers, oversee and implement impact avoidance and minimization measures, and document impacts.
7. *Restoration Plans to be Completed in Advance.* All actions that require active habitat restoration, enhancement, and/or compensation must have an appropriate plan developed, prior to implementation. Ensure that all necessary permits are obtained for restoration projects, such as a U.S. Army Corps of Engineers Section 404 permit (federal), CCC approval, and possibly Non-point Source Discharge Elimination System permits to discharge water into a wetland.

B. *Catalog and Track Success of Measures Employed.* Maintain a reference catalog of past avoidance, mitigation, and compensatory measures, as well as a system for ongoing evaluation of their effectiveness.

VI. Ensure consistency with the Integrated Cultural Resources Management Plan.

VII. Ensure compliance with the MBTA; native birds are generally protected by the MBTA. Planners must review proposed activities for work during the active breeding season. Habitat clearing should be timed to avoid the breeding season. All contracts and work orders prepared for SCI must include provisions that prohibit harming, damaging, or destroying active bird nests. See Appendix E for more information on benefits for species protected under the MBTA.

VIII. SCI natural resources or NAVFAC Southwest biologists should provide contractual language prepared and approved for construction contracts.

IX. Ensure the operations, activities, projects, and programs on SCI in or on coastal lands or waters affecting coastal zones, comply with the state's coastal approved management program to the maximum extent practicable (OPNAVINST 5090.1C CH-1).

4.5 Integrating Other Plans and Programs

INRMPs must be prepared in coordination with installation range plans, training plans, Integrated Cultural Resources Management Plans, Integrated Pest Management Plans, Installation Restoration Plans, and other appropriate plans. Proper coordination is of particular concern at an installation with an associated range. Such an installation must coordinate with the range manager and mission claimants to ensure that the current and future management strategies outlined in the RCMP are reflected in the INRMP. However, an INRMP is not intended to function as a comprehensive compilation of detailed information on all related topics. It should briefly summarize the key interrelationships with these plans, reference where the plans may be obtained, and describe where detailed information can be found (Navy 2006).

4.5.1 Environmental Restoration Program

The Defense Environmental Restoration Program, created under the Superfund Amendments and Reauthorization Act, has two site cleanup programs: Installation Restoration Program for sites with past releases of hazardous substances and Munitions Response Program for sites with munitions and explosives of concern.[4]

The installation recognizes that adverse impacts to natural resources addressed in this INRMP may result from the release of hazardous substances, pollutants, and contaminants into the environment. The Navy Installation Restoration Program is responsible for: 1) identifying Comprehensive Environmental Response, Compensation, and Liability Act releases, Resource Conservation and Recovery Act releases, and releases under related provisions; 2) considering risks and assessing impacts to human health and the environment, including impacts to endangered species, migratory birds, and biotic communities; and 3) developing and selecting response actions when a release may result in an unacceptable risk to human health and the environment.

As of 2012, nine of the 17 sites had been cleaned up (Table 4-1); there are currently eight sites (Map 4-4) still identified for potential environmental clean-up on SCI. SCI is neither listed, nor proposed for listing on the National Priorities List.

Table 4-1. Active Environmental Restoration Sites addressed through the Comprehensive Environmental Response, Compensation and Liability Act and Resource Conservation and Recovery Act of 2012 (Naval Facilities Engineering Command Southwest, Environment Restoration).

Installation Restoration Site #	Description	Acreage	Status
1	Lemon Tank Canyon disposal area	4	Removed
2	Photography Laboratory drainage	2	
3	Missile guidance scene	3	Removed
4	Fire fighting training area	0.5	
5	JP-5 fuel spill	1	Removed
6	Abandoned underground Air Force tank	2	Removed
7	Diesel fuel spill near power plant	1	
8	Transformer spill near Building 60138	1	Removed
9	Transformer spill near Building 60142	0.5	Removed
10	Former Airfield area	2	
11	Former disposal area west of Wilson Cove	0.3	
12	North Tank Dam disposal area	10	
13	Small disposal area west of Lemon Tank Canyon	1	
14	Old ordnance disposal area		Removed
15	SCI Landfill		Removed
16	Wilson Cove Gas Station	1	Removed
17	Power Plant	0.5	
	TOTAL ACREAGE	29.8	

4. For more information, visit: https://portal.navfac.navy.mil/portal/page/portal/NAVAC/NAVFAC_WW_PP/NAVFAC_NFESC_PP/ENVIRONMENTAL/ERB/ERP.

Map 4-4. Current Installation Restoration sites on San Clemente Island.

When appropriate, the regional or installation natural resources management staff help the Installation Restoration Program Remedial Project Manager identify potential impacts to natural resources caused by the release of these contaminants. Regional or installation natural resources staff will also participate, as appropriate, in the Installation Restoration Program decision-making process through: communicating natural resources issues on the installation to the Remedial Project Manager; reviewing and commenting on Installation Restoration Program documents (e.g., Remedial Investigation, Ecological Risk Assessment); and ensuring that response actions, to the maximum extent practicable, are undertaken in a manner that minimizes impacts to natural resources on the installation. Additionally, the regional or installation natural resources staff will make recommendations to the Remedial Project Manager regarding cleanup strategies and site restoration, if necessary. During initial monitoring protocols, the natural resources manager may suggest sampling and testing so as to not impact sensitive or critical areas. During the planning phase of site restoration, the natural resources manager has the opportunity to recommend site restoration practices outlined within the INRMP.

The lack of perennial ground water and the unique properties of the terrestrial environment on SCI constrain the majority of investigations and remediation of Installation Restoration sites. Currently, Remedial Project Managers assigned to the Environmental Restoration group of NAVFAC Southwest in San Diego maintain and oversee investigations and remedial work at Installation Restoration sites on SCI. Remedial Project Managers meet with Los Angeles Regional Water Quality Control Board representatives annually to review the status of projects, discuss objectives, and develop a joint execution plan. In conjunction with NAVFAC Southwest, Remedial Project Managers continue to actively perform investigations and remediation to close individual Installation Restoration sites.

4.5.2 Integrated Cultural Resources Management Plan

Cultural resources typically include buildings, structures, objects, and/or prehistoric and historical archaeological sites. Once a cultural resource is determined eligible for listing in the National Register of Historic Places, it is considered a historic property for the purposes of compliance with Sections 106 and 110 of the National Historic Preservation Act.

At present, four thousand cultural resources, primarily prehistoric and historical archaeological sites, have been recorded on SCI. Based on probabilistic sampling methodologies, the number of archaeological resources on SCI is estimated as high as 8,000 sites. Considering site volume and dispersion on SCI, the potential to adversely affect cultural resources sites through natural resources programs and activities requires coordination and review by the Cultural Resources Program Manager at NAVFAC Southwest Environmental Core (EV52). The Site Approval Review provides the primary planning mechanism for projects conducted by the NRO to be reviewed by other programs, such as Cultural Resources.

In an effort to provide a more streamlined compliance approach to cultural resources management on SCI, the CO of NBC entered in to a Programmatic Agreement with the State Office of Historic Preservation. The Programmatic Agreement allows the Cultural Resources Program Manager to make specific determinations regarding effects to historic properties, without State Office of Historic Preservation consultation.

In compliance with Section C.1 of the Programmatic Agreement, the Navy is preparing an Integrated Cultural Resource Management Plan for SCI. The primary objective of the Integrated Cultural Resource Management Plan is to provide readily accessible support for efficient management of cultural resources and proactive conformance with requirements and compliance mandates.

4.5.3 Oil Spill Hazardous Substance Prevention and Clean Up

The National Response Team is the primary national contingency planning, policy, and coordination organization for oil and hazardous substances emergency response. The Oil Pollution Act of 1990 and CWA are the driving public laws behind the formation of the National Response Team. The 16 federal member agencies of the National Response Team have expertise and interests in various aspects of emergency preparedness and response. They have developed a National Response System that provides a framework for coordination among federal, state, and local responders. The National Response System includes four levels of contingency planning: federal, regional, area and local, and site-specific industry) (Figure 4-2).

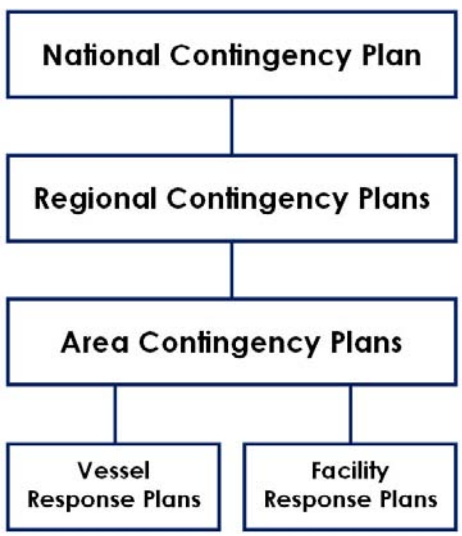

Figure 4-2. Four levels of oil spill response contingency plans.

Due to the over-water transfer of petroleum products, and in accordance with the Oil Pollution Act of 1990, SCI has a Facility Response Plan and an Emergency Response Action Plan (both updated in April 2001). In addition, Boats and Docks personnel at SCI are trained in oil spill response and are equipped with a platform boat, oil spill containment boom, skimmer, utility boats, vacuum truck, and disposable absorbent materials in the event of a spill.

SCI operates under the Emergency Response Action Plan under NBC's Spill Prevention, Control, and Countermeasures Plan (January 2007) to comply with Title 40 of the CFR, Parts 110 (Discharge of Oil) and 112 (Oil Pollution Prevention). This Oil and Hazardous Substance Integrated Contingency Plan addresses petroleum storage, spill prevention, and response protocol at SCI.

Federal Regulatory Framework

The federal Water Pollution Control Act of 1972 (33 USC § 1251, *et seq.*), as amended, by the CWA of 1977 authorizes the President, in the case of an oil or hazardous substance release, to take any action necessary to mitigate damage to public health and welfare, including, but not limited to: fish, shellfish, wildlife, public and private property, shorelines, and beaches. Natural Resources Trustees are authorized to recover damages for injury to, destruction of, or loss of natural resources resulting from a discharge or the substantial threat of a discharge of oil into navigable waters.

NOAA is assigned responsibility for Natural Resources Damage Assessment from spills, and the Navy has adopted NOAA procedures for damage assessment (15 CFR § 990). Similarly, the U.S. Department of the Interior is in charge of damage assessment for hazardous substance spills under EO 12580. The baseline condition of natural resources and services that would exist, had the oil or hazardous substance release not occurred, is estimated using historical data, reference data, control data, or data on incremental changes alone or in combination, as appropriate. Navy guidance (OPNAVINST 5090.1C CH-1) suggests that this information may be obtained from INRMPs, NEPA documents, or special studies.

Potential partners for planning support, response, and restoration, in the event of an oil spill near SCI, include the USFWS, CDFW, NOAA, National Park Service, and BLM.

Natural Resources Damage Assessment and Ephemeral Data Collection Plan

DoD guidance (DoDINST 4715.03) states that “all DoD components shall develop and promulgate criteria and procedures for assessing natural resources damage claims in the event natural resources under DoD control are damaged [injured] by oil or a hazardous substance released by another party.” Navy requirements (OPNAVINST 5090.1C CH-1) go beyond DoDINST 4715.03 and apply to natural resources injury occasioned by oil or hazardous substance releases from both DoD and non-DoD sources.

Where an oil spill, regardless of source or physical location, injures or threatens to injure natural resources within Navy management or control, NOAA Natural Resources Damage Assessment procedures serve to guide Navy activities in the mitigation, assessment, and collection of natural resources damages occasioned by the spill. The baseline assessment, compiled prior to a spill, becomes essential to both pre-incident planning for response, as well as the post-incident assignment of damages. Baseline ecological information, which includes data in this INRMP, is required under OPNAVINST 5090.1C CH-1 on behalf of the Navy Regional Environmental Coordinator.

NAVFAC Southwest has developed an Ephemeral Data Collection Plan in support of Natural Resources Damage Assessment (Robilliard et al. 1997). Immediately during and after a spill, data will be collected to evaluate the injury. Examples include: macro invertebrate surveys, water and sediment samples, and vegetation surveys. Following federal guidelines, this is completed cooperatively with the responsible party and fellow trustee agencies. The NAVFAC plan identifies specific locations, methodologies, and responsibilities for data collection.

The U.S. Navy follows regional stranding and injured wildlife protocol established by the Southwest Region Marine Mammal Stranding Network. An MOU between NMFS and the U.S. Navy, *Assist in Marine Mammal Stranding Investigations* (Agreement No. PR-055), requires the development of the Regional Stranding Investigation Assistance Plan. The Regional Stranding Investigation Assistance Plan is developed at the regional level with the Navy Stranding Response Coordinators. In addition, NBC Instruction 5090.1 *Base Fishing Regulation*, requires compliance with federal and state laws concerning fish and wildlife, including marine mammals.

State Regulatory Framework

The Office of Spill Prevention and Response is responsible for protecting California's natural resources by preventing, preparing for, and responding to spills of oil and other deleterious materials, as well as restoring and enhancing affected resources. Both the federal and state statutes (Oil Pollution Prevention Act 1990 and Senate Bill 2040) were enacted in consequence of the catastrophic oil spills of 1989 and required contingency planning for both state and federal governments. The USCG and CDFW-Office of Spill Prevention and Response agreed to a joint preparation of contingency plans by co-chairing the three Port Area Committees for Contingency Planning: USCG Port Areas for San Francisco, Los Angeles/Long Beach, and San Diego.

SCI currently has in place an Integrated Contingency Plan for Oil and Hazardous Substance Spill Prevention and Response (2007) that complies with state and federal standards. The Integrated Contingency Plan for Oil and Hazardous Substance Spill Prevention and Response is an operational, single-source document designed to meet the combined regulatory requirements for an EPA Facility Response Plan, EPA Spill Prevention Control and Countermeasure Plan, a USCG Response Plan for Oil Facilities (Marine Transportation-Related Facility Response Plan), and a State of California, Office of Spill Prevention and Response Oil Spill Contingency Plan.

Storage and transfer operations of fuel and other potentially hazardous substances within Wilson Cove are overseen by the Port Operations Officer-In-Charge, as well as established Standard Operating Procedures, including the staging of oil booms and response personnel, in the event of an oil or hazardous substance discharge. Safeguards, monitoring, and reporting requirements for shore-based storage facilities and distribution locations are also captured in the Integrated Contingency Plan.

4.5.4 Los Angeles Basin Plan

The Los Angeles Regional Board's Basin Plan is designed to preserve and enhance water quality and protect the beneficial uses of all regional waters. Specifically, the Basin Plan: 1) designates beneficial uses for surface and ground waters; 2) sets narrative and numerical objectives that must be attained or maintained to protect the designated beneficial uses and conform to the state's anti-degradation policy; and 3) describes implementation programs to protect all waters in the region. In addition, the Basin Plan incorporates (by reference) all applicable State and Regional Board plans and policies and other pertinent water quality policies and regulations.

4.5.5 Recovery Planning for Federally Listed Species on Channel Islands

Recovery Plan for the Endangered and Threatened Species of the California Channel Islands. This plan was developed in 1984 and covers federally listed species on SCI, Santa Barbara Island, and San Nicolas Island.

National Park Service Channel Island Fox Recovery Plan. A recovery team was developed in 2004. The plan lists recovery strategies and goals for the northern Channel Islands regarding island fox (*Urocyon littoralis*) populations.

U.S. Fish and Wildlife Recovery Plan for Four Subspecies of Island Fox. A Draft Recovery Plan was released for public comment and review in November 2012. This recovery plan was voluntary and includes long-range strategies to help protect the species and regain their natural health to enable them to be removed from protected status.

Recovery Plan for 13 plant species in the Northern Channel Islands Plan (USFWS 2001). This plan covers the following endangered species: Hoffmann's rock-cress (*Arabis hoffmannii*); Santa Rosa Island manzanita (*Arctostaphylos confertiflora*); island barberry (*Berberis pinnata* subsp. *insularis*); soft-leaved paintbrush (*Castilleja mollis*); island bedstraw (*Galium buxifolium*); Hoffmann's slender-flowered gilia (*Gilia tenuiflora* subsp. *hoffmannii*); Santa Cruz Island bushmallow (*Malacothamnus fasciculatus* subsp. *nesioticus*); Santa Cruz Island malacothrix (*Malacothrix indecora*); island malacothrix (*Malacothrix squalida*); island phacelia (*Phacelia insularis* var. *insularis*); and Santa Cruz Island fringepod (*Thysanocarpus conchuliferus*). It also covers threatened species: Santa Cruz Island dudleya (*Dudlyea nesiotica*) and island rush-rose (*Helianthemum greenei*).

Several *Five-Year Reviews for federal listed species* have been implemented and completed. Reviews were performed in 2007 for the western snowy plover (*Charadrius alexandrinus nivosus*) and San Clemente woodland-star (*Lithophragma maximum*) with recommendations to maintain their federal list status. The San Clemente Island larkspur's (*Delphinium variegatum* subsp. *kinkiense*) five-year review was published in 2008. Five-year reviews were also implemented in 2009 for the San Clemente loggerhead shrike (*Lanius ludovicianus mearnsi*) and the San Clemente sage sparrow (*Amphispiza belli clementeae*). In 2012, the island night lizard (*Xantusia riversiana*) was reviewed with a recommendation to delist the species based on recovery. Additionally, in 2012, the Santa Cruz Island rockcress (*Sibara filifolia*) and San Clemente Island bush-mallow (*Malacothamnus clementinus*) were reviewed with no recommendations made to change their endangered status. However, the 2012 five-year reviews of the San Clemente Island indian paintbrush (*Castilleja grisea*) and San Clemente Island lotus (*Acmispon dendroideus* var. *traskiae*) recommended the species be downlisted from endangered to threatened.

4.5.6 Wildlife Action Plan

The CDFW, as an INRMP partner, seeks consistency of this INRMP with its Wildlife Action Plan (WAP). In order to receive federal funds through the State Wildlife Grants Program the U.S. Congress charged each state to develop a WAP to examine the health of wildlife and prescribe actions to conserve wildlife and vital habitat before becoming additionally stressed, and more costly to protect (Consolidated Appropriations Act of 2005 Public Law 108-447). The U.S. Congress also directed that the strategies must identify and be focused on the "species of greatest conservation need" while addressing the full array of wildlife and wildlife-related issues (CDFW 2007). The California WAP recommends conservation actions that address stressors to habitats and stresses the importance of federal-state partnerships and partnerships with non-governmental organizations with a stake in wildlife, land, and aquatic management. The WAP provides guidance to these partnering institutions by identifying wildlife and habitat conservation actions and information needs at a strategic level. The WAP addresses concerns on SCI, both terrestrial and marine. The WAP calls out six vertebrate and three invertebrate species from SCI as special status, including: San Clemente sage sparrow; San Clemente loggerhead shrike; San Clemente deer mouse (*Peromyscus maniculatus clementis*); San Clemente (spotted) towhee (*Pipilo maculatus* [=*erythrophthalmus*] *clementae*); island fox; island night lizard; San Clemente coenonycha beetle (*Coenonycha clementia*); San Clemente island snail (*Micrarionta gabbi*); and San Clemente Island blunt-top snail (*Sterkia clementina*).

The WAP also identifies primary issues for wildlife in the region, which include overfishing, degradation of marine habitats, invasive species, pollution, human disturbance, growth and development, and climate change. This INRMP contributes to addressing wildlife stresses identified in the California WAP that described below.

- Restricted access to SCI habitats contributes to WAP goals for protecting intertidal areas and lessening human disturbance of marine life in the water and on land. NSZs provide an incidental benefit to marine habitats similar to that of a marine protected area.
- The funding of baseline and trends studies in NSZs contributes to the WAP requirement to use the best available scientific data and form collaborative partnerships to prioritize the needs of the marine region.
- The WAP emphasized collaborative enforcement in of the marine region. This is supported through the collaborative enforcement efforts of NSZs by the Navy and USCG.
- Limited shoreline development in support of military training areas addresses the WAP issue of managing shoreline growth and development that fragments or degrades wildlife habitat.
- Water quality information collected for Bight '08 in SCI waters contributes to setting appropriate priorities for pollution protection. The Navy also participates in oil spill response planning on a regional basis, which contributes to seabird protection as identified in the WAP.
- Invasive species surveys, protocols, and projects for marine and terrestrial invasive species contribute to important management efforts of special status species. The WAP places special emphasis on rat and feral cat control to protect seabird colonies; the Navy actively controls these predators.
- Monitoring the status and trends of endemic species and maintaining a vegetation restoration program assists in the preparation for climate change. INRMP objectives seek to maintain current distributions and occurrences of endemic species, which would ensure some resilience to effects of climate change.

4.6 Beneficial Partnerships and Collaborative Resources Planning

Current Management

The Sikes Act (as amended) provisions and cooperative agreements for outdoor recreation, such as for hunting and fishing, are implemented nationally by an MOU between the DoD and U.S. Department of the Interior.

Navy and DoD policy calls for its installations to expand involvement in regional ecosystem planning, management, and restoration initiatives (OPNAVINST 5090.1C CH-1; DoDINST 4715.03). Establishing cooperative planning efforts with surrounding land agencies and individuals will benefit SCI natural resources and those of the entire region. Cooperative planning can also reduce the costs of actions that require management across boundaries, such as biological monitoring.

The Navy requests coordination directly with CDFW prior to the special designation (e.g., Special Animal, Special Plant, Protected Species, or State Threatened or Endangered) or status change of any endemic species or subspecies occurring on SCI.

Cooperative Agreements are another means of establishing partnerships to accomplish goals of the NRO. Installations may enter into cooperative agreements with states, local governments, non-governmental organizations, and individuals to provide for the maintenance and improvement of natural resources or conservation research on or off the installation (DoD 2011). Previous partnerships and work completed as a result are described in Appendix D.

The NBC natural resources managers have many potential partners for conservation planning. Some potential partners and their applicable plans used for conservation include:

- BLM and the Coastal California National Monument. SCI has 47 offshore rocks, which are part of the Coastal California National Monument. The Monument was established in 2000 by President Clinton. The Resource Management Plan for the Coastal California National Monument (BLM 2005) describes out a comprehensive approach to managing offshore rocks. The plan outlines initial efforts focusing on interpretation and education.
- A Northern Channel Islands Recovery Plan for plants was developed by USFWS and there is a need for USFWS to produce a Southern Channel Islands Recovery Plan.
- NMFS Habitat Conservation Plans. For non-federal entities, these plans are designed to offset potentially harmful effects of a proposed activity on a listed species. They also provide additional conservation benefits and flexibility for landowners by planning for unlisted species.

Partners may include:

- USFWS Ecological Services
- NMFS
- Los Angeles Regional Water Quality Control Board
- Federal Aviation Administration
- USCG
- BLM
- National Park Service
- U.S. Geological Survey
- Catalina Island Conservancy

5.0 Implementation Strategy

To achieve the objectives of this Integrated Natural Resources Management Plan, management strategies in Chapters 3 and 4 need to be prioritized, assigned, and prepared for funding. This chapter outlines an implementation strategy that is a fundamental element of the Navy's adaptive management approach and is consistent with the budgeting hierarchy of U.S. Department of Defense and Navy directives.

Effective implementation of the practices and projects described in Chapters 3 and 4 of this Integrated Natural Resources Management Plan (INRMP) will help to achieve sustainability of San Clemente Island (SCI) ecosystems and associated species, while ensuring no net loss of the capability of SCI lands and waters to support the U.S. Department of the Navy (Navy) mission. The success of this INRMP requires diligence by leadership and natural resources staff to comply with regulatory requirements, integrate complementary installation management plans, strengthen interagency partnerships, and implement adaptive management approaches for individual projects. It also requires a review for "operation and effect." A review for operation and effect is defined as "a comprehensive review by the Parties, at least once every five years, to evaluate the extent to which the goals and objectives of the INRMP continue to meet the purpose of the Sikes Act (as amended, 2012), which is to carry out a program that provides for the conservation and rehabilitation of natural resources on military installations."

A compliant INRMP is defined as "a complete plan that meets the purposes of the Sikes Act (as amended)[§101(a)(3)(A-C)], contains the required plan elements [§101(b)(1)(A-J)], and has been reviewed for operation and effect within the past five years [§101(2)(b)(2)]." If the INRMP is greater than five years old, then it must have undergone a review for operation and effect within the past five years.

The responsibility for development, revision, and implementation of INRMPs is shared at every level in the U.S. Department of Defense (DoD) and among its command elements. Roles of various parties identified as stakeholders in implementing this INRMP are covered in Chapter 1, Section 1.6 INRMP Responsibilities.

5.1 Staffing and Personnel Training

The Sikes Act (as amended) (Section 670g) specifically requires "sufficient numbers of professionally trained natural resources management and natural resources enforcement personnel to be available and assigned responsibility" to implement an INRMP.

Adequate training of natural resources personnel is important to the success of military sustainability and land management. The Chief of Naval Operations Instruction (OPNAVINST) 5090.1C CH-1 requires that Navy commands develop, implement, and enforce the management plan through personnel with professional training in natural resources. "Natural resources programs shall support military readiness and sustainability and commands shall assign specific responsibility, provide centralized supervision, and assign professionally trained personnel to the program. Natural resources personnel shall be provided an opportunity to participate in natural resource management job-training activities and professional meetings."

The Environmental Division of the Public Works Department of Naval Base Coronado is responsible for identifying personnel requirements to accomplish INRMP objectives. The Environmental Division is also responsible for providing input into this process by allocating existing budgetary and personnel resources and then identifying staffing needs based on any additional current and future projects. Personnel assigned to natural resources management are responsible for implementing the INRMP.

The following staffing is needed to implement this INRMP at SCI:

- Wildlife Biologist (currently filled)
- Botanist (currently filled)
- Marine Ecologist (currently filled)
- Environmental Operations Manager (logistics) (currently filled)
- Biological Technician (position needed)
- Environmental Protection Specialist (National Environmental Policy Act) (currently filled)

In addition, contractual support, partnerships, and cooperative agreements are needed.

Periodically, additional training is necessary to keep personnel updated on the current practices and advances in knowledge of topics. Training opportunities may be offered in the forms of structured courses or conferences, workshops, and/or symposiums. SCI will evaluate annual workshops or professional conferences for attendance, depending on funds available for travel and training. For example, the Natural Resources Office identified the annual National Military Fish and Wildlife Association Conference as a priority because many important topics and policy changes directly affecting SCI natural resources management are discussed. In addition to other training, installation biologists should attend National Military Fish and Wildlife Association each year to collaborate and gain valuable training and ideas.

Other conferences or workshops will be evaluated for their usefulness in improving the success of natural resources management activities through professional development and information exchange, and to present Navy natural resources achievements to the professional community.

5.2 INRMP Review, Metrics, and Adaptive Management

According to OPNAVINST 5090.1C CH-1, annual reviews must verify that:

- Current information on all conservation metrics is available.
- All *must fund* projects and activities have been budgeted and implementation is on schedule.
- All required trained natural resources positions are filled or are in the process of being filled.
- Projects and activities for the upcoming year have been identified and included in the INRMP. An updated project list does not necessitate revising the INRMP.
- All required coordination has occurred.
- All significant changes to the installation's mission requirements or its natural resources have been identified.
- The INRMP objectives remain valid.

5.2.1 Natural Resources Conservation Measures of Merit and INRMP Metrics

DoD installations are instructed to report progress toward meeting natural resources conservation program measures of merit to the Deputy Under Secretary of Defense for Installations and Environment at each Environmental Management Review and to Congress in the Defense Environmental Programs Annual Report. The Office of the Secretary of Defense (OSD) reports on the status of its INRMPs to ensure they support and sustain the installation missions while complying with federal laws, regulations, DoD and Navy policies, Executive Orders (EOs), and other requirements.

Sikes Act (as amended) Implementation Guidance (Deputy Under Secretary of Defense for Installations and Environment Memorandum 10 October 2002) added new tracking procedures, entitled *metrics*, to ensure proper INRMP coordination and project implementation. In 2004, Naval Facilities Engineering Command Southwest (NAVFAC) was tasked to develop a metric system for Navy natural resources programs to measure conservation impacts on installation missions and the success of partnerships with the U.S. Fish and Wildlife Service and state fish and wildlife agencies. DoD Instruction (DoDINST) 4715.03 (2011) continued to require the use of Natural Resources Conservation metrics to assess the overall health and trends of the natural resources program and to identify and correct potential funding and other resource shortfalls.

INRMP Annual Reviews are facilitated by the Navy Conservation website (Appendix L). The Navy Conservation website is designed to assist decision makers in assessing INRMP implementation and how well conservation efforts are applied across Navy sites in the 54 states and territories. Because each installation has an installation number, OSD will also be able to geo-reference the information collected and utilize Geographic Information System techniques to better map and manage its resources.

The metrics achieve the following:

- Assess INRMP implementation
- Measure conservation efforts

- Ensure no net loss to military testing and training lands
- Understand the conservation program's installation mission support
- Indicate the success of interagency natural resource partnerships

The Navy Conservation website provides the means to evaluate performance in seven focus areas:

- Ecosystem Integrity
- Listed Species and Critical Habitat
- Fish and Wildlife Management for Public Use
- Partnership Effectiveness
- Team Adequacy
- INRMP Project Implementation
- INRMP Impact on the Installation Mission

Each of the seven Focus Areas contains criteria that can be evaluated. The criteria responses have weighted values applied and a 0-100 rating is calculated for the entire focus area. The 1 to 100 scores corresponds with a Green (67-100), Yellow (66-34), and Red (33-0) report card. Current metrics scores are available in Appendix L.

5.2.2 Supporting the Natural Resources Data Call

Natural resources managers are often occupied with data requests as decision-makers pass down their reporting and analysis requirements. Data management guidelines and projects are discussed in Section 3.11 Data Integration, Access, and Reporting.

For example, upon request from Commander Naval Installations Command, NAVFAC maintains natural resources program information necessary to satisfy reporting requirements, legislative information requests, and support projects. This information is collected in the NAVFAC Natural Resources Data Call Station and applicable Geographic Information System programs. In addition, Regional Commanders/Area Coordinators shall report new conservation regulatory requirements (i.e., proposed listings of threatened and endangered species, proposed critical habitat restrictions, biological opinions, National Environmental Policy Act mitigation measures, etc.) via the chain of command, in coordination with NAVFAC Southwest, that impact Naval readiness and sustainability. This assessment may be accomplished via the Natural Resources Data Call Station or by written report by 15 November for the preceding fiscal year. This assessment should be very detailed on the particular impacts on readiness, sustainability, and training including: days of training lost due to natural resources restrictions, endangered species impacts and costs for mitigation and protection, limitations on night operations, limitations on training capability, costs of mitigation related to endangered species, migratory birds, and any other issues or impacts that are important to Navy to support overall readiness and sustainability (OPNAVINST 5090.1C CH-1).

5.3 INRMP Project Programming and Budgeting

Installation Commanding Officers or Officers-in-Charge endorse, via signature, their INRMPs and are held accountable if the installation becomes out of compliance with federal laws. Their responsibility is to act as stewards of natural resources under their jurisdiction and integrate natural resources requirements into the day-to-day decision-making process. To accomplish this they involve appropriate tenant, operational, training, or research and development commands in the INRMP review process to provide no net loss of the military mission. At their discretion they may bring in the Navy Judge Advocate General or Office of the General Counsel Legal Counsel to provide advice and counsel with respect to legal matters related to natural resources management and INRMPs (OPNAVINST 5090.1C CH-1). The Commanding Officers of shore activities holding Class 1 plant accounts (land) shall request funding sufficient to ensure support of an integrated program as prescribed by OPNAVINST 5090.1C CH-1 and the Real Estate Operations and Natural Resources Management Procedural Manual NAVFAC P-73, Vol. II, including personnel support and training.

The Heads of the OSD and DoD Components with natural resources management responsibilities shall plan, program, and budget resources necessary to establish, execute, monitor, and maintain integrated natural resources conservation programs, consistent with OSD ranking guidelines "Programming and Budgeting Priorities for Natural Resources Programs," other DoD guidance and fiscal policies, and future deadlines (DoDINST 4715.03).

Formal adoption of an INRMP constitutes a commitment to seek funding and execute, subject to the availability of funding, all *must fund* projects and activities in accordance with specific time frames identified in the INRMP. An INRMP is considered implemented if an installation:

- Actively requests, receives, and uses funds for *must fund* projects and activities
- Ensures sufficient numbers of professionally trained natural resources management personnel are available to perform the tasks required by the INRMP
- Coordinates annually with all cooperating offices
- Documents specific INRMP action accomplishments undertaken each year

Since the Sikes Act (as amended) requires implementation of the INRMP there is a clear fiscal connection between INRMP preparation, revision, implementation and funding. Indeed, failure to prepare and implement the INRMP provides a potential cause of action under the Sikes Act (as amended). Accordingly, it is vital that budget personnel understand and participate in the INRMP process. Funding to implement natural resources management will largely come from program sources. See Appendix B for the Implementation Table.

5.3.1 Natural Resources Management Priorities and Funding Classifications

Project prioritization systems are listed below, showing OSD, DoDINST 4715.03, and Navy Environmental Readiness Level (ERL) priority systems. All compliance projects (the *must fund* category) are ranked according to Navy ERLs and timeline urgency to facilitate capability versus cost trade-off decisions (Chief of Naval Operations 2004). The highest ERL (4) is considered the absolute minimum level of compliance. It supports all actions specifically required by law, regulation, or EO. Subject to the availability of funding, all Navy ERL 4 projects and activities must be programmed in accordance with specific timeframes identified in this INRMP.

The budget programming hierarchy for this INRMP is based on Navy funding level classifications (see below for level classification descriptions).

Environmental Readiness Program Assessment Database

Environmental Program Requirements (EPRs) cover multiple subject matter or *business lines* aside from natural and cultural resources. EPRWeb is an optimized online database used to define all programming for the Navy's environmental requirements. EPRWeb records data on project expenditures and provides immediate, web-based access to requirements entered by the multiple Navy environmental programs, including Environmental Compliance, Pollution Prevention, Conservation, Radiological Controls, and Range Sustainment, as related to environmental costs on military ranges. It is the Navy's policy to fully fund projects in order to comply with all applicable: federal, state, and local laws; EOs; and associated implementing rules, regulations, DoDINSTs, DoD Directives, and applicable international and overseas requirements (OPNAVINST 5090.1C CH-1).

All natural resources requirements are entered into the EPRWeb and available for review/approval by the chain of command by dates specified in the Guidance Letter that is provided annually by Chief of Naval Operations (N45). This database is the source document for determining all programming and budgeting requirements of the Environmental Quality Program. EPRWeb is also the tool for providing the four ERL capabilities used in producing programming and budgeting requirements for the various processes within the budget planning system (see Section 1.7 Stewardship and Compliance). Not all stewardship actions are tracked in EPRWeb. For example, environmental education for Navy personnel and contractors and speaking at public events.

Four Navy ERLs (see below for descriptions) have been established to enable capability-based programming and budgeting of environmental funding and facilitate capability versus cost trade-off decisions.

Budget priorities for threatened and endangered species management, especially compliance with Biological Opinions, receive the *highest possible* budgeting priority, and support SCI's need to avoid critical habitat designations under Section 4(b)(2) of the Endangered Species Act, or Section 4(a)3 of the Endangered Species Act (exemption from critical habitat designations for national security reasons).

Department of Defense Funding Level Classifications

- **Recurring Natural Resources Conservation Management Requirements:** Administrative, personnel, and other costs associated with managing DoD's Natural Resources Conservation Program that are necessary to meet applicable compliance requirements in federal and state laws, regulations, EOs, and DoD policies or in direct support of the military mission. DoD Components shall give priority to recurring requirements associated with the operation of facilities, installations, and deployed weapons systems. These activities include day-to-day costs of sustaining an effective manpower, training, supplies, permits, fees, testing and monitoring, sampling and analysis, reporting and record-keeping, maintenance of natural resources conservation equipment, and compliance self-assessments.

- **Non-Recurring Natural Resources Management Requirements:** DoD components shall prioritize non-recurring requirements using these classifications:
  - **Current Compliance:** Includes installation projects and activities to support: 1) installations currently out of compliance (e.g., received an enforcement action from an authorized federal or state agency or local authority); 2) signed compliance agreement or consent order; 3) meeting requirements with applicable federal or state laws, regulations, standards, EOs, or DoD policies; 4) immediate and essential nature of operational integrity or military mission sustainment; and 5) projects or activities that will be out of compliance if not implemented in the current program year. Projects or activities that would be out of compliance include: a) environmental analyses for natural resources conservation projects, and monitoring and studies required to assess and mitigate potential impacts of the military mission on conservation resources; b) planning documentation, master plans, compatible development planning, and INRMPs; c) natural resources planning-level surveys; d) reasonable and prudent measures included in the incidental take statements of biological opinions, biological assessments, surveys, monitoring, reporting of assessment results, or habitat protection for listed, at-risk, and candidate species so that proposed or continuing actions can be modified in consultation with the U.S. Fish and Wildlife Service or National Marine Fisheries Service; e) mitigation to meet existing regulatory permit conditions or written agreements; f) non-point source pollution or watershed management studies or actions needed to meet compliance dates cited in approved State coastal non-point source pollution control plans, as required to meet consistency determinations consistent with the Coastal Zone Management Act; g) wetlands delineation critical for the prevention of adverse impacts to wetlands so that continuing actions can be modified to ensure mission continuity; and h) compliance with missed deadlines established in DoD executed agreements.
  - **Maintenance Requirements:** Includes those projects and activities needed to meet an established deadline beyond the current program year and maintain compliance. Examples include: 1) compliance with future deadlines; 2) conservation, Geographic Information System mapping and data management to comply with federal, state, and local regulations, EOs, and DoD policy; 3) efforts undertaken in accordance with non-deadline specific compliance requirements of leadership initiatives; 4) wetland enhancement to minimize wetlands loss and enhance existing degraded wetlands; and 5) conservation recommendations in biological opinions issued pursuant to the Endangered Species Act.
  - **Enhancement Actions Beyond Compliance:** Includes those projects and activities that enhance conservation resources or the integrity of the installation mission or are needed to address overall environmental goals and objectives, but are not specifically required by law, regulation, or EO, and are not of an immediate nature. Examples include: 1) community outreach activities; 2) educational and public awareness projects; 3) restoration or enhancement of natural resources when no specific compliance requirement dictates a course or timing of action; and 4) management and execution of volunteer and partnership programs.

Navy Funding Levels Classification

- **Environmental Readiness Level 4.** ERL 4 is considered the absolute minimum level of environmental readiness capability. Supports all actions specifically required by law, regulation, or EO (DoD Class I and II requirements) just in time. Supports all DoD Class 0 requirements as they relate to a specific statute such as hazardous waste disposal, permits, fees, monitoring, sampling and analysis, reporting and record keeping. Supports recurring administrative, personnel and other costs associated with managing environmental programs that are necessary to meet applicable compliance requirements (DoD Class 0). Supports minimum feasible Navy executive agent responsibilities, participation in OSD sponsored inter-department and inter-agency efforts, and OSD mandated regional coordination efforts

- **Environmental Readiness Level 3.** Supports all capabilities provided by ERL 4. Supports existing level of Navy executive agent responsibilities, participation in OSD sponsored inter-department and inter-agency efforts, and OSD mandated regional coordination efforts. Supports proactive involvement in the legislative and regulatory process to identity and mitigate requirements that will impose excessive costs or restrictions on operations and training. Supports proactive initiatives critical to the protection of Navy operational readiness.
- **Environmental Readiness Level 2.** Supports all capabilities provided under ERL 3. Supports enhanced proactive initiatives critical to the protection of Navy operational readiness. Supports all Navy and DoD policy requirements. Supports investments in pollution reduction, compliance enhancement, energy conservation and cost reduction.
- **Environmental Readiness Level 1.** Supports all capabilities provided under ERL 2. Supports proactive actions required to ensure compliance with pending/ strongly anticipated laws and regulations in a timely manner and/or to prevent adverse impact to Navy mission. Supports investments that demonstrate Navy environmental leadership and proactive environmental stewardship.

5.3.2 Implementation Schedule

This INRMP will become effective upon the acceptance and signatory release described in Section 5.1 Staffing and Personnel Training. Current projects, activities, and plans have been incorporated into the INRMP, as this INRMP serves as a formal structuring and integration of the existing Natural Resources Management Program.

Future work identified herein will be implemented as funding becomes available. Priorities identified in this INRMP will generally determine the order of implementation. Naval Base Coronado Natural Resources Managers will determine what projects and activities are appropriate to initiate, given funding, at any particular time. An INRMP is meant to be flexible, dynamic, and adaptable to the immediate concerns and needs of natural resources management and the military mission. Programming for INRMP implementation generally occurs in one- to three-year budget cycles through the Program Objectives Memorandum system; this is how the DoD allocates resources and links INRMP objectives to budgets and execution. See Appendix B for the Implementation Table.

5.3.3 Federal Anti-Deficiency Act

SCI intends to implement recommendations in this INRMP within the framework of regulatory compliance, national Navy mission obligations, anti-terrorism and force protection limitations, and funding constraints. All actions contemplated in this INRMP are subject to the availability of funds properly authorized and appropriated under federal law. Language in this INRMP is not intended to be, nor must be construed to be, a violation of the Anti-Deficiency Act (31 U.S. Code 1341 et seq.).

5.3.4 Funding Sources

The costs of implementing natural resources management actions may be funded from a variety of sources. Funding sources should be reviewed carefully to identify qualifying projects. There are restrictions on how different Navy funding sources for natural resources management may be used. It is important that appropriate funding sources are used and that EPR exhibits clearly justify funding requests so that 1) natural resource funds are distributed widely, and 2) funding levels are not threatened by use of resource funds in ways that are inconsistent with funding program rules. Execution of this INRMP by the federal government is contingent on the availability of funds properly allocated in accordance with applicable law. All natural resources projects must be addressed in the INRMP.

For large projects involving different Navy organizations, representatives of the organization would coordinate budgeting and scheduling to ensure that the project can be accomplished in the planned timeframe. Large-budget projects may not be completely funded in a single fiscal year, requiring incremental funding over the term of the project.

In some cases, smaller, lower-priority projects may be conducted using unspent funds from other tasks or year-end fallout funding. Some projects may be accomplished with little or no funding required, such as those requiring only a change of policy or coordination.

5.3.4.1 Department of Defense Funding Sources

The costs of executing INRMP actions may be funded from a variety of DoD sources. The primary funding sources to Navy natural resources programs include:

1. **Operations and Maintenance, Navy Environmental Funds.** Environmental funds are a subcategory of Operations and Maintenance funds. Environmental funds are primarily used for compliance-related needs. The majority of natural resources projects are funded with Operations and Maintenance environmental funds. These appropriated funds are the primary source of resources to support must-fund, just-in-time environmental compliance (i.e., Navy Level 1 projects). Operations and Maintenance Navy funds are generally not available for Navy Level 2-5 projects.
2. **Fish and Wildlife Fees**. Also called Sikes Act Funds, these funds are collected via sales of licenses to hunt or fish (DoD 2011). They are authorized by the Sikes Act (as amended) and may be used only for fish and wildlife management on the installation where they are collected. SCI generates no such funds, and none are anticipated unless security and safety conditions change to allow hunting on the installation, which is not anticipated.
3. **Recycling Funds.** Installations with a Qualified Recycling Program may use proceeds for some types of natural resources projects.
4. The **DoD Legacy Resource Management Program** (LRMP) is a special congressionally-mandated initiative to fund military conservation projects. The LRMP can provide funding for a variety of conservation projects, such as regional ecosystem management initiatives, habitat preservation efforts, archaeological investigations, invasive species control, monitoring and predicting migratory patterns of birds and animals, and national partnerships and initiatives. The LRMP has three main components: stewardship, leadership, and partnership. Stewardship projects assist the military in sustaining its natural resources. Leadership initiatives provide programs

that serve to guide and often become flagship programs for other military, scientific, and public organizations. Partnerships provide for cooperative efforts in planning, management, and research. The LRMP emphasizes five areas:

- Ecosystem approaches to natural resources management to maintain biological diversity and the sustainable use of land and water resources for the military mission and other uses.
- Interdisciplinary approaches that incorporate the often overlapping goals of natural and cultural resources management. Legacy strives to take advantage of this by sharing management methodologies and techniques across natural and cultural resources initiatives.
- Promoting natural and cultural resources by public and military education and involvement.
- Application of resource management initiatives regionally. The LRMP supports regional efforts between the military and other governmental and non-governmental organizations.
- Development of innovative new technologies to provide more efficient and effective natural resources management.

5. **Strategic Environmental Research and Development Program and Environmental Security Technology Certification Program.** The Strategic Environmental Research and Development Program (SERDP) and Environmental Security Technology Certification Program are the DoD's environmental science and technology program, planned and executed in partnership with The U.S. Department of Energy and Environmental Protection Agency with participation by numerous other federal and non-federal organizations. SERDP invests across a broad spectrum of basic and applied research, as well as advanced development to improve DoD's environmental performance, reduce costs, and enhance and sustain mission capabilities. SERDP and Environmental Security Technology Certification Program promote partnerships and collaboration among academia, industry, the military services, and other federal agencies. They are independent programs managed from a joint office to coordinate efforts from basic and applied research to field demonstration and validation.

6. **Special Initiatives.** The DoD or Navy may establish special initiatives to fund natural resources projects. Funding is generally available only for a limited number of projects. There are currently two such DoD initiatives:

- *Streamside Forests.* Lifelines to clean water is a DoD streamside restoration small grants program. Funds are available to military installations working in partnership with a local school and/or civic organization to purchase local native plant material for small streamside restoration projects. Funds are distributed as reimbursements; up to $5,000 may be awarded per project. This is an ongoing program with no deadline; therefore, proposals can be submitted at any time. Applications and additional information are available on the DoD Environment, Safety and Occupational Health Network and Information Exchange website.[1]
- *Sustaining Our Forests, Preserving Our Future.* Funding to ensure that the integrity of DoD forested lands remains intact.

1. Available online at: http://www.denix.osd.mil/denix/Public/News/Earthday98/Grants/grants.html.

Navy Working Capital Fund

This is a revolving fund that is generated by fees for services and used to pay expenses. Many natural resources projects are funded through the Navy Working Capital Fund. All projects submitted must be in the INRMP, or a clear justification for their omission must be provided. These funds are generally not available for Navy ERL 1-3 projects.

5.3.4.2 External Assistance

Environmental program funding within the Navy is primarily based upon federally mandated requirements. Consequently, program managers are encouraged to seek outside funding, expertise, and support for projects consistent with the objectives of the INRMP. Scientific research that benefits installation natural resources can be accomplished through partnerships or external funding sources from various federal, state, local, and non-profit organizations with an interest in achieving the objectives consistent with those of the INRMP.

Contractor Support

Outside contractors are being used to support an increasing list of needed projects. In accordance with Circular No. A-76, the federal government is mandated to use commercial sources to supply the products and services the government needs. Contractors are involved in projects such as National Environmental Policy Act documentation, vegetation surveys, marine monitoring, Test and Evaluation species surveys (i.e., birds, abalone, and plants), management plans, and impact analysis of operational activities.

Cooperative Agreements

Cooperative agreements are legal relationships (not a contract) between the Navy and states, local governments, institutions of higher education, hospitals, non-profit organizations, and/or individuals. Cooperative Agreements are permitted to accomplish work identified in INRMPs pursuant to section 670c-1 of the Sikes Act (as amended). The principal purpose of the relationship is to work with the state, local government, or other recipient to carry out a public purpose of support or stimulation authorized by a law of the United States instead of acquiring (by purchase, lease, or barter) property or services for the direct benefit or use of the U.S. Government.

Cooperative Ecosystem Studies Units

The Cooperative Ecosystem Studies Units program[2] is a working collaboration among federal agencies, universities, state agencies, non-governmental organizations, and other non-federal institutional partners. The Cooperative Ecosystem Studies Units National Network provides multi-disciplinary research, technical assistance, and education to resources and environmental managers. Although the overall program is overseen by U.S. Department of Interior, one of the participating agencies is DoD.

SCI recognizes the importance of cooperating with federal and state agencies in addition to private organizations. These organizations and other federal agencies, particularly this INRMP's signatory partners (U.S. Fish and Wildlife Service and California Department of Fish and Wildlife), Bureau of Land Management, National Park Service, and NAVFAC Southwest, will continue to assist with implementation of various aspects of this INRMP.

2. For more information regarding the Cooperative Ecosystem Studies Units program refer to the following website: http://www.cesu.psu.edu.

SCI can also work with other federal agencies and military branches through Military Interdepartmental Purchase Requests. Military Interdepartmental Purchase Request is a method for transferring funds amongst federal agencies.

5.3.5 Research Funding Requirements

Environmental program funding within the Navy is primarily based upon federally-mandated requirements. Consequently, program managers are encouraged to seek outside funding for projects consistent with the INRMP, such as research, that will benefit natural resources on installations, but that are not directly related to federal mandates. Past research is presented in Appendix H. Proposed research is listed in the Implementation Table (Appendix B).

Universities are an excellent source of research assistance and provide outstanding resource specific expertise. Collaborative investigations performed in conjunction with the installation biologist provide the most likely and cost-effective sources of assistance with implementation of this INRMP.

New funding sources should be sought from federal, state, local, and non-profit organizations with an interest in achieving the objectives of this INRMP in partnership with SCI. This funding would need to be consistent with authorization to receive and use such funds and often require cost-sharing. This funding opportunity should be sought for projects that are not Navy Class 3 or 4 *must-fund* items tied directly to immediate regulatory compliance. Examples are watershed management, habitat enhancement, and/or wetland restoration.

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Appendix A

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Appendix H

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