U.S. Fish & Wildlife Service

Hopper Mountain, Bitter Creek, and Blue Ridge National Wildlife Refuges

Final Comprehensive Conservation Plan and Environmental Assessment

September 2013

Disclaimer

CCPs provide long-term guidance for management decisions and set forth goals, objectives, and strategies needed to accomplish refuge purposes and identify the U.S. Fish and Wildlife Service's best estimate of future needs. These plans detail program planning levels that are sometimes substantially above current budget allocations and, as such, are primarily for the U.S. Fish and Wildlife Service's strategic planning and program prioritization purposes. The plans do not constitute a commitment for staffing increases, operational and maintenance increases, or funding for future land acquisitions.

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Final Comprehensive Conservation Plan

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Implementation of this Comprehensive Conservation Plan and alternative management actions/programs have been assessed consistent with the requirements of the National Environmental Policy Act (42 USC 4321 et seq.)

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Abbreviations and Acronyms

Refuge Improvement Act	National Wildlife Refuge System Improvement Act of 1997
Refuge System	The National Wildlife Refuge System
Service	U.S. Fish and Wildlife Service
APHIS	Animal and Plant Health Inspection Service
ATV	all terrain vehicle
AUM	animal unit months
BLM	Bureau of Land Management, U.S. Department of the Interior
BMP	best management practices
CalPIF	California Partners in Flight
CAP	contaminant assessment process
CCP	Comprehensive Conservation Plan
CCP/EA	Comprehensive Conservation Plan/Environmental Assessment
CCRP	California Condor Recovery Plan
CDFG	California Department of Fish and Game (California Department of Fish and Wildlife)
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CO	carbon monoxide
CO_2	carbon dioxide
CR	cultural resources
DOI	Department of the Interior
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
F	Fahrenheit
FMP	Fire Management Plan
GIS	Geographic Information System
GLO	General Land Office
GPS	global positioning system
HGM	hydro-geomorphologic
HMP	Habitat Management Plan
I&M	Inventory and Monitoring (Program, USFWS)
IPCC	Intergovernmental Panel on Climate Change

IPM	Integrated Pest Management
LEED	Leadership in Energy and Environmental Design
MBTA	Migratory Bird Treaty Act
MCL	maximum contaminant level
msl	mean sea level
NEPA	National Environmental Policy Act
NGO	nongovernmental organization
NHPA	National Historic Preservation Act
NM	National Monument
NOI	Notice of Intent
NOx	nitrogen oxides
NO2	nitrogen dioxide (NO_2)
NPS	National Park Service, U.S. Department of the Interior
NRHP	National Register of Historic Places
NWPS	National Wilderness Preservation System
NWR	National Wildlife Refuge
NWRS	National Wildlife Refuge System (Refuge System)
PM2.5	particles less than 2.5 micrometers in diameter; "fine" particles
PM10	particulate matter less than 10 microns in diameter
ROG	reactive organic gasses
RONS	Refuge Operating Needs System
sf	square foot (feet)
SHPO	(California) State Historic Preservation Office
SO4	sulphate
SSS	Special Status Species
UCIHRMP	University of California, IHRMP
USFS	Forest Service, U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service (Service), U.S. Department of the Interior
USGS	U.S. Geological Survey, U.S. Department of the Interior
VHF	very high frequency
WSA	wilderness study area
WUI	wildland urban interface

Chapter 1. Introduction and Planning Background

1.1 Introduction

The U.S. Fish and Wildlife Service (Service) prepared this Comprehensive Conservation Plan (CCP) to guide management of the Hopper Mountain National Wildlife Refuge (NWR), Bitter Creek NWR, and Blue Ridge NWR for the next 15 years. The CCP provides a description of the desired future conditions and long-range guidance to accomplish the purposes for which each refuge was established. The CCP and accompanying environmental assessment (EA) address Service legal mandates, policies, goals, and National Environmental Policy Act (NEPA) compliance.

The Hopper Mountain NWR Complex (or Refuge Complex) in southern California was created primarily to restore the endangered California condor population to its native range. Three refuges in the Refuge Complex—Hopper Mountain, Bitter Creek, and Blue Ridge NWRs—were created expressly for this purpose. A fourth refuge, the Guadalupe-Nipomo Dunes NWR, is also managed and administered by the Hopper Mountain NWR Complex. This CCP addresses the management of Hopper Mountain, Bitter Creek, and Blue Ridge NWRs. A separate CCP will be prepared for the management of Guadalupe-Nipomo Dunes NWR.

The refuges in the Hopper Mountain NWR Complex are 4 of over 550 refuges that comprise the U.S. Fish and Wildlife Service's National Wildlife Refuge System (Refuge System). The mission of the Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

The Refuge Complex is one of many partners in the California Condor Recovery Program (Recovery Program). Cooperators are involved in releasing California condors (*Gymnogyps californianus*) to parts of their historic range in the wild. As part of the Refuge System, the three refuges addressed in this CCP—Hopper Mountain, Bitter Creek, and Blue Ridge NWRs—provide foraging, roosting, and nesting habitat for the endangered California condor and upland-dependent wildlife species of California's foothills. Bitter Creek NWR serves as a release site, where captive and rehabilitated condors are released. Chapter 3 includes more information about the relationship between the Recovery Program and the refuges.

Hopper Mountain NWR

Hopper Mountain NWR is in Ventura County, approximately 6 miles north of the community of Fillmore. The refuge was established in 1974 to protect the endangered California condor, its habitat, and other wildlife resources. Hopper Mountain NWR encompasses 2,471 contiguous acres. This refuge is closed to the public due to the sensitive nature of the California Condor Recovery Program activities, the sensitivity of its resources, and the lack of public access to the site.

Hopper Mountain NWR entrance. Photo: USFWS

Bitter Creek NWR

Bitter Creek NWR is located approximately 80 miles north of Los Angeles and approximately 10 miles southwest of the community of Maricopa in the foothills above the San Joaquin Valley. The approved acquisition boundary includes lands in portions of Kern, Ventura, and San Luis Obispo

Bitter Creek NWR entrance. Photo: USFWS

counties. Bitter Creek NWR is situated in the northern reaches of the Transverse Range, an ecologically diverse area where the Coast Range, Sierra Nevada Mountains, western Mojave Desert, and San Joaquin Valley converge. The refuge was established in 1985 to provide safe roosting and foraging habitat for California condors and to protect other endangered species. Bitter Creek NWR encompasses 14,097 acres.

Blue Ridge NWR

Blue Ridge NWR is located in central Tulare County in the foothills of the Sierra Nevada Mountains, 11 miles north of Springville and about 17 miles northeast of Porterville, California. Blue Ridge NWR was established in 1982 to protect critical habitat for the endangered California condor. Blue Ridge NWR encompasses 897 acres. This CCP is divided into 5 chapters: Chapter 1, Introduction and Planning Background; Chapter 2, Comprehensive Conservation Plan Process; Chapter 3, Refuge Resources and Environment; Chapter 4, Management Direction; Refuge Complex Goals, Objectives and Strategies; and Chapter 5, Implementation and Monitoring.

Blue Ridge NWR entrance. Photo: USFWS

1.2 Purpose and Need for a Plan

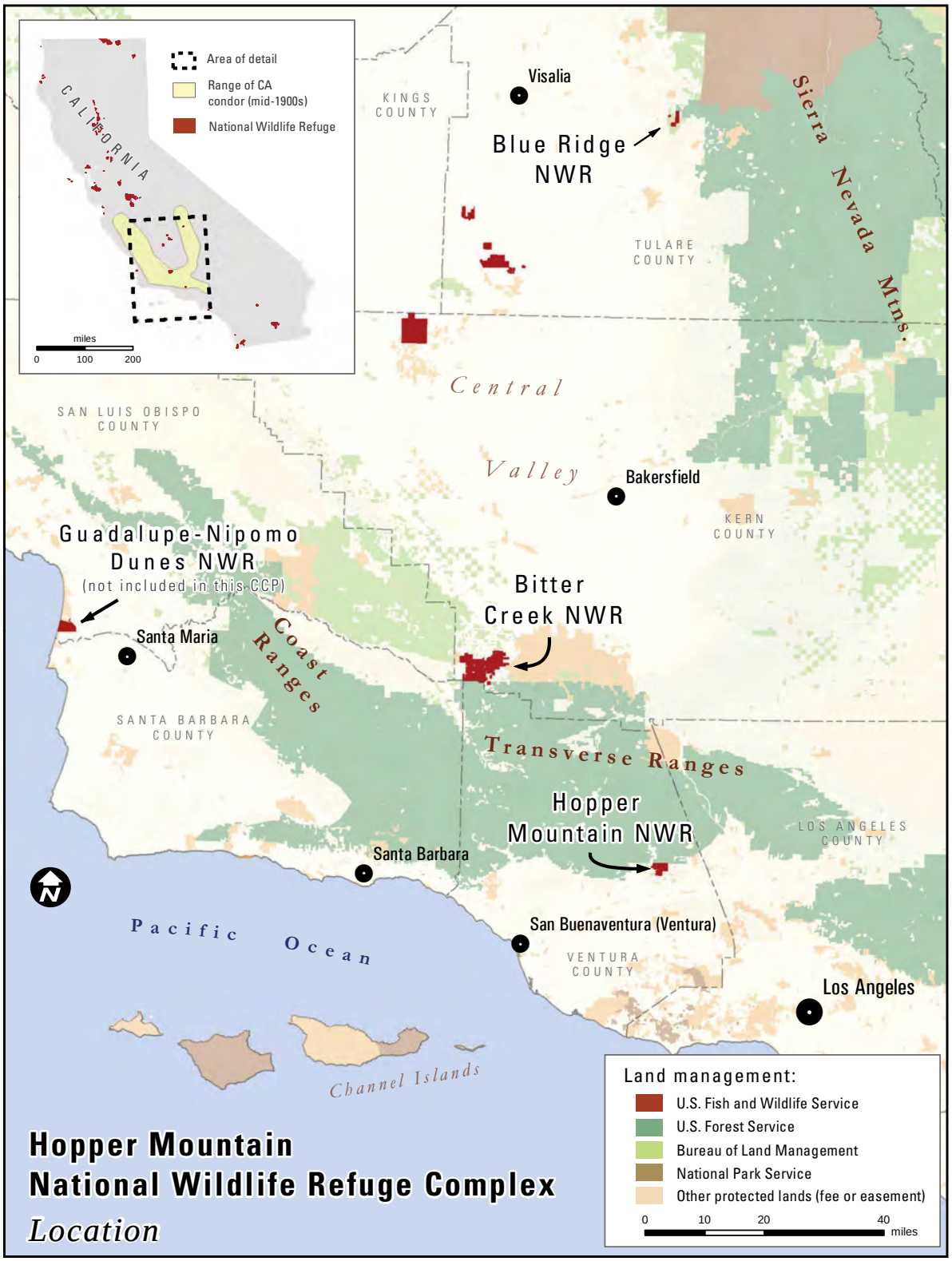
The U.S. Fish and Wildlife Service is developing comprehensive conservation plans to guide the management and resource use for each refuge in the Refuge System. The Refuge System forms the largest network of public lands in the world managed principally for fish and wildlife.

A CCP provides a description of the desired future conditions and long-range guidance necessary for meeting refuge purposes. The CCP and associated environmental assessment meet the mandates of the National Wildlife Refuge System Improvement Act of 1997 (Refuge Improvement Act) and address Service mandates, policies, goals, and appropriate NEPA compliance. The Service's future management plans for the Hopper Mountain, Bitter Creek, and Blue Ridge NWRs are provided in this document. The final plan is developed according to revisions made during internal and public review.

Hopper Mountain, Bitter Creek, and Blue Ridge NWRs do not currently have a comprehensive management plan that provides guidance for managing habitat, wildlife, and public use. The intent of the CCP is to describe how these refuge units' founding purposes should be pursued during the next 15 years. The plan sets goals and objectives and provides strategies for achieving them based on specific refuge unit purposes, federal laws, Refuge System goals, and Service policies. Management activities are selected based on their efficacy in fulfilling refuge goals and objectives.

The CCP is comprehensive in that it addresses all activities that occur on the refuge; however, the noted management activities or strategies are broadly stated. The refuge staff will prepare detailed step-down plans that follow the CCP process and describe how a management strategy, such as developing an interpretive program, will be applied. These plans are adjusted based on monitoring results, available funds, staff, and current Service policy. The effects of management actions are monitored to provide information for

Figure 1-1. Hopper Mountain National Wildlife Refuge Complex Location



needed modifications of management practices or activities. The CCP has flexibility and will be reviewed periodically to ensure that its goals, objectives, strategies, and time frames remain valid.

The Service is preparing this plan for these refuges to:

- Provide a clear vision statement of the desired future conditions when refuge purposes and goals have been accomplished.
- Provide a basis for management that is consistent with the Refuge System mission and refuge purposes and ensure the needs of wildlife and plants come first, before other uses.
- Provide a scientific foundation for refuge unit management.
- Provide long-term continuity in refuge unit management.
- Ensure the compatibility of current and future uses of the refuge units.
- Ensure the management of each refuge is consistent with federal, state, and local plans.
- Provide an opportunity for the public to help shape future management of the refuges.
- Provide visitors, partners, neighbors, and the public with a clear understanding of the reasons for management priorities and actions on the refuge units.
- Provide a basis for operation, maintenance, and development of budget requests.

1.3 The U.S. Fish and Wildlife Service

Hopper Mountain, Bitter Creek, and Blue Ridge NWRs are managed by the U.S. Fish and Wildlife Service. The Service is the primary federal agency responsible for conserving, protecting, and enhancing fish and wildlife and their habitats for the continuing benefit of the American people. Although the Service shares this responsibility with other federal, state, tribal, local, and private entities, the Service has specific responsibilities for migratory birds, threatened and endangered species, anadromous and inter-jurisdictional fish, and certain marine mammals, referred to as Federal Trust Species. The Service also manages the Refuge System and national fish hatcheries,

Roadside condor viewing site. Photo: USFWS

enforces federal wildlife laws and international treaties on importing and exporting wildlife, assists state fish and wildlife programs, and helps other countries develop wildlife conservation programs.

The Service holds its official mission as:

"Working with others, to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people."

1.4 The National Wildlife Refuge System

In 1903, President Theodore Roosevelt named Florida's Pelican Island the nation's first bird sanctuary, which—along with other sanctuaries and preserves—evolved into the National Wildlife Refuge System. Since that time, the Refuge System has grown to more than 150 million acres. It currently includes 554 refuges, with at least one in every state and most U.S. territories, as well as over 3,000 waterfowl production areas. The Refuge System is the world's largest collection of lands and waters set aside specifically for the conservation of wildlife and ecosystem protection. The needs of wildlife and their habitats come first on refuges, in contrast to other public lands managed for multiple uses. The Refuge System provides important habitat for native plants and many species of mammals, birds, fish, and threatened and endangered species.

The mission of the Refuge System, as stated in the Refuge Improvement Act, is:

"To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" (16 USC 668dd et seq.).

The goals of the Refuge System, as defined in the Refuge System Mission and Goals and Refuge Purposes Policy (601 FW1 of the Service Manual) are to:

- Conserve a diversity of fish, wildlife, and plants and their habitats, including species that are endangered or threatened with becoming endangered.
- Develop and maintain a network of habitats for migratory birds, anadromous and inter-jurisdictional fish, and marine mammal populations that is strategically distributed and carefully managed to meet important life history needs of these species across their ranges.
- Conserve those ecosystems, plant communities, wetlands of national or international significance, and landscapes and seascapes that are unique, rare, declining, or underrepresented in existing protection efforts.
- Provide and enhance opportunities to participate in compatible wildlife-dependent recreation (hunting, fishing, wildlife observation and photography, and environmental education and interpretation).
- Foster understanding and instill appreciation of the diversity and interconnectedness of fish, wildlife, and plants and their habitats.

Collectively, these goals articulate the foundation for our stewardship of the Refuge System and define the unique and important niche it occupies among the various federal land systems. These goals will help guide development of specific management priorities during development of CCPs.

In addition, the guiding principles of the Refuge System are:

On Condor Ridge. Photo: USFWS

- We are land stewards, guided by Aldo Leopold's teaching, that land is a community of life and that love and respect for the land is an extension of ethics. We seek to reflect that land ethic in our stewardship and to instill it in others.
- Wild lands and the perpetuation of diverse and abundant wildlife are essential to the quality of the American life.
- We are public servants. We owe our employers, the American people, hard work, integrity, fairness, and a voice in the protection of their trust resources.
- Management, ranging from preservation to active manipulation of habitats and populations, is necessary to achieve Refuge System and Service missions.
- Wildlife-dependent uses involving hunting, fishing, wildlife observation and photography, and environmental education and interpretation, when compatible, are legitimate and appropriate uses of the Refuge System.
- Partnerships with those who want to help us meet our mission are welcome and indeed essential.
- Employees are our most valuable resource. They are respected and deserve an empowering, mentoring, and caring work environment.
- We respect the rights, beliefs, and opinions of our neighbors.

1.5 Refuge Complex Purpose and Authority

National Wildlife Refuge System lands have been acquired under a variety of legislative acts and administrative orders. The transfer and acquisition authorities, used to obtain the lands, usually have one or more purposes for which land can be transferred or acquired.

The purpose(s) for which these lands were acquired are important for determining and planning their management, such as for this CCP. The transfer and acquisition authorities used to obtain the lands comprising the Hopper Mountain, Bitter Creek, and Blue Ridge NWRs are listed in the following text.

The common purpose for acquiring lands for Hopper Mountain, Bitter Creek, and Blue Ridge NWRs is:

"…to conserve (A) fish or wildlife which are listed as endangered species or threatened species…. or (B) plants…" 16 U.S.C. Sec 1534 (Endangered Species Act of 1973, as amended).

Additionally, the purposes for acquiring lands for Hopper Mountain NWR include:

"...for the development, advancement, management, conservation, and protection of fish and wildlife resources...16 U.S.C. Sec 742f(a)(4) "...for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude..." 16 U.S.C. Sec 742f(b)(1) (Fish and Wildlife Act of 1956).

1.6 Legal and Policy Guidance

National wildlife refuges are guided by the purposes of each individual refuge; mission and goals of the Refuge System; and Service policy, laws, and international treaties. Relevant guidance includes the National Wildlife Refuge System Administration Act of 1966, as amended by the Refuge Improvement Act, Refuge Recreation Act of 1962, selected portions of the Code of Federal Regulations, and the Service Manual.

Condor Ridge, Hopper Mountain NWR. Photo: USFWS

Refuges are also governed by a variety of other federal laws, Executive orders , treaties, interstate compacts, regulations, and policies pertaining to the conservation and protection of natural and cultural resources (see Service Manual 602 FW 1 (1.3)).

1.6.1 The Refuge Improvement Act

The Refuge Improvement Act, which amends the National Wildlife Refuge System Administration Act of 1966, serves as an "organic" act for the Refuge System and provides comprehensive legislation describing how the Refuge System should be managed and used by

Table 1-1. Key policies related to management of national wildlife refuges

Policy	Purpose
Refuge System Mission and Goals and Refuge Purposes (601 FW 1)	Reiterates and clarifies the Refuge System mission and how it relates to the Service mission; explains the relationship between the Refuge System mission, goals, and purpose(s). It also includes the decision making process for determining refuge purposes.
Biological Integrity, Diversity and Environmental Health Policy (601 FW 3)	Provides guidance for maintaining and restoring, where appropriate, the biological integrity, diversity, and environmental health of the Refuge System.
Comprehensive Conservation Planning (602 FW 3)	Describes the requirements and processes for developing refuge Comprehensive Conservation Plans.
Appropriate Use (603 FW 1)	Describes the initial decision process the refuge manager follows when first considering whether or not to allow a proposed use on a refuge. The refuge manager must find a use appropriate before undertaking a compatibility review of the use.
Compatibility (603 FW 2)	Details the formal process for determining if a use proposed on a national wildlife refuge is compatible with the Refuge System mission and the purposes for which the refuge was established. Units of the Refuge System are legally closed to all public access and use, including economic uses, unless and until they are officially opened through a compatibility determination. Appendix C contains several draft compatibility determinations for proposed uses on the refuges. These will be open to public comment with the Draft Plan and formalized with the Final Comprehensive Conservation Plan.
Wildlife-Dependent Recreation (605 FW 1-7)	Provides specific information and guidance for each of the six priority wildlife-dependent uses: the policy for the use; guiding principles for the use; guidelines for program management; and guidelines for opening the specific program.

the public. The Refuge Improvement Act's main components include the following.

- A strong and singular wildlife conservation mission for the Refuge System
- A recognition of six priority public uses of the Refuge System (hunting, fishing, wildlife observation and photography, and environmental education and interpretation)
- A requirement that the Secretary of the Interior maintain the biological integrity, diversity and environmental health of Refuge System lands
- A new process for determining compatible uses on refuges
- A requirement for preparing a Comprehensive Conservation Plan for each refuge by 2012

1.6.2 Refuge System Policies

These policies are available online at *www.fws.gov/policy/manuals.* Table 1-1 provides brief descriptions of key policies related to refuge management and use.

1.7 Refuge Acquisition History

Fee title lands are owned by the Service and serve as the core of national wildlife refuge lands. The fee title lands owned by the Service on Hopper Mountain, Bitter Creek, and Blue Ridge NWRs are addressed in this Comprehensive Conservation Plan and total 17,465 acres. These lands are managed for wildlife as the priority.

1.7.1 Hopper Mountain NWR

The Hopper Mountain area was originally owned by oil companies. In 1930, Eugene Percy bought the land as a cattle ranch and built the house. Percy lived there with his wife, Ruth, for 38 years. After 1968, the Hopper Mountain area that is now the refuge changed hands several times among oil companies. In 1974, the Service acquired 1,871 acres to establish the refuge under the authority of the Fish and Wildlife Act of 1956. In 1991, the Service acquired an additional 600 acres from the Nature Conservancy. Today, the approved acquisition boundary includes 2,471 acres, all of which are owned in fee title by the Service.

Hopper Mountain NWR, house and lupines. Photo: USFWS

1.7.2 Bitter Creek NWR

Historically, the Bitter Creek area was used as a cattle ranch and used extensively by wild condors before all remaining wild condors were brought into captivity in 1987. Interest in acquiring the refuge property was initiated when plans to subdivide the area for development were made public. Conservation organizations maintained that substantial development and the associated increase in human activity would not be compatible with the condors' use of the area (USFWS 2008a). In 1985, acting under the authority of the Endangered Species Act, with Land and Water Conservation funding, approximately 800 acres of the former Hudson Ranch and adjoining properties were acquired by the Service to conserve plants and wildlife listed as

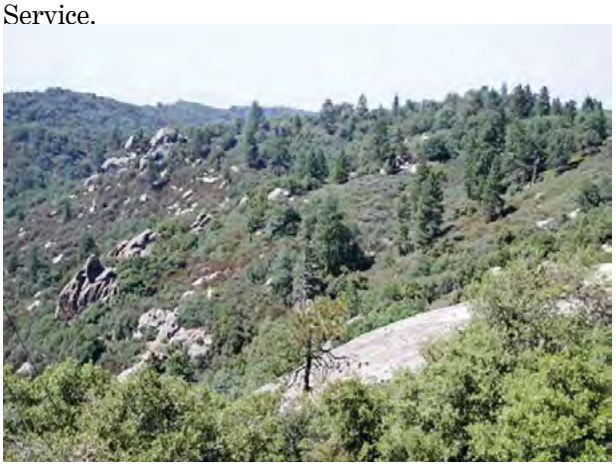
Remnant corral, Bitter Creek NWR. Photo: USFWS

endangered species or threatened species. Although the refuge provides habitat for several listed species, the primary goal for the establishment of the refuge was to preserve essential foraging and roosting habitat for the California condor (USFWS 1975). Lands within the future Bitter Creek NWR were categorized as essential foraging habitat in the original Biological Assessment for establishment of the refuge (Lawrence 1983). In 1987, the Service acquired an additional 11,944 acres of the former Hudson and Hoag ranches. Since 1987, the Service has continued to work with willing landowners on various land exchanges to consolidate refuge lands with mutual management benefits (e.g., exchanging outlying refuge lands for private in-holdings within the approved acquisition boundary). Because the Service's land acquisition program is based on willing sellers, not all lands within the approved acquisition boundary will become part of the refuge. Today, the approved acquisition boundary includes 23,572 acres, of which the Service owns 14,097 acres in fee title.

1.7.3 Blue Ridge NWR

In the area surrounding what is now the Blue Ridge NWR, there are three principal private landowners and 4 public owners (USBLM, California Department of Fish and Game, U.S. Fish and Wildlife Service, and U.S. Forest Service) (USBLM 1985). In 1976, about 11,000 acres in the Blue Ridge area were declared critical habitat for the California condor on the basis of its importance as a traditional roosting area for the birds (FR 41(187):41914–41916), requiring special protection by all agencies of the federal government. The area also serves to

complement the condor's historical foraging area known generally as the "foothill foraging zone," which begins around Glenville and the Greenhorn Mountains and spreads north into central Tulare County. In 1982, Blue Ridge NWR was established under the authority of the Endangered Species Act as a refuge in the Service's Kern NWR Complex with 897 acres acquired from private landowners (willing sellers). Blue Ridge NWR was established to protect critical habitat for the California condor. Today, the approved acquisition boundary includes 897 acres, all of which is owned in fee title by the Service.



Blue Ridge NWR. Photo: USFWS

1.8 Refuge Management History

The Refuge Complex staff conducts monitoring activities to support the California Condor Recovery Program on Hopper Mountain and Bitter Creek NWRs. On-refuge condor monitoring includes daily radio telemetry, seasonal releases of condors into the wild, nest entries to test or evacuate injured juveniles, weekly supplemental feeding to help sustain newly released condors, feeding observations, and seasonal trapping for blood testing for contaminants and disease. See Appendix D for on-refuge condor monitoring activities from 1992 to present.

To inform refuge management decisions, various other bird, mammal, and plant surveys have been conducted on Hopper Mountain and Bitter Creek NWRs. The previous surveys are summarized in the tables in Appendix D.

Future mangement actions, land use, and public use for each of the refuges are included in Chapter 4.

1.8.1 Hopper Mountain NWR Management History

Wildlife and Habitat Management. Hopper Mountain NWR was established in 1974 to provide safe roosting and foraging habitat for California condors and to protect other threatened and endangered species. To date, the focus of the Service's management of Hopper Mountain NWR has been the activities that implement the California Condor Recovery Plan. Since its establishment, the refuge has been closed to public use due to the sensitive nature of the California Condor Recovery Program activities, the sensitivity of its resources, and a lack of public access to the site.

Vehicles are used regularly for condor management activities on the refuge. All-terrain vehicles (ATV) and other motor vehicles such as pickup trucks are used for monitoring, tracking, feeding, and moving condors. Refuge staff use ATVs and hiking trails to access adjacent U.S. Forest Service lands and private property (with prior access agreements) to monitor condor nesting activity. In the past, mist net arrays were used to survey Neotropical migrant songbirds and other resident birds using the refuge (see Appendix D). At this time, condor monitoring activities are ongoing; however, no biological surveys are being done on the refuge for other species.

The Service uses various mechanical and biological (non-chemical) techniques to reduce the spread of invasive plant species near the man-made wetland, including canary grass (*Phalaris arundinacea*) and horehound (*Marrubium vulgare*).

Staff has not intensively managed the existing 5-acre man-made wetland near the refuge headquarters (house). During the spring, runoff water from rain is diverted from the refuge access road and drainages near the house and cabin to the wetland area. This diversion preserves the road from erosion and protects the structures, while adding a small amount of water to the wetland. Drinking water is pumped from a natural spring on the refuge by a solar powered water pump to a large 20,000-gallon above ground storage tank

near the house and cabin. From this tank, 15,000 gallons are reserved for fire suppression and 5,000 gallons are reserved for use in the house and cabin. The natural spring also provides water for a 2,500-gallon water tank near the condor facility.

Fire Management. Fire preparedness is an important aspect of refuge management. Fire management is currently limited to prevention or suppression. More information about the fire suppression equipment and some of the fire history of Hopper Mountain NWR are included in Chapter 3.

Each year, prior to summer, a local fire department is contracted to remove vegetation around all structures using brush mowers, string trimmers, and a tractor with a brush mowing attachment. All cut vegetation is placed into large piles and then burned, when conditions are appropriate, or mulched. County fire engines and helicopters used for fire suppression are on stand-by at the refuge to extinguish any possible fire outbreaks during the operation. Fire crews also use hand tools to create bare ground fire breaks around the main compound and the condor facility.

Early in the spring when vegetation is beginning to sprout, the fire department also uses all terrain vehicles with herbicide tanks with glyphosate herbicide (such as *Roundup*) to spray vegetation around all structures (including the condor facility, house, barn, solar panels, and storage buildings). This reduces the amount of mowing required later in the summer. In total, approximately 15 acres of vegetation is cut or cleared around the structures on the refuge. A strip of vegetation along each side of the main 2-mile refuge road is also cut to allow the road to act as a potential fire break. The main road is also occasionally graded as needed

Bitter Creek NWR. Photo: USFWS

by the fire department using a road grader. This fire treatment is done annually, usually taking approximately 5 working days with up to 20 wildfire personnel to complete the project. Vehicles used for pre-season fire treatment are confined to existing roads. In addition, hand-held string trimmers are used to trim ATV trails annually.

Oil and Gas Extraction Access. There are currently 3 oil well pads that contain producing wells and storage facilities on refuge lands. The lessees of this property are permitted to use a 2-track road to access the land (on existing roads). Land may be accessed via truck (standard pickup or oil tank-trucks) or ATV year round, depending on road conditions. The use is limited to conducting oil and gas related work.

Cultural Resources Management. Very few archaeological surveys have been performed within the boundaries of Hopper Mountain NWR, so the potential for significant cultural resource sites is not clearly understood. Since its establishment in 1972, fieldwork on the refuge has fallen into three categories: 1) Third parties fulfilling requirements to obtain conditional use permits for oil exploration; 2) Compliance with Section 106 of the National Historic Preservation Act (NHPA) for refuge management and Recovery Program activities; and 3) Post-wildfire damage assessment. The total acreage surveyed as a result of these efforts is unknown, but it totals no more than 20 acres at most, less than 1% of the refuge's total acreage.

1.8.2 Bitter Creek NWR Management History

The Bitter Creek area that was to become the refuge was categorized as an essential foraging habitat in the original Biological Assessment for establishment of the refuge (Lawrence 1983). Bitter Creek NWR was established in 1985 to provide safe roosting and foraging habitat for California condors and to protect other threatened and endangered species. Since its establishment, the refuge has been closed to public use due to the sensitive nature of the California Condor Recovery Program activities and the sensitivity of its resources.

Wildlife and Habitat Management. A major factor in the management of the refuge is its key role in support of the California Condor Recovery Program. Since 1995, the refuge has served as a release site for the Recovery Program to release condors into the wild. In support of the Recovery Program, various condor management activities have been conducted on the refuge, including:

- condor population monitoring; very high frequency (30–300MHz) (VHF), global positioning system (GPS), and visually
- providing sites for the Recovery Program to trap and process condors (assess body condition, attach transmitters)
- twice yearly (minimum) trapping and sampling all southern California condors; monitoring contaminants in released condors (analyzing blood and feather samples)
- providing sites to vaccinate condors for West Nile Virus and sites for supplemental feedings to maximize survivorship
- maintaining temporary quarters for Service biologists performing Recovery Program activities and researchers, volunteers, and partners supporting Recovery Program or refuge goals (up to five residents)
- releasing up to 15 tagged condors into the wild per year (as needed and as determined by the Recovery Program)
- coordinating with ranches to allow condors to feed on natural livestock mortalities

In addition to management activities supporting the California condor, the Service manages grassland, mixed scrub, oak and juniper woodlands, riparian, and wetland habitats that support other plants and wildlife, as well as the condor. After purchasing the refuge in 1985, the Service allowed grazing to continue. From 1985 to 1995, the refuge was managed as part of the Kern NWR Complex. Management activities were limited to oversight and adjustment of the grazing program and monitoring of species and habitats. The Hopper Mountain NWR Complex assumed management of the refuge in 1995, with continued oversight and modification of the grazing program, limited herbicide application, monitoring for the presence of native species, and other habitat management activities (including installation of permanent fencing around riparian and designated sensitive areas).

Grazing Management. Beginning in 1984, the Service conducted an EA for its acquisition of the land that would become Bitter Creek NWR. This EA concluded that livestock grazing could be permitted on the basis that it was compatible with the refuge purpose. The EA did not require grazing but rather determined that it is compatible with the refuge purpose. In 1994, the Service made a renewed compatibility determination, concluding that grazing could be used for the purpose of managing vegetation. The compatibility determination also stated that the grazing program was "designed to be an interim measure until a more comprehensive wildlife habitat management plan is developed for the refuge." Based on the authority of these determinations, special use permit(s) authorizing grazing on the refuge were issued annually by the Service between about 1985 and 2004. One private neighboring landowner was, and continues to be, authorized to use a small, non-contiguous portion of the refuge for grazing under an annual permit. Permits for the main part of the refuge were issued annually to another individual. The most recent such permit was issued in October 2004, authorizing grazing on 9,200 acres. That permit expired on September 30, 2005, and the Service has not issued any additional permits covering this portion of the refuge since that date.

When that permit for the main unit was in place, lower elevations were grazed during winter/spring from December 15 to June 15, alternating with higher elevations from June 15 to December 15. The base herd could not exceed 370 animal units (forage consumption on the basis of one standard mature 1,000-pound cow, either dry or with calf up to 6 months old) at one time, for a maximum of 4,400 animal unit months (AUM) (AUM is the amount of air-dry forage calculated to meet one animal unit's requirement for one month [780 pounds]). The Service continued to maintain the water system developed prior to refuge establishment, including extensive piping of natural springs into troughs and water tanks for use by livestock and wildlife.

Since the permit for the main unit expired on September 30, 2005, the Service has not issued any additional permits covering this portion of the refuge. An internal habitat review in 1996 found that the refuge resources were degraded and recommended that the existing grazing program needed to be re-

California condor. Photo: USFWS

evaluated; therefore, the Service decided not to issue additional grazing permits. The cessation of grazing on the main portion of the refuge is intended to remain until the CCP process is complete.

In May 2008, the Service publicly issued a "Draft EA and Compatibility Determination for the Bitter Creek NWR Grassland Habitat Management and Restoration Plan" (USFWS 2008b). This document again proposed using grazing as a tool for managing the refuge in accordance with refuge purposes. Thereafter, with input from the public, the Service decided to gather additional scientific data through development of an Independent Rangeland Review of Bitter Creek NWR (2010 Rangeland Review). In July 2010, a draft of the Bitter Creek NWR Independent Rangeland Review was issued for public comment; in August 2010, a final version was completed (George and McDougald 2010). The 2010 Rangeland Review assesses the feasibility of grazing on the refuge and provides the recommendations of its authors as certified range specialists. The 2010 Rangeland Review generally recommended that carefully managed grazing could be beneficial to the refuge. The 2010 Rangeland Review and technical comments received on it are available on the refuge website at: *www.fws.gov/hoppermountain/BitterCreekNWR/BittercreekNWR.html.*

Also in 2010, the Service decided to combine its previously ongoing EA drafting process with another ongoing planning process to establish a CCP for the Hopper Mountain NWR Complex, which includes Bitter Creek NWR. The 2010 Rangeland Review and comments, along with the information gathered during the CCP scoping period, are being considered in the CCP process. In 2011, in parallel with the

CCP process, the Service began development of a Prescribed Grazing Plan for Bitter Creek NWR. See Chapter 4 for more information about the future use of grazing at Bitter Creek NWR.

Wildlife Surveys. To date, plant and wildlife data collected to inform refuge management decisions include surveys for burrowing owl (*Athene cunicularia*) (2006), rare and endangered reptiles and amphibians (1994), small mammals (2006–2007), tricolored blackbird (*Agelaius tricolor*) (2006–2011), and plant surveys of Bitter Creek NWR (1997, 2009–2011). Sightings of wildlife have also been documented for San Joaquin kit fox (*Vulpes macrotis mutica*) (1982–2009), tule elk (*Cervus elaphus* ssp. *nannodes*) (2008–present), and other species (periodically between 1991 and 2008). See Appendix D for a list of surveys conducted. See also Chapter 3 for Special Status Species.

Fire Management. Fire preparedness is an important aspect of refuge management. The Service suppresses all wildfires and implements fire prevention and mitigation measures (such as fuel breaks) at the wildland urban interface (WUI) and roads. The approved update to the Fire Management Plan for Bitter Creek NWR allows prescribed burning in the form of pile burning (USFWS 2001). Pile burning is a low risk use of fire, used primarily in winter, when air quality is less likely to be adversely affected. The Service obtains the required permits to burn from the regional air quality district. Department of the Interior and Service policy require that the Service comply with all air quality regulations and obtain permits for all planned burning on the refuge.

Cultural Resources Management. Previous cultural resource inventories have recorded sites associated with Native American use of the refuge area along with historic-period resources. To date, approximately 7.5% (1,886 acres) of the 14,096-acre refuge has been systematically surveyed as a result of 13 archaeological research projects conducted on the refuge. It is highly probable that additional archaeological sites will be exposed by human actions or natural causes in the future.

Previous archaeological research includes the following. In 1982 and 1983, three land parcels were surveyed for cultural resources in anticipation of development for housing within or immediately adjacent to what later became the refuge boundary. As a result, seven prehistoric archaeological resources and three isolated artifacts were recorded within the current refuge boundaries.

Archaeological fieldwork on the refuge since its establishment in 1985 has primarily focused on compliance with Section 106 of the NHPA for a variety of undertakings proposed either by right-of-way holders or by the refuge.

1.8.3 Blue Ridge NWR Management History

Blue Ridge NWR was established in 1982 and was first managed by Kern NWR Complex. In 2000, management of Blue Ridge NWR was transferred to Hopper Mountain NWR Complex. The refuge was acquired to protect roosting and foraging critical habitat for condors. Extensive surveys of plants, birds, mammals, amphibians, reptiles, and butterflies are included in Appendix E and online at *www.fws.gov/hoppermountain/BlueRidge/SpeciesListBlueRidgeNWR.html.*

Since its establishment, the refuge has been closed to the public due to the sensitivity of its resources. Due to Blue Ridge NWR's remote location and limited

Condor roost snag, Blue Ridge NWR. Photo: USFWS

staffing and resources, management activities have been limited to clearing fuels and other measures to reduce fire risks at the WUI.

1.9 Interim Refuge Goals

Aside from national and regional guidance for management of refuges, these individual refuge units have also developed their own internal goals and objectives throughout their management by the Service. Although the goals and objectives for management of the different refuge units have changed or been modified through time, all have retained management goals and objectives with a focus on habitat for the federally protected California condor and other migratory birds as a priority, providing habitat for endangered and sensitive animal and plant species, and maintaining biodiversity. The following are the 1997 interim goals created for each refuge pursuant to the Refuge Improvement Act. The CCP goals presented in Chapter 4 of this CCP expand upon and supersede the interim goals.

Hopper Mountain NWR 1997 Interim Goals

The management plan from 1997 (1997 Interim Goals) for this refuge indicated the following refuge goals:

- Provide essential rearing and monitoring facilities, as well as foraging, roosting, and nesting habitat, to accomplish the goals of the California Condor Recovery Plan.
- Restore and maintain a native diversity of wildlife and their habitats.

Bitter Creek NWR 1997 Interim Goals

- Assist in the recovery of the endangered California condor.
- Provide safe, quality habitat for other native plant and animal species, including those listed as threatened or endangered.
- Gather baseline biological data on plant and animal communities through inventory efforts to provide input for management decisions.
- Provide information and education.

Blue Ridge NWR 1997 Interim Goals

- Provide essential foraging and roosting habitat for the California condor to achieve the goals of the Recovery Plan.
- Provide native diversity of habitat for other plant and animal species, including those listed as threatened or endangered.

1.10 Refuge Vision Statements

As part of the CCP process, the Refuge Complex developed vision statements for each refuge. The vision for the refuge provides a simple statement of the desired overall future condition of the refuge. From the vision flow more specific goals, which in turn provide the framework to craft more detailed and measurable objectives that are the heart of the CCP. The vision and goals are also important in developing alternatives, and they are reference points for keeping objectives and strategies meaningful, focused, and attainable.

1.10.1 Hopper Mountain NWR Vision Statement

A high mountain valley encircled by deep canyons, steep ridgelines, and rocky pinnacles, Hopper Mountain National Wildlife Refuge is the gateway into California condor country. On the southern border of the Sespe Condor Sanctuary, the refuge is an outpost on the edge of an unforgiving terrain where California condors safely forage, nest, and roost. Under the wing of these majestic birds, the refuge supports healthy examples of oak woodlands, grasslands, chaparral, coastal sage scrub, seasonal wetlands, riparian areas, and some of the last remaining intact stands of California black walnut. Decorating the rock spires where condors now perch, preserved Chumash rock art symbolizes the connection these indigenous people have to the land and sacred bird. Hopper Mountain NWR emanates a sense of stewardship and conservation to neighboring lands. The refuge exemplifies productive relationships with neighboring landowners and partners. Refuge facilities serve as resources for the scientific community and academic institutions to conduct research supporting refuge purposes.

1.10.2 Bitter Creek NWR Vision Statement

California condors circle the skies above, while below, the Bitter Creek National Wildlife Refuge landscapes showcase conservation in action. As a hub of condor activity and research opportunities,

Snag Ridge, Hopper Mountain NWR. Photo: USFWS

Bitter Creek NWR is a unique keystone at the nexus of two mountain ranges encompassing much of the historical California condor range and serving as an important wildlife corridor. The refuge protects habitat within an important east/west running mountain range and provides movement corridors for populations of native ungulates, raptors, and other wildlife. Condor and other wildlife movements extend beyond refuge boundaries and exemplify the Service's contribution to a much larger conservation initiative as we partner with public and private landowners. Alongside these charismatic animals, so, too, can lesser known and rare wildlife and plant species thrive within this intact and functioning ecosystem. Also protected on the refuge are Native American cultural resources and remnants of 19th century homesteads.

1.10.3 Blue Ridge NWR Vision Statement

Set atop a dramatic ridge high above the San Joaquin Valley, Blue Ridge National Wildlife Refuge provides important roosting habitat in the pristine foothills of the southern Sierra Nevada mountain range, overlooking foraging habitat for the endangered California condor. The refuge showcases the Sierra foothill plant communities, including coniferous forests, woodlands, and chaparral. Inspiring an appreciation for diverse, rugged, and remote natural areas, Blue Ridge NWR models land stewardship by protecting wildlife corridors, ecological processes, and mixed habitats. The refuge partners with adjacent land agencies and owners, local communities, and conservation organizations to accomplish mutual goals for the region.

1.11 Existing Partnerships

In 2010, during the Conserving the Future Conference, the Service began the process of charting the course for the Refuge System's next decade by updating a vision for the future of America's national wildlife refuges (USFWS 2011c). As a result, the Service reaffirmed its guiding principles including: "Partnerships with those who want to help us meet our mission are welcome and indeed essential."

The Service gains conservation strength through building partnerships. We have always worked with a variety of partners, including federal, state, and local agencies; tribes; nongovernmental organizations; friends groups; and volunteers. We strive to be a vital component of local communities as we conserve wildlife and habitats. Since its inception a century ago, the Refuge System has worked closely with the conservation community to conserve and restore species and habitats. The Service will continue to work with a growing roster of partners in the future (USFWS 2011c). Partners provide support for refuge activities and programs, raise funds for projects, act as advocates for wildlife and the Refuge System, and provide support on important wildlife and natural resource issues.

A variety of people, including but not limited to scientists, ranchers, birders, farmers, students and outdoor enthusiasts, are keenly interested in Hopper Mountain, Bitter Creek, and Blue Ridge NWRs' management of wildlife species, plants, and habitats. This is illustrated by the partnerships that have

already developed. New partnerships will be formed with interested organizations, local civic groups, community schools, federal and state governments, and other civic organizations as funding, staff, and opportunities become available. The following is a list of existing partners.

- Audubon Society
- California Department of Fish and Game
- California Native Plant Society
- California State University Bakersfield
- California State University San Luis Obispo
- City of Fillmore
- Friends of California Condors Wild and Free
- Kern County
- Los Angeles Zoo
- Los Padres ForestWatch
- San Diego Zoo
- Santa Barbara Zoo
- Seneca Oil and Gas Company
- U.S. Dept. of Agriculture, Forest Service, Angeles National Forest
- U.S. Dept. of Agriculture, Forest Service, Los Padres National Forest
- U.S. Dept. of Agriculture, Forest Service, Sequoia National Forest
- U.S. Dept. of the Interior, Bureau of Land Management
- University of California Santa Barbara
- Ventura County
- Wildlands Conservancy/Wind Wolves Preserve

Condor flight pen at Bitter Creek NWR. Photo: USFWS

Chapter 2. Comprehensive Conservation Plan Process

2.1 Overview of the Planning Process and Policies

The National Wildlife Refuge System Improvement Act of 1997 (Refuge Improvement Act) requires that the Service prepare a Comprehensive Conservation Plan (CCP) for every refuge in the National Wildlife Refuge System (Refuge System). Both the U.S. Fish and Wildlife Service (Service) and the public benefit from this requirement because the CCP process helps ensure the Service fully evaluates, develops, and achieves its long-term vision and goals for each refuge, and provide for public input. Once a CCP is approved, the refuge must follow the management priorities provided in the approved CCP. The procedural provisions in the Council on Environmental Quality's Regulations for Implementing National Environmental Policy Act (NEPA) require all federal agencies to integrate the NEPA process with other planning as early as possible. In accordance with these regulations, the refuge planning policy states that each CCP will comply with the provisions of NEPA by concurrently preparing an environmental assessment (EA) or environmental impact statement (EIS) to accompany or be integrated with the CCP. The purpose of integrating the two processes is to provide a systematic interdisciplinary approach; identify and analyze the environmental effects of the proposed actions; describe appropriate alternatives to the proposal; and involve the affected state and federal agencies, tribal governments, and the affected public in the planning and decision making process. The Draft CCP and EA (CCP/EA) for the Hopper Mountain, Bitter Creek, and Blue Ridge National Wildlife Refuges (NWRs) is intended to meet this dual requirement for compliance with the Refuge Improvement Act and NEPA. Refuge planning policy guides the process and development of the CCP, as outlined in Part 602, Chapters 1, 3, and 4 of the Service Manual.

Service policy, the Refuge Improvement Act, and NEPA provide specific guidance for the planning process, such as seeking public involvement in the preparation of the NEPA document—in this case, the EA. The development and analysis of a range of management alternatives within the EA include a "no action" alternative that reflects current conditions and management strategies on the refuges. Management alternatives developed as part of this planning process, including the no action alternative, can be found in Appendix B, the EA.

2.1.1 The Planning Process

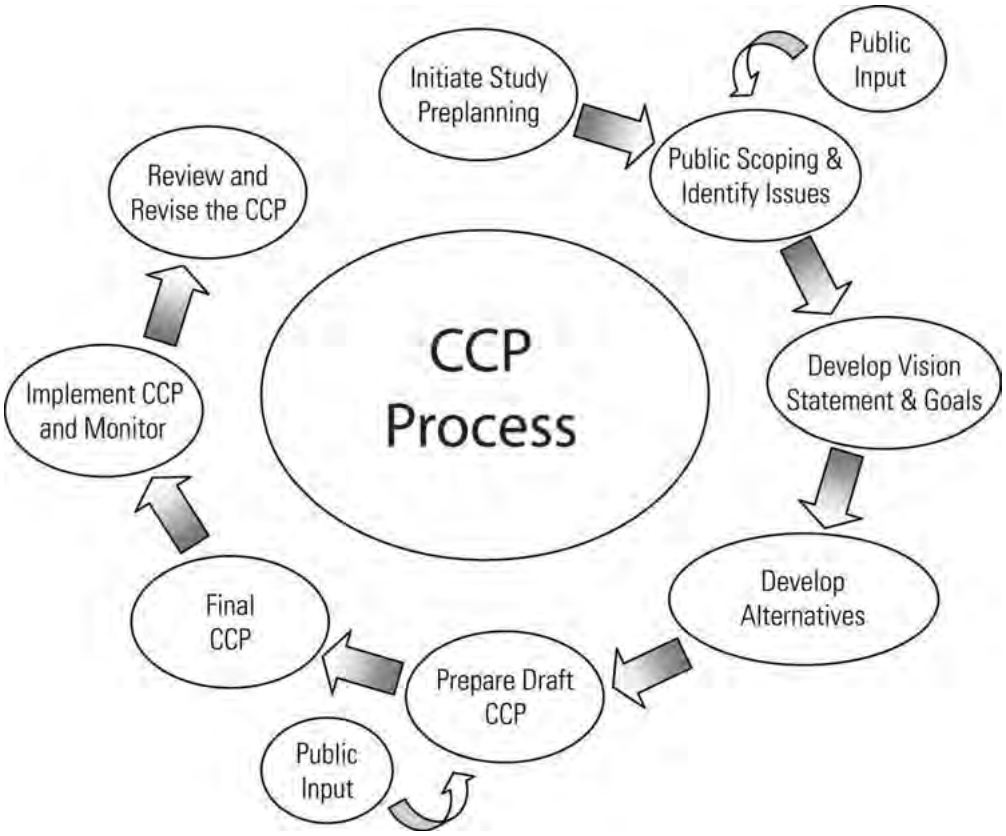
Pre-Planning

Preliminary CCP planning began with information gathering in the fall of 2009. The official process began on April 6, 2010, when a Notice of Intent to prepare a CCP/EA, and request for comments was published in the Federal Register (Vol. 75, Number 65, pages 17430–17431). Pre-planning involves forming CCP planning teams, developing the CCP schedule, and gathering data. The teams determined procedures, work allocations, and outreach strategies. In addition, the Refuge Complex created a preliminary mailing list for CCP outreach.

The key steps in this CCP development process include:

- Pre-planning and team formation
- Public scoping
- Identify issues, opportunities, and concerns
- Define and revise vision statement and refuge goals
- Develop and assess alternatives
- Identify preferred alternative plan
- Release Draft CCP/EA
- Revise draft documents and release Final CCP
- Implement CCP
- Monitor/feedback (adaptive management)

Figure 2-1. The CCP Process Diagram



The Planning Team

The CCP process requires close teamwork with staff, planners, and other partners to accomplish the necessary planning steps, tasks, and work to generate the CCP document and associated EA. Two teams were formed:

Core Team. A core planning team was established to prepare the CCP/EA. The core team is the production entity of the CCP; the members are responsible for researching and generating the contents of the CCP document and participating in the entire planning process. The core team consists of refuge management staff, biologists, and geographic information system (GIS) personnel. Facilitated by the refuge planner, the Hopper Mountain, Bitter Creek, and Blue Ridge NWRs' core team meets periodically to discuss and work on the various steps in the process and sections of the CCP. The team members also work independently in producing their respective CCP sections, based on their area of expertise. Multi-tasking by team members is a standard requirement since work on the CCP occurs in addition to their regular workload.

Expanded Team. The expanded planning team serves as the advisory and coordination forum of the CCP. It is significant for the refuges because of the Refuge Complex's basis and history of working in partnership with other federal, state, local, and private agencies and organizations concerned with the Coast Ranges, southern Sierra Nevada Mountains, Transverse Range, western Mojave Desert, San Joaquin Valley, and their watersheds. The CCP expanded team consists of the core team and other Service and federal agency specialists from various relevant disciplines, which provide overview, discussion, and coordination during the planning process. California Department of Fish and Game and tribal leaders and members were also invited to be active participants on the CCP planning team.

Meetings are held with the planning teams throughout the process to discuss various planning issues and develop vision statements, goals, alternatives, objectives, and strategies, as well as to share information about the Refuge Complex.

Once the public comment period on the Draft CCP/EA has closed, all written and oral comments received on the Draft CCP/EA will be reviewed and analyzed. Written responses will be prepared for all substantive comments and the CCP/EA will be modified as appropriate. The Final CCP will identify the selected alternative, which could be the proposed action, the "no action" alternative, another alternative, or a combination of actions or alternatives discussed in the Draft CCP/EA. The Final CCP will also include, in its appendices, additional information about public involvement and responses to comments received on the Draft CCP/EA.

2.2 The Planning Process for Hopper Mountain, Bitter Creek, and Blue Ridge NWRs

2.2.1 Public Outreach and Initiation of CCP and NEPA Processes

Public involvement is an important and required component of the CCP and NEPA processes. During the planning process, the refuge staff continues to actively participate with the various working groups and agency teams concerning the Coast Ranges, southern Sierra Nevada Mountains, Transverse Ranges, and surrounding areas. The staff also met with interested parties and local groups to explain the refuges and the planning process, and to listen to their concerns. Information newsletters called Planning Updates are also mailed to the public. These periodic publications are created to provide the public with up-to-date refuge planning information and progress on the CCP process, as well as request input throughout the planning process. The Planning Updates are also available at the refuges and on the Hopper Mountain Refuge Complex website. In February 2010, the first Planning Update, introducing the refuges and the CCP process, was mailed to over 200 members of the public, elected officials, organizations, media, and agency representatives. A list of individuals and organizations that were sent a copy of the planning updates or attended scoping meetings is available upon request. The Notice of Intent (NOI) to prepare the CCP/EA was published on April 6, 2010.

2.2.2 Issues, Concerns, and Opportunities Identified by the Public and the Service

Prior to the public meetings, the Service's internal scoping process identified the following issues and challenges to address during the CCP process: management for recovery of the California condor, grassland/upland habitat management, native upland habitat (and whether it has the potential to support San Joaquin Valley species), managing endemic wildlife and plant communities, monitoring key wildlife and plant communities, and habitat fragmentation/connectivity. Other issues identified during scoping for the Service to address were over-grazing, wildfire risks, environmental education and interpretation on the closed refuges, increasing awareness of the California Condor Recovery Program (Recovery Program) and defining the refuges' roles in supporting the Recovery Program. A detailed summary of the scoping comments received during the scoping period is provided in Appendix K.

2.2.3 Public Scoping Meetings

Public scoping meetings allow the Service to provide updated information about the Refuge System and the refuges. Most importantly, these meetings allow the Service staff to hear the public's comments about concerns and opportunities at the refuges. These public meetings provide valuable discussions and identify important issues regarding the refuges and the surrounding region.

During the spring of 2010, public scoping meetings were conducted, news releases circulated, website information posted, and informational mailings sent to interested parties to gather input and comments. The public had opportunities to attend 3 public scoping meetings: one meeting in Fillmore (on April 20, 2010), one meeting in Taft (on April 28, 2010), and one in Porterville (on May 5, 2010). Approximately 71 people attended the Taft meeting, one person attended the Porterville meeting, and none attended the Fillmore meeting.

Prior to public scoping meetings, the Service issued a press release to many local media outlets, such as local newspapers, including the following:

- Bakersfield News Website (related to The Californian)
- Condor Call (bimonthly newsletter of Los Padres Sierra Club Chapter)
- Fillmore Gazette Newspaper
- KVTA Radio (Fillmore)
- LA Times Newspaper Blog
- Santa Barbara Independent Newspaper
- Santa Barbara Newspress Newspaper
- Taft Midway Driller
- The Bakersfield Californian (newspaper)
- Ventura County Star Newspaper

A planning update was distributed in March 2010 to interested stakeholders that had been identified through prior planning processes. An "issues workbook" was also distributed to the mailing list and at public meetings to help focus public input on issues relevant to the CCP.

2.2.4 Scoping Comments Received

During the public scoping meetings in 2010, verbal comments were recorded and additional comments were received in response to the issues workbook distributed by the planning team. Verbal comments were recorded at the public meetings, and written comments were submitted via letters and emails (19), completed issues workbooks (4), comment cards (1), meeting evaluations (6), and a petition letter with 276 signatures (hereafter referred to as the *petition signatories* or *petitioners*). The scoping comment period closed on May 21, 2010. A summary of public comments received orally and in writing during the public scoping process is provided in Appendix K: Public Involvement.

Service staff also reviewed the comments that were received in 2008, during the public comment period on the 2008 draft Environmental Assessment for the Bitter Creek National Wildlife Refuge Grassland Habitat Management and Restoration Plan (USFWS 2008b). Comments on the 2008 Bitter Creek NWR Grassland Habitat Management EA have been incorporated into the CCP scoping process and are represented in the Scoping Summary Report (Appendix K).

The diversity of issues is reflected in the summaries that follow. The issues identified during scoping provided a basis for forming the alternatives considered in the EA for the CCP (Appendix B). The issues and comments that were received were also important in formulating the objectives and strategies in the CCP, which will guide refuge management for the next 15 years.

The issues that follow are stated as questions that closely resemble the form in which they were raised in the scoping process. This section includes highlights of the concerns and/or comments raised by respondents, as well as a brief background about the issue(s). The Scoping Summary Report in its entirety is provided in Appendix K.

Issues, concerns and opportunities

Wildlife management – listed species. *How will the Service identify, protect, and manage populations and habitat for federally-protected species and resident and migratory birds on the refuges?*

Background. All three refuges were established with the common purpose of conserving fish or wildlife that are listed as endangered species or threatened species or plants, in accordance with the Endangered Species Act of 1973, as amended. In the past, inventory and monitoring efforts on the three refuges have focused almost exclusively on the California condor. Other limited bird surveys have been periodically conducted, and limited vegetation sampling has been conducted on Hopper Mountain and Bitter Creek NWRs. However, there is limited baseline information about federally-protected species other than the condor. These surveys are a critical first step in protecting listed species and meeting the Refuge Improvement Act's mandate to "monitor the status and trends of fish, wildlife, and plants in each refuge" (PL 105–57).

Comments. Many of the respondents during the scoping period were supportive of the refuges' purpose: to protect habitat for the endangered California condor. A few comments recommended that no management action be taken that does not contribute to condor recovery. Many individuals

encouraged the use of grazing as a condor management activity. Comments regarding other threatened and endangered species were more mixed. Several individuals and conservation organizations made general statements about the importance of managing for listed species and said that sensitive and rare species must be addressed in the CCP. The petition that was submitted during scoping requested that the Service stop listing the blunt-nosed leopard lizard, giant kangaroo rat, and Kern mallow as residents, indicating that Bitter Creek NWR was not the correct habitat for, and there had been no confirmed sightings of, any of these species.

Wildlife management – native ungulates. *Should the Service reintroduce native ungulates such as elk and antelope to Bitter Creek NWR?*

Background. A management strategy to support Bitter Creek NWR's objective to provide foraging habitat for condors is to support the native ungulate population and other native wildlife to contribute to a forage base for California condors (USFWS 1996). Tule elk that were introduced on the adjacent Wind Wolves Preserve to the east have been documented on Bitter Creek NWR.

Comments. Scoping comments varied about native ungulates (e.g., tule elk, pronghorn antelope, and mule deer). Several individuals and conservation organizations recommended the reintroduction of native ungulates, while other respondents, including those who signed the petition, were not in favor of elk and antelope. One individual said that elk and antelope are not significant historical residents of the Bitter Creek NWR, have a negative impact on neighboring private property, pose a hazard to motorists, and are not necessary components for condor recovery or Bitter Creek NWR biodiversity. The petition requested that the CCP make clear that tule elk migrated to the refuge via private property and were part of a herd reintroduced in the Wind Wolves Preserve to the east.

Vegetation. *How should the Service inventory, monitor, and manage grasslands and other vegetation on the refuges?*

Background. In the past, inventorying and monitoring efforts on the 3 refuges have focused almost exclusively on the California condor. For Hopper Mountain NWR, an updated plant list was started in 2010 (De Vries 2010) and updated in May 2011. This list should be referenced and expanded when future work is conducted. For Bitter Creek NWR, in 2009, a reconnaissance and focused plant survey was conducted (De Vries 2009). There is limited information about the plants present on Blue Ridge NWR. Conducting baseline surveys is a critical first step in protecting listed species and meeting the Refuge Improvement Act's mandate to "monitor the status and trends of fish, wildlife, and plants in each refuge" (PL 105–57).

Comments. Several scoping comments called for inventories and monitoring programs to establish the location and density of existing plant species, determine the desired plant community, and evaluate the impact of future management practices. Comments from conservation organizations included specific recommendations and suggested that the CCP describe the schedule and methodology of proposed monitoring programs. Several comments were in favor of restoring the refuges to pre-settlement conditions. A group of conservation organizations requested that the CCP evaluate the effect of certain land use activities, and that it outline a plan for continuing invasive species eradication efforts. Another conservation organization urged the Service to consider restoration without intervention by mechanical, chemical, or grazing disturbances (no livestock, no burning, no mowing, and no herbicide). Comments at one public meeting noted that spraying may have a negative effect on water sources and suggested that the refuge be a part of a weed management area.

Comments Specific to the 2008 Bitter Creek NWR Grassland Habitat Management EA. Many comments on the 2008 Bitter Creek NWR Grassland Habitat Management EA addressed mowing and herbicide application. Several comments described widespread spraying and mowing as expensive, inefficient, and impractical. Several expressed concern about the potential impacts of spraying and mowing on native plants and wildlife, and on air and water quality. One response recommended the use of herbicide only in selected areas.

How will the Service manage Bitter Creek NWR grasslands to improve habitat for federally-protected species such as the California condor, San Joaquin kit fox, and migratory birds? How will the effects of this management be monitored?

Background. Special use permits authorizing grazing on the Bitter Creek NWR were issued annually by the Service between about 1985 and 2004. One private neighboring landowner was, and continues to be, authorized to use a small, non-contiguous portion of the refuge for grazing under an annual permit. Permits for the main part of the refuge were issued annually to another individual. The most recent such permit was issued in October 2004, authorizing grazing on 9,200 acres. That permit expired on September 30, 2005, and the Service has not issued any additional permits covering this portion of the refuge since that date. In July 2010, a draft of the Bitter Creek NWR Independent Rangeland Review was issued for public comment, and in August 2010, a final version was completed (George and McDougald 2010). That review generally recommended that carefully managed grazing could be beneficial to the refuge resource (see also Chapter 1, Refuge Management History).

Comments. Scoping comments reflected conflicting opinions on cattle grazing at Bitter Creek NWR. A number of respondents, including the petition signatories, were in favor of grazing; some were opposed; and others recommended that it be allowed only when necessary to attain a specific ecological goal.

Fire management. *How will the Service protect life, property, and refuge resources from wildfire risks?*

Background. The Service suppresses all wildfires and implements fire prevention and mitigation measures (such as fuel breaks) at the wildland urban interface and roads. The approved update to the Fire Management Plan (FMP) for Bitter Creek NWR allows prescribed burning in the form of pile burning (USFWS 2001). No changes are proposed to the existing approved FMPs for Hopper Mountain, Bitter Creek, and Blue Ridge NWRs in association with this CCP.

Comments. The majority of comments regarding fire management were strongly opposed to prescribed burns for habitat management. The most common concern raised was that prescribed burns would have a negative impact on air quality and result in adverse health effects for Kern County residents.

Oil and gas development. *How can the Service protect wildlife populations, habitats, and other resources while providing for the exercise of non-federal oil and gas development rights?*

Background. There are currently three oil well pads that contain producing wells and storage facilities on Hopper Mountain NWR fee title lands. Another pad, called a production facility, has no wells at this time. The private operator of the oil pads is responsible for operation and maintenance of the well. While the federal government owns almost all the surface lands in the National Wildlife Refuge System, the federal government does not own the subsurface mineral rights in many cases. This is the case on Hopper Mountain NWR. For those areas where the federal government does not own the mineral estate, there is limited control over oil and gas exploration and drilling.

Comments. For oil and gas development, organizations requested that the CCP provide mechanisms and authority to remediate oil and gas activities on the refuges and adjacent lands and ensure that activities on existing or proposed drilling pads near or inside the refuges are not harming listed species.

Private in-holdings. *How can the Service ensure protection of refuge resources and healthy wildlife habitats within the refuges while fulfilling access requirements for private in-holdings and easements?*

Background. The Service owns 14,097 acres within the approved acquisition boundary for Bitter Creek NWR. Within the boundary are privately owned lands; some of these privately owned lands (or "in-holdings") are completely surrounded by refuge lands with access easements through the refuge. Other refuge lands are not contiguous with the main part of the refuge and difficult to access often due to steep terrain (see Figures 3-6 and 3-8). The

Service's policy allows for acquisition of lands from willing sellers.

Comments. Organizations suggested that the CCP assess the extent of access roads to private inholdings and evaluate how the Service can allow access to these parcels in a way that is compatible with refuge purposes. They recommended that the CCP identify a program to acquire private inholdings from willing sellers within the approved acquisition boundary.

Water resources. *Should the Service restore the natural hydrology of parts of Hopper Mountain and Bitter Creek NWRs?*

Background. The ravine near Hopper Mountain NWR buildings has a minor surface flow year round from the spring and the overflow from the 20,000-gallon holding tank that feeds a 3-acre wetland impounded behind the access road and culvert. Bitter Creek NWR has an intricate and expansive water system of 22 water tanks and nearly 10.5 miles of pipes. Currently, almost all of the springs on the refuge have been diverted or otherwise tapped to provide water for troughs and tanks throughout the refuge (Pers. comm. Heitmeyer, M. 2011).

Comments. Organizations requested that a basic water resources assessment be conducted for the refuges.

Wilderness review. *Should the Service recommend designating parts of the refuges as wilderness?*

Background. The purpose of a wilderness review is to identify and recommend for congressional designation Refuge System lands and waters that merit inclusion in the National Wilderness Preservation System (NWPS). Wilderness reviews are a required element of CCPs and are conducted in accordance with the refuge planning process outlined in 602 FW 1 and 3. The northern boundary of Hopper Mountain NWR is contiguous with the 219,700-acre Sespe Wilderness, which is managed by the U.S. Forest Service. Hopper Mountain NWR meets the criteria necessary for a wilderness study area.

Comments. Organizations urged the Service to include a wilderness review in the CCP to determine whether wilderness designation may be appropriate for portions of Bitter Creek or Hopper Mountain NWRs.

Wildlife-dependent recreation. *How will the Service provide compatible wildlife viewing and other wildlife-dependent recreational opportunities?*

Background. Since the establishment of the 3 refuges, public access has not been permitted due to the sensitivity of California condors and Recovery Program activities, sensitivity and vulnerability of several special status species, logistical considerations, public safety issues, and limited staffing to conduct visitor services and interpretation. The primary concern is that public visitation has the potential to disturb condor management activities taking place on the refuges, such as supplemental feeding and trapping activities.

Comments. During scoping, a few people were concerned about the lack of visitor services at the refuges. A group of conservation organizations recommended that the Service declare certain areas off-limits where public access is incompatible with wildlife protection. Two comments expressed support for public access if the Service can ensure that the use is compatible with the refuges' primary purposes. Additional suggestions included wildlife-viewing opportunities, supervised condor viewing trips, volunteer programs, and a monthly designated access day.

A few comments supported the continued closure of the refuges, at least in the near term. One individual requested that the Service install signage to indicate why the Bitter Creek NWR is closed to public use. Two people listed off-road vehicle access or trespass as an issue of major concern. One person listed hunting as an issue of major concern, and two comments recommended that hunting not be allowed. A group of conservation organizations requested that the CCP evaluate the extent of poaching and trespass and contain specific actions to reduce such illegal activity, including increased law enforcement presence.

Comments specific to the 2008 Bitter Creek NWR Grassland Habitat Management EA. One comment stated that the refuge does not provide a public

benefit because it does not allow public access. One person suggested that the presence of an on-site grazing operator could help control unauthorized public use of the refuge.

Environmental education. *To what extent should the Service provide educational programs and outreach to school-age children and the public?*

Background. The lack of public access, combined with the closure of refuges to public visitation since their establishment, has resulted in a low awareness of the refuges in the surrounding region, particularly for Hopper Mountain and Blue Ridge NWRs. Bitter Creek NWR is perhaps better known since it is bisected by Highway 166/33 and other public county roads, and periodic Service-led tours are advertised. Also, although the Recovery Program is a bi-national program often cited as one of the most successful endangered species recovery programs in the world, it does not seem to be well known and understood in the Ventura County area.

Comments. Several scoping responses encouraged the development of educational programs for school children and the public. Another comment suggested that refuge staff and volunteers visit schools to provide outreach about the value of protecting and enhancing refuges. It was also recommended that the Service educate the public about economic benefits provided by the refuges.

Cultural resources. *How will the Service conserve the cultural and/or historic resources on the refuges?*

Background. Very little archaeological research has been conducted within the boundaries of Hopper Mountain NWR; and since its establishment, limited fieldwork has been conducted. Since Bitter Creek NWR was established, the majority of cultural resource investigations on the refuge have been carried out by or under the auspices of the Service's Cultural Resources Team. To date, approximately 7.5% (1,886 acres) of Bitter Creek NWR has been systematically surveyed, and only limited assessments have been conducted on cultural resources in the general Blue Ridge area. According to records, none of the 897-acre Blue Ridge NWR has been systematically surveyed.

Comments. Several comments addressed cultural resources. One individual listed cultural/historical resource preservation as an issue of major concern. Two comments requested that the refuges be surveyed for Native American and post-settlement cultural resources. A conservation organization requested that the CCP and associated NEPA document identify and describe the refuges' archaeological and historical resources and analyze any impacts to these resources resulting from proposed plan actions.

Climate change. *How will the refuges be affected by climate change, and what can the Service do about it?*

Background. The Intergovernmental Panel on Climate Change (IPCC) concluded that warming of the climate system is unequivocal. The potential for rapid and lasting climate warming poses a significant challenge for fish and wildlife conservation (IPCC 2007). Department of the Interior (DOI) Secretarial Orders issued in 2001 and 2009 (Orders 3289 and 3226) made clear that climate change impacts should be considered in refuge planning. Further, the House of Representatives' resolution (H. CON. RES. 398) introduced in May 2006, proposed that the Service address, in our CCPs, the effects of changing climate on refuge resources (H. CON. RES. 2006). The key to responding to climate change at the refuges will be adaptive management—learning from our monitoring, continually assessing changes, and adapting our management to what works to protect refuge resources.

Comments. Two comment letters from conservation organizations stated that the potential impacts of climate change should be a central consideration in the development of the CCP. One of the letters made three additional recommendations: (1) that the CCP outline a plan to inventory and monitor climate change-related variables and trends; (2) that the CCP include climate change information in environmental education and interpretation programs; and (3) that the CCP initiate a process to define and minimize ongoing environmental threats like habitat fragmentation, invasive species, and pollution.

General CCP framework. *How will the Service ensure that refuge management actions in the CCP are science based?*

Background. The Service's Refuge Management policy (601 FW3 Biological Integrity, Diversity, and Environmental Health) requires sound professional judgment, particularly during the comprehensive conservation planning process. Sound professional judgment incorporates field experience, knowledge of refuge resources, a refuge's role within an ecosystem, applicable laws, and best available science, including consultation with others both inside and outside the Service.

Comments. Many scoping comments, including the petition, called for the CCP to be science based. Several comments expressed concern that the Service is biased against ranchers, cattle, and grazing. The petition asked that such bias not be allowed to influence the planning process. In contrast, a few individuals urged the Service to prioritize wildlife and stand up to grazing interests.

Public involvement. *How will the public's concerns about the "Draft EA and Compatibility Determination for the Bitter Creek NWR Grassland Habitat Management and Restoration Plan" be addressed since that EA will not be finalized and Bitter Creek's grassland management is going to be addressed in the CCP?*

Background. In May 2008, the Service publicly issued a draft EA and Compatibility Determination for the Bitter Creek NWR Grassland Habitat Management and Restoration Plan (USFWS 2008b). In 2010, the Service decided to combine its previously ongoing EA drafting process with another ongoing planning process to establish a CCP for the Hopper Mountain Refuge Complex, which includes Bitter Creek NWR. The 2010 Bitter Creek NWR Independent Rangeland Review and comments and the 2008 Bitter Creek NWR Grassland Habitat Management EA comments, along with the information gathered during the CCP scoping period, are being considered in the CCP process.

Comments. Public involvement in the decision making process was an issue of major concern raised by many during the 2010 CCP scoping period.

California condor. Photo: USFWS

Many comments from members of the public and elected representatives reflected dissatisfaction with the 2008 Bitter Creek NWR Grassland Habitat Management EA. Several responses requested that all previous comments on the 2008 Bitter Creek NWR Grassland Habitat Management EA be incorporated into the CCP process and reviewed by the project team.

Administration and operation. *How will management of the refuges benefit the surrounding community?*

Background. The Refuge Administration Act, as amended, clearly establishes that wildlife conservation is the singular Refuge System mission. House Report 105–106 accompanying the Refuge Improvement Act states ". . . the fundamental mission of our System is wildlife conservation: wildlife and wildlife conservation must come first." Biological integrity, diversity, and environmental health are critical components of wildlife conservation. The goals of the Refuge System, as defined in the Refuge System Mission and Goals and Refuge Purposes Policy (601 FW1 of the Service Manual) reflect that the needs of wildlife and plants and their habitats come first on refuges, in contrast to other public lands managed for multiple uses.

Comments. Comments expressed that refuge staff should not treat the land as their own but should instead manage it in a manner that will benefit the local community.

2.2.5 Development of the Refuge Vision

A vision statement is developed or reviewed for each refuge as part of the CCP process. Vision statements are grounded in the unifying mission of the Refuge System and describe the desired future conditions of the refuge unit in the long term (more than 15 years). They are based on the refuge's specific purposes, the resources present on the refuge, and any other relevant mandates. Refer to Chapter 1 for the vision statements for the Hopper Mountain, Bitter Creek, and Blue Ridge NWRs.

2.2.6 Determining the Refuge Goals, Objectives, and Strategies

The purpose for creating the refuges is established by law (see Chapter 1). The Refuge Improvement Act directs that the planning effort develop and revise the management focus of a refuge within the Service's planning framework, which includes the Service mission, the Refuge System mission, ecosystem guidelines, and refuge purposes. This is accomplished during the CCP process through the development of goals, objectives, and strategies. Refer to Chapter 4 for the goals, objectives, and strategies for Hopper Mountain, Bitter Creek, and Blue Ridge NWRs.

2.2.7 Development of the Refuge Management Alternatives

The development of alternatives, assessment of their environmental effects, and the identification of the preferred management alternative are fully described in the EA (Appendix B). Alternatives were developed with consideration of issues and information learned during internal and public scoping to represent reasonable options that address the specific refuge issues and challenges. A "no action" or continuation of current management alternative is required by NEPA. The no action alternative is Alternative A, also described in the EA (Appendix B).

2.2.8 Selection of the Refuge Proposed Action

The alternatives were analyzed in the EA (Appendix B) to determine their effects on the refuge environment. Based on this analysis, we have identified Alternative B as the proposed action because it best achieves the Hopper Mountain, Bitter Creek, and Blue Ridge NWRs' goals and purposes, and missions of the Refuge System and the Service.

Proposed Action Criteria

The planning policy that implements the Refuge Improvement Act requires the Service to select a preferred alternative that becomes its proposed action, as required by NEPA. The written description of this proposed action is effectively the Draft Plan. Alternative B is the proposed action for the refuges because it best meets the following criteria:

- achieves the mission of the Refuge System;
- achieves the refuge purposes;
- provides guidance for achieving the refuges' 15-year vision and goals;
- maintains and restores the ecological integrity of the habitats and populations on the refuges;
- addresses the important issues identified during the scoping process;
- addresses the legal mandates of the Service and the refuges; and
- is consistent with the scientific principles of sound fish and wildlife management and endangered species recovery.

The proposed action described in the Draft EA is preliminary. The action ultimately selected and described in the Final CCP will be determined, in part, by the comments received on the Draft EA. The proposed action presented in the Final CCP may or may not be the preferred alternative presented in this version. The Final CCP may propose a modification of one of the alternatives presented here or a combination of elements from more than one alternative.

Chapter 3. Refuge Resources and Environment

3.0 Hopper Mountain National Wildlife Refuge Complex

Background Common to Hopper Mountain, Bitter Creek, and Blue Ridge NWRs

Relationship Between the Refuge Complex and the California Condor Recovery Program

The Hopper Mountain NWR Complex (Refuge Complex) serves as lead office for the California Condor Recovery Program (Recovery Program) and is one of many partners that support this multi-state and international recovery effort. Cooperators are involved in releasing condors to their historic range, managing free flying populations, and maintaining a captive population for a captive breeding program.

The Refuge Complex manages a release site for the Recovery Program in the southern California region, currently located at Bitter Creek NWR. To further support the Recovery Program, the Refuge Complex staff conducts management activities on and off the Refuge Complex. Management activities include bi-annual trapping for lead exposure detection and treatment, a nest guarding program, daily monitoring of the population, and the annual release of captive reared condors. Nest guarding is a term for an intensive management strategy where condor nests are monitored for problems. When problems are detected, interventions are used to prevent nest failure. The strategy was first used with, or at least described for, Puerto Rican parrots (Lindsey 1992). The Recovery Program has implemented a nest guarding program for condors in southern California to identify and treat the leading causes of nest failure in the reintroduced population. The program consists of nest monitoring by trained observers, during which time quantitative behavioral data are collected. Body condition and microtrash data are collected during routine and emergency nest entries. Interventions thus far have included egg transplants, nest cleaning, West

Mule deer. Photo: USFWS

Nile Virus vaccinations, lead exposure treatments, and temporarily evacuating chicks so microtrash ventriculus (stomach) impactions may be removed. Microtrash is a term used for small, roughly coin-sized, refuse such as glass shards and bottle caps. This trash is often collected by condor parents and fed to their chicks during nesting season. The nest guarding program has enabled the Recovery Program to more accurately identify the stage at which nesting attempts are failing and will help guide management decisions for long term solutions to threats to condor nesting attempts. Pre-nest guarding nesting success (number of nests fledging chicks divided by the total number of nests) (2001–2006) was 6% and post-nest guarding (2006–2010) nesting success has been 66%).

Recovery Program activities supported by the Refuge Complex occur at Bitter Creek and Hopper Mountain NWRs. Both refuges have supplemental feeding stations, trap sites, and condor flight pen facilities. These facilities are used to hold captive reared condors prior to release and to trap and temporarily hold wild condors for routine health exams and transmitter maintenance. Sick or injured condors are currently transported to veterinary facilities at the Los Angeles Zoo. The flight pen at Bitter Creek NWR was built in 2002, and the facility at Hopper Mountain NWR has been present since 2000. The Hopper facility

was renovated in 2010 after it was damaged by a wildfire in 2007. The Refuge Complex is not directly involved in captive breeding. More information about the condor recovery activities at each refuge is presented in subsequent text (see Special Status Species). Additional information about the Recovery Program can be found online at *www.fws.gov/hoppermountain/CACORecoveryProgram/CACondorRecoveryProgram.html.*

Since establishment of the 3 refuges, public access has not been permitted due to the sensitivity of California condors and Recovery Program activities, sensitivity and vulnerability of several special status species, logistical considerations, public safety issues, and limited staffing to conduct visitor services and interpretation. The primary concern is that public visitation has the potential to disturb condor management activities taking place on the refuge, such as supplemental feeding and trapping activities.

Public Use Trends in California

California's population is increasing by hundreds of thousands each year. By 2030 to 2040, California's population is expected to reach approximately 50 million (California Department of Finance 2004). According to California State Parks' *Parks and Recreation Trends in California* (2005), Californians are active outdoor enthusiasts with 66% to 92% reporting participation in the most popular outdoor recreation activities: walking, driving for pleasure, visiting historic sites, attending cultural events, wildlife viewing, trail hiking, using open turf areas, pool/beach activities, visiting museums, and picnicking at developed sites.

Further, the California State Parks report says that as the California population increases, competition for the remaining open space will be particularly acute along the interstate corridors; in the five southern California counties of Los Angeles, Orange, San Diego, Riverside, and San Bernardino; in the Central Valley; and along the western face of the Sierra Nevada. In addition, California's senior population is expected to double by 2020 as the baby boomers approach retirement age. As the population ages, all levels of the recreation and leisure services system will see more participation by older and healthier adults. The Refuge Complex offers wildlife-dependent interpretation and education at Hopper Mountain and Bitter Creek NWRs as described in the following sections specific to each refuge.

Volunteers

Volunteers and intern biologists provide thousands of hours of service to the Hopper Mountain NWR Complex and California Condor Recovery Program. During 2009, volunteers and interns donated approximately 8,464 hours (USFWS 2010b). In fiscal year 2010, volunteers and interns donated 1,219 hours at Bitter Creek NWR, plus over 9,683 hours for the Recovery Program. These activities included plant inventories, maintenance, condor monitoring, invasive plant removal, and other Recovery Program activities.

Partners

The Refuge Complex has benefited from partnerships with multiple organizations and agencies. Management of the condor population is heavily reliant on relationships with these partners. Partners include:

- Bureau of Land Management
- California Department of Fish and Game
- Los Angeles Zoo
- Centro de Investigacion Cientifica y de Educacion Superior de Ensenada
- Comision Nacional de Areas Naturales Protegidas
- Direccion General de Zoologicos
- Friends of California Condors Wild and Free
- Instituto Nacional de Ecologia
- Los Angeles Zoo
- National Park Service
- Oregon Zoo
- Peregrine Fund
- San Diego Zoo Global
- Santa Barbara Zoo
- U.S. Forest Service
- U.S. Geological Survey
- University of California Davis
- University of California Santa Cruz
- Ventana Wildlife Society

Archaeological and Historical Resources
Under federal ownership, archaeological and historical resources within the refuges receive protection through federal laws mandating the consideration and management of cultural resources. This includes but is not limited to the Archaeological Resources Protection Act, the Archaeological and Historic Preservation Act, the Native American Graves and Repatriation Act, and the National Historic Preservation Act of 1966. A summary of archaeological and historical resources is included for each refuge in Chapter 1, under Refuge Management History.

3.1 Hopper Mountain National Wildlife Refuge

Hopper Mountain NWR is located in the rugged and steep mountainous terrain of eastern Ventura County, California, approximately 4 miles northeast of the town of Fillmore. This 2,471-acre refuge adjoins the southern boundary of the Sespe Condor Sanctuary (Sanctuary), a component of the U.S. Forest Service, Los Padres National Forest (see Figure 3-1. Hopper Mountain NWR, Location). The 53,000-acre Sanctuary contains critical California condor nesting and roosting habitat. Strategically located adjacent to the Sanctuary, the refuge helps buffer these nesting and roosting areas from human disturbance and protects a portion of the foraging habitat within a much larger area where the condors have historically foraged and fed. Hopper Mountain NWR also protects a variety of plant communities that provide habitat for other species protected under the federal Endangered Species Act (see Figure 3-5. Hopper Moutain NWR Landcover/ Vegetation).

▼ Hopper Mountain NWR Physical Environment

3.1.1 Geology and Soils

Hopper Mountain NWR is near Hopper Mountain and Oat Mountain, in Ventura County, where the South Coast Range meets the western Transverse Ranges on the coast of the Pacific Ocean. Hopper Mountain NWR lands are of Middle and Upper Miocene origin (approximately 5 to 13 million years ago), geologically known as the Monterey Formation. The Monterey Formation is predominately shale, light-gray to buff, thinly bedded to laminated, well-cemented with calcite and silica; occasionally sandstone beds; fossiliferous; and marine. The Monterey Formation is a major oil-producing geological formation. For information on oil and gas extraction. see the Land Use section in this chapter. Elevations at Hopper Mountain NWR range from 1,430–4,050 feet.

Soils
The 1970 Ventura County Soil Survey shows Calleguas shaly loam and Los Osos clay loam as dominant soil types. The refuge is located in the Coast Ranges. Most of the refuge lands have steep slopes (30%–50% incline) and have a high erosion potential (see Figure 3-4. Hopper Mountain NWR, Soils).

3.1.2 Climate and Climate Change

Climate
Annual precipitation near Hopper Mountain NWR is 22.99 inches per year based on average climate conditions from 1971–2000, with the lowest precipitation occurring in July (average of 0.01 inches) and the greatest precipitation occurring in February (5.18 inches) (PRISM 2011). Approximately 86% of annual precipitation generally occurs from November through March.

Increasing trends in the number of non-dry July months can be observed from 1895 to 2011, especially since 1980. Annual average temperature near the refuge ranges from a minimum of approximately 52 degrees Fahrenheit (F) to a maximum of approximately 71 degrees F based on average climate conditions from 1971 to 2000. The lowest temperatures occur in December and January (ranging from a monthly minimum of approximately 42 degrees F to a monthly maximum of approximately 57 degrees F), and the highest temperatures occur in July and August (ranging from a monthly minimum of approximately 66 degrees F to a monthly maximum of approximately 88 degrees F).

Increasing trends in annual maximum temperatures (see Appendix J – Climate, Figure 2), and in seasonal maximum temperatures in winter (January and February) and spring (March, April, and May) (see Appendix J – Climate, Figure 3), were observed from 1895 through October 2011,

Figure 3-1. Hopper Mountain NWR, Location

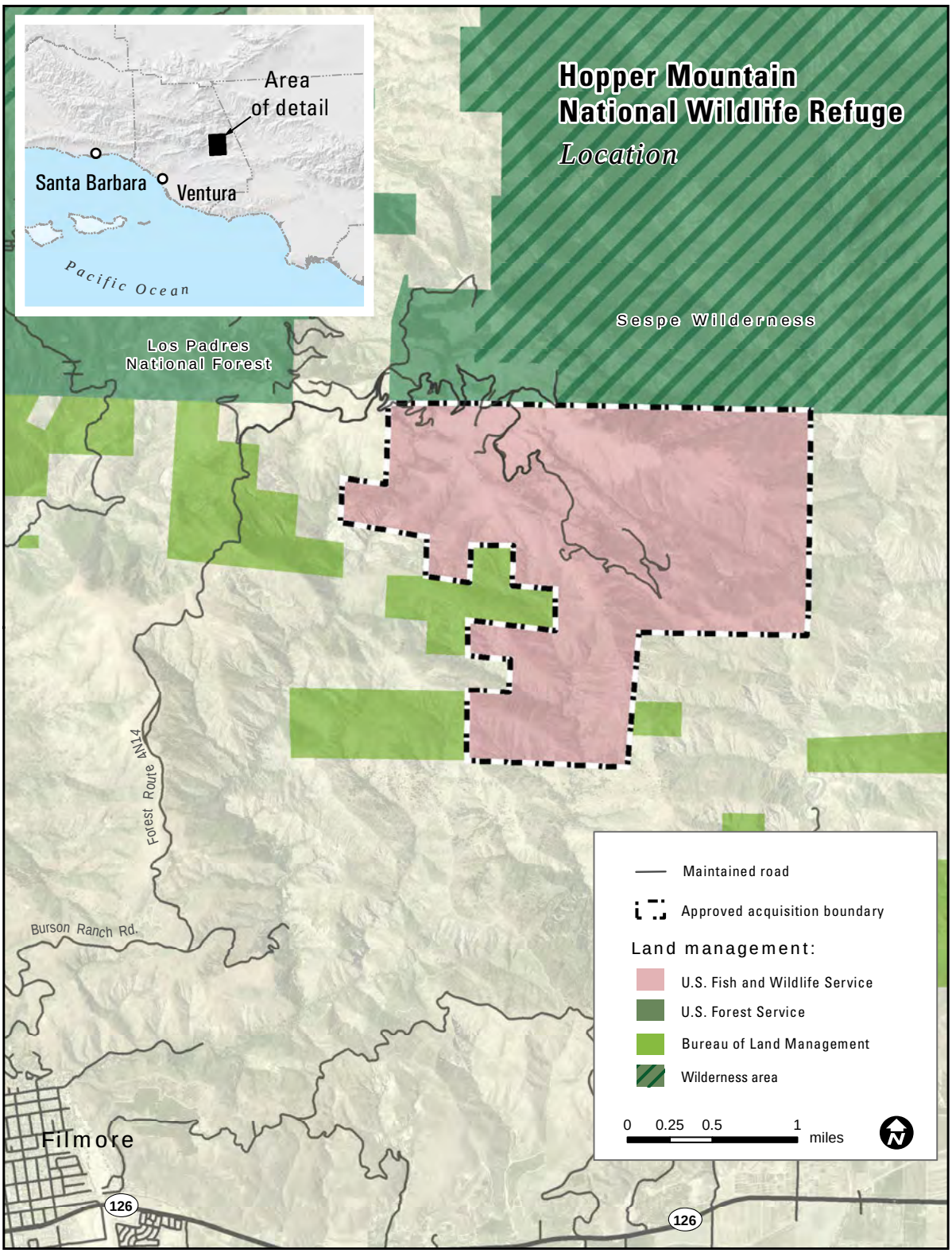


Figure 3-2. Hopper Mountain NWR, Facilities

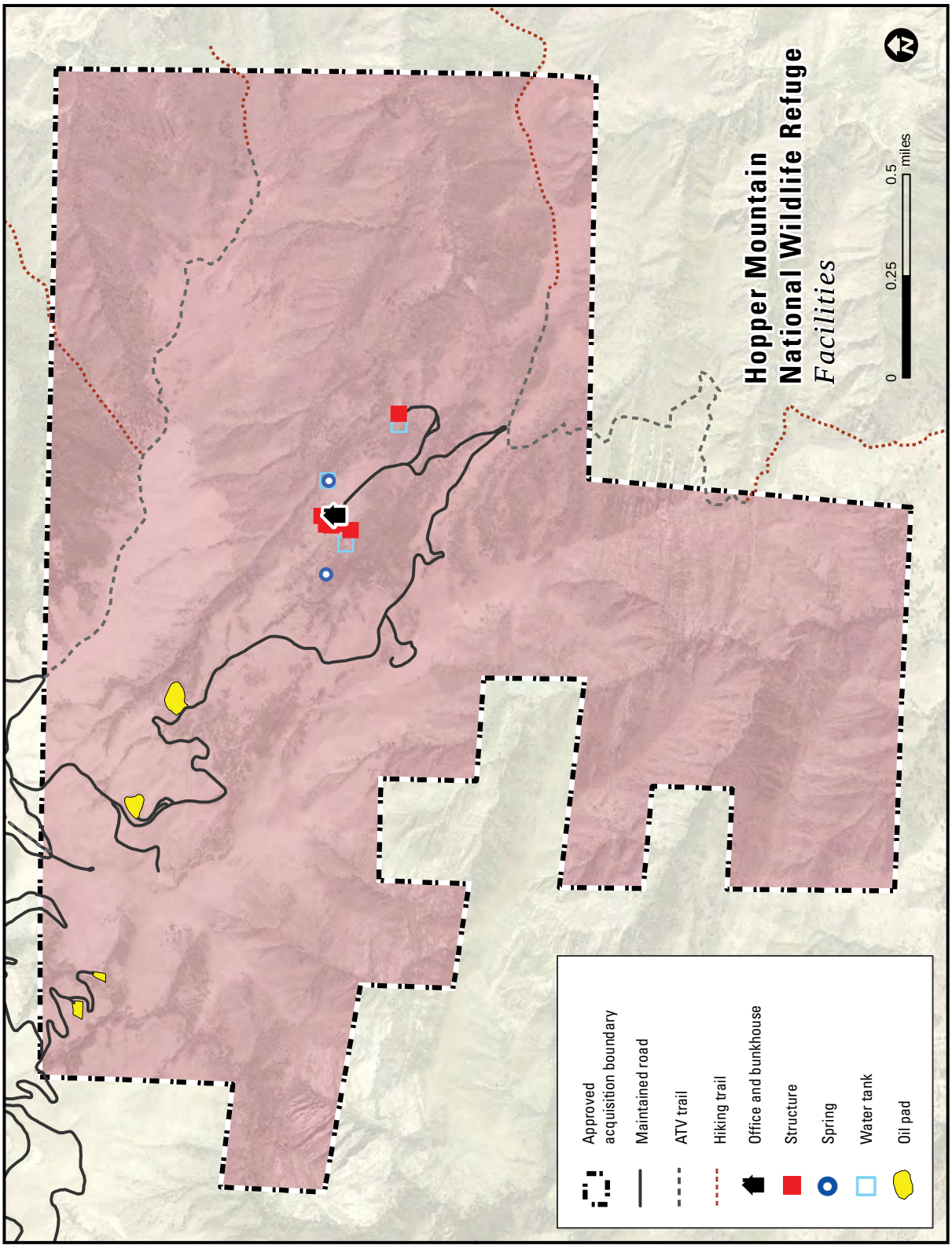


Figure 3-3. Hopper Mountain NWR, Slope

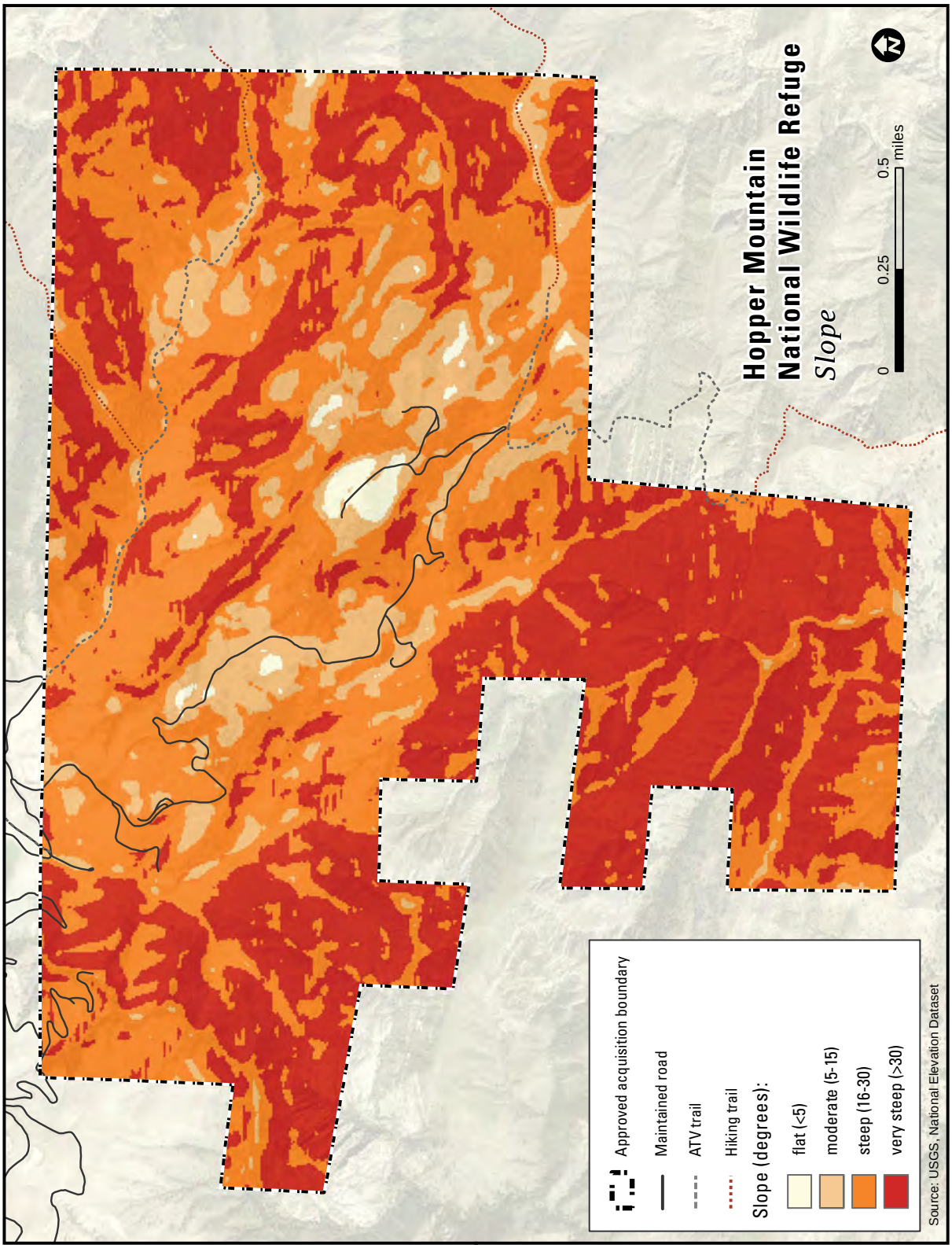


Figure 3-4. Hopper Mountain NWR, Soils

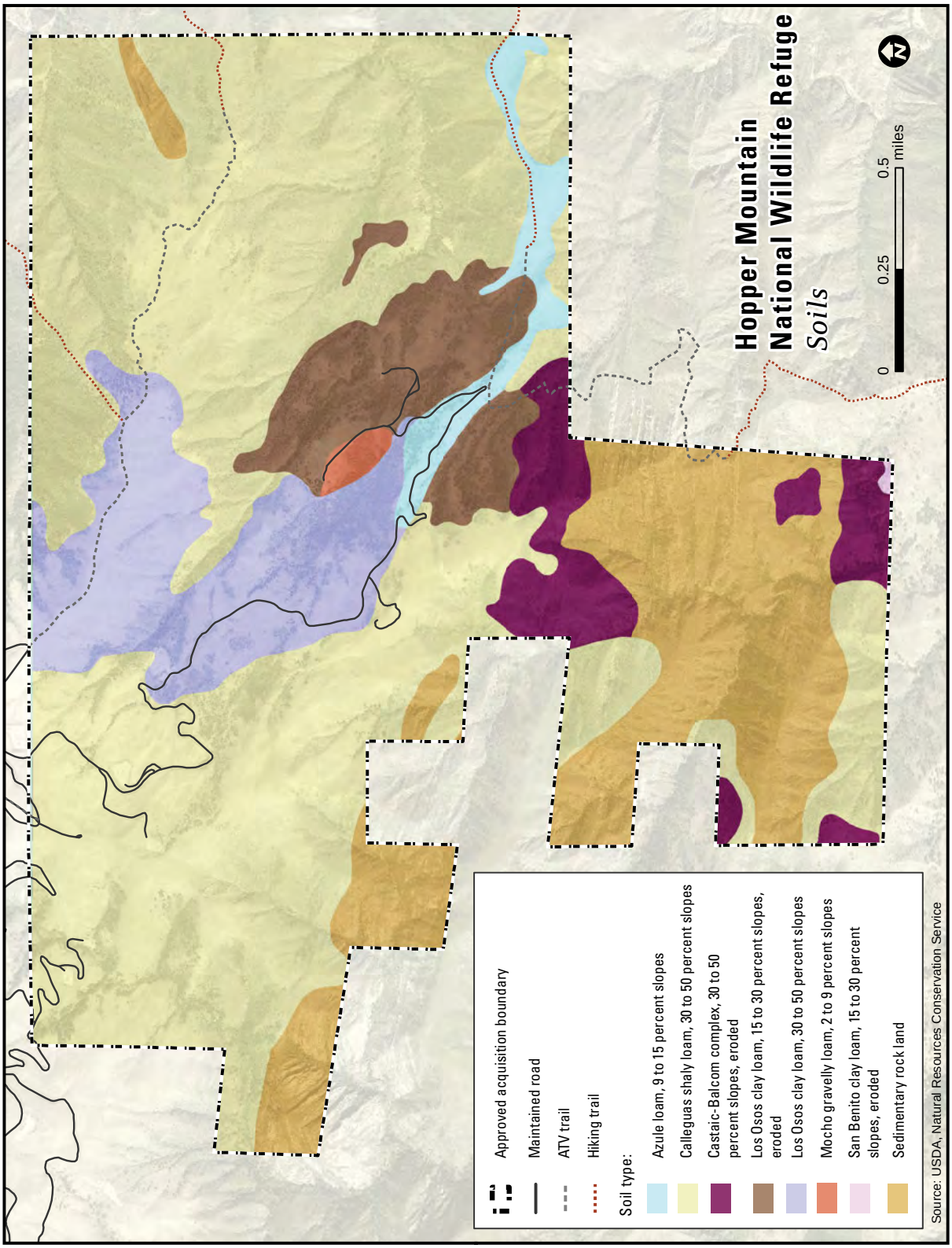
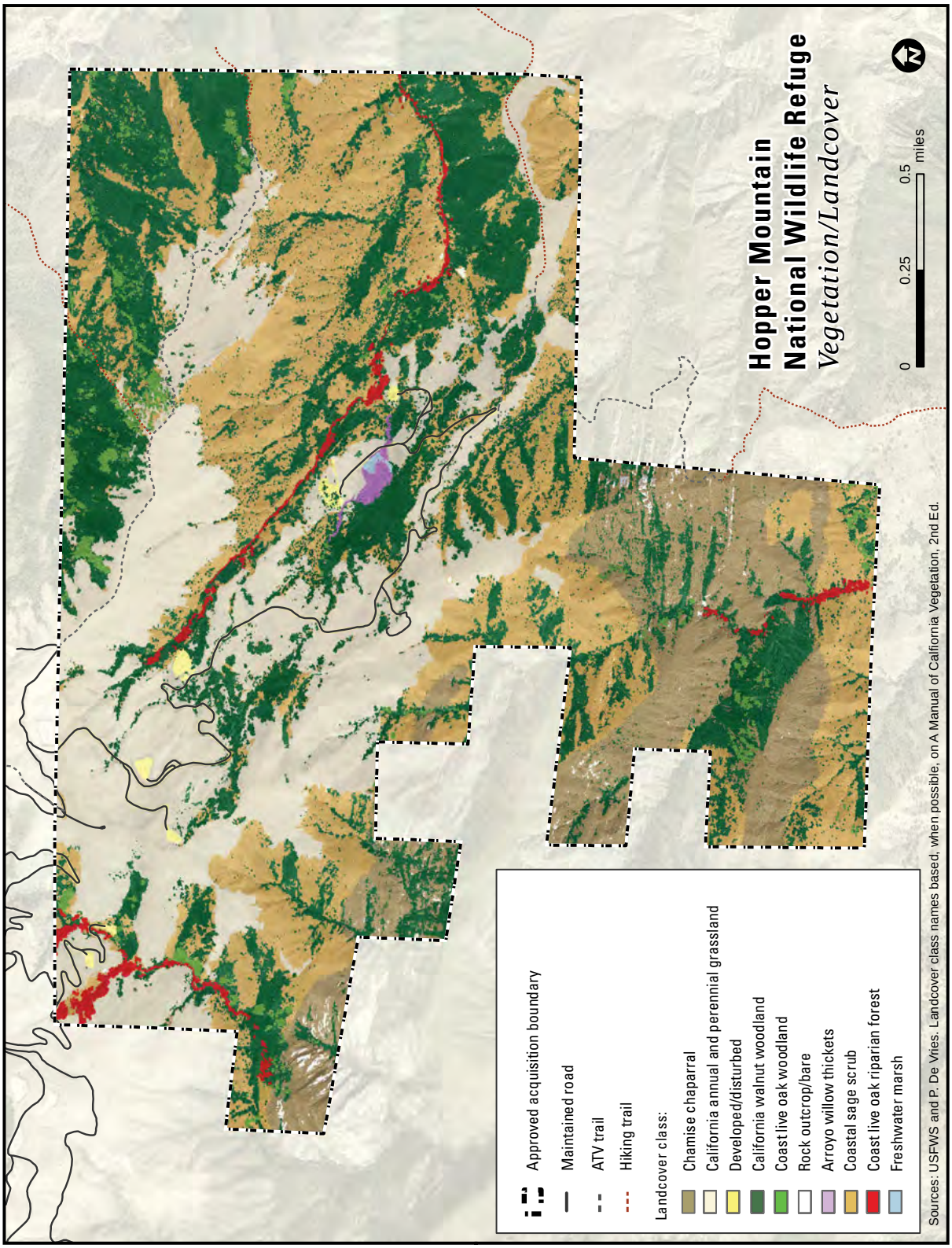


Figure 3-5. Hopper Mountain NWR, Vegetation/Landcover



especially since the early 1980s. Increasing trends in annual minimum temperatures (see Appendix J – Climate, Figure 2), and a similar pattern in monthly minimum temperatures in all months except November and December, were observed from 1895 through 2011.

Climate Change
The Hopper Mountain NWR is located near the center of the Southwestern California Ecoregion (PRBO 2011). For southwestern California, uncertainty associated with climate models makes it difficult to make definitive conclusions about the effects of climate change and increases in greenhouse gasses on fire regimes. Wildfires periodically burn large areas of chaparral and adjacent woodlands in autumn and winter and often occur in conjunction with Santa Ana weather events, which combine high winds and low humidity, following a wet winter rainy season (Westerling et al. 2004). There is currently no consensus on how climate change will influence Santa Ana events or fire in southwestern California. Because some models projected drier conditions than others, large fires (greater than 494 acres) ranged from an increase of 28% to a decrease of 29%. Under wetter climate models, the probability of large fires in southern California increased, particularly in low-elevation ecosystems dominated by grass and low-density shrub vegetation types (Westerling and Bryant, 2008) (see References in PRBO Climate Change report at *http://data.prbo.org/apps/bssc/climatechange*). No published information is available at this time on the projected effects of climate change on streamflow in southwestern California near the location of Hopper Mountain NWR.

Vegetation change. In southwestern California, the area of chaparral/coastal scrub was projected to decrease 38%–44% by 2070, and area of grassland—while currently only 3% of the ecoregion—was projected to increase by 345%–390% (PRBO 2011).

Threats to wildlife. In southwestern California, the predominant effects of climate change on wildlife populations will likely result from changes in vegetation communities. These changes will include increases in the amount of grassland and a loss of coastal scrub habitats. This shift may be hastened by changes in fire severity and frequency. High temperature events will become more common, and species with very narrow temperature tolerance levels may experience thermal stress. Additionally, an increase in extreme high temperature events may cause direct mortality to some species and halt or diminish reproduction. Snow-fed rivers and streams will have less water, which may reduce riparian habitat and affect species associated with riparian areas. The effects of fires in this region are likely to affect species directly through increased mortality and indirectly by modifying vegetation structure and composition. However, there is substantial uncertainty about how fire regimes, including Santa Ana events, will change (PRBO 2011).

3.1.3 Historic Role of Fire

Prior to the modern era of fire suppression, burning in grasslands, sage scrub, and chaparral vegetation of the south coast was characterized by numerous summer lightning-ignited fires that were generally small to moderate in size, punctuated by massive Santa Ana wind-driven fires once or twice per century (Keeley and Fotheringham 2001). These fires often spread into adjacent coast live oak and California walnut woodlands. Fire return intervals in south coast grasslands are believed to have been influenced by proximity to Native American settlements (Keeley 2002). In these areas, fire was relatively frequent; however, in more remote areas, lightning was the primary ignition source and grasslands burned once to several times per century (Keeley 2006). These grassland fires were typically of low intensity and low severity (Keeley 2006). Fire regimes in sage scrub and chamise chaparral were historically characterized by moderate to high intensity, high-severity crown fires at a frequency of 15-70+ years for sage scrub and 30-60 years for chaparral (Keeley 2006, Sawyer et al. 2009).

Most native perennial grasslands have been converted to non-native annual grasslands. Modern human ignitions in grasslands, sage scrub, and chaparral have increased fire frequency and length of the fire season (Wells et al. 2004), and most ignitions now occur in the fall. Fire size, however, has generally decreased due to increasingly effective fire suppression and habitat fragmentation (Keeley et al. 1999). The increased presence of

California condor over Hopper Mountain NWR. Photo: USFWS

non-native annual grasses in sage scrub can also facilitate fire spread and increase fire intensity and severity. Frequent fires in southern California sage scrub vegetation (cover) types have resulted in widespread type conversion to non-native annual grasslands (Minnich and Dezzani 1998).

Historically, coast live oak and walnut woodlands experienced fire once to several times per century, with an estimated return interval of 25-100+ years (Keely 2006, Sawyer et al. 2009). Fire intensity was typically low to moderate, and severity low to high (Keely 2006, Sawyer et al. 2009). High-severity fires were usually restricted to areas with accumulations of understory fuels. Both coast live oak and California walnut can be top-killed, but both are known to resprout vigorously (Esser 1993). Frequent fires often decrease oak and walnut seedling recruitment and can suppress resprouts for many decades (Keeley 1990, Keeley 2006).

Recent large fires (1997 Hopper Fire, 2003 Piru Fire, 2007 Ranch Fire) fanned by fall Santa Ana winds have burned across all vegetation types on Hopper Mountain NWR at a frequency much higher than they occurred historically. If this trend continues, the refuge could experience decreases in cover of coastal sage scrub, chamise chaparral, and coast live oak and California walnut woodlands, and a significant increase in cover of non-native annual grasslands.

3.1.4 Air Quality

The refuge is in Ventura County, California, which is in the South Central Coast Air Basin (Basin). Air quality in the Basin is among the worst in the United States. The Ventura County Air Pollution Control District is the agency responsible for ensuring compliance with federal and state air quality standards in the Basin. The federal and state governments have each established ambient air quality standards for several pollutants. Most standards have been set to protect public health. However, standards for some pollutants are based on other values, such as protecting crops and materials and avoiding nuisance conditions. Currently, the Basin is federally classified as a nonattainment area

for ground-level ozone and particulate matter less than 10 microns in diameter (PM10) (California Air Resources Board 2011). The South Central Coast Air Basin is in attainment or has not been classified for all other criteria pollutants.

Ozone, the main component of photochemical smog, is formed through a complex series of chemical reactions between reactive organic gasses (ROG) and nitrogen oxides (NOx). On-road motor vehicles are the largest contributors to NOx emissions in the Basin. On-road motor vehicles, area-wide sources, and stationary sources are significant contributors to ROG emissions. A significant portion of the stationary source ROG emissions are fugitive emissions from the extensive oil and gas production operations in the Basin. Once formed, ozone remains in the atmosphere for 1 or 2 days. As a result, ozone is a regional pollutant and often affects a large area. The main effects of ozone include damage to vegetation, chemical deterioration of various materials, and irritation and damage to the human respiratory system.

Carbon monoxide (CO) is an odorless, invisible gas which usually forms as a by-product of incomplete combustion of organic substances. The majority of the CO emitted in the Basin comes from motor vehicles. CO is a relatively localized pollutant, often resulting from a combination of high traffic volumes and traffic congestion. As a result, measured concentrations are not necessarily representative of the entire study area. A mildly toxic pollutant, CO interferes with oxygen transport to body tissues.

Particle pollution (also known as "particulate matter") in the air includes a mixture of solids and liquid droplets. Some particles are emitted directly; others are formed in the atmosphere when other pollutants react. Particles come in a wide range of sizes. Those less than 10 micrometers in diameter (PM10) are so small that they can get into the lungs, potentially causing serious health problems. Ten micrometers is smaller than the width of a single human hair. PM10 is produced by stationary point sources such as fuel combustion and industrial processes; fugitive sources, such as roadway dust from paved and unpaved roads; wind erosion from open land; and transportation sources, such as automobiles. Soil type and soil moisture content are important factors in PM10 emissions. Federal and state PM10 standards are designed to prevent respiratory disease and protect visibility.

- ***Fine particles*** (PM2.5). Particles less than 2.5 micrometers in diameter are called "fine" particles. These particles are so small they can be detected only with an electron microscope. Sources of fine particles include all types of combustion, including motor vehicles, power plants, residential wood burning, forest fires, agricultural burning, and some industrial processes.
- ***Coarse dust particles.*** Particles between 2.5 and 10 micrometers in diameter are referred to as "coarse." Sources of coarse particles include crushing or grinding operations and dust stirred up by vehicles traveling on roads.

Certain land uses are considered more sensitive to air pollution than others. Locations such as schools, hospitals, and convalescent homes are labeled sensitive receptors because their occupants (the young, old, and infirm) are more susceptible to respiratory infections and other air quality-related health problems than are other people. Residential areas are also considered sensitive receptors because residents tend to be home for extended periods, resulting in sustained exposure to any pollutants present. Fillmore and Bardsdale, 2 cities located close to the refuge, are considered sensitive areas.

Hopper Mountain NWR. Photo: USFWS

3.1.5 Water

Several watercourses drain from the refuge into Hopper Creek. These intermittent channels that drain into Hopper Creek usually contain water only in winter, spring, and early summer. However, the ravine near the house (for staff and volunteers) has a minor surface flow year-round from the spring and the overflow from the 20,000-gallon holding tank that feeds a 3-acre wetland. The natural spring feeding the wetland flows year-round and provides water to the house, a condor holding facility, and to 5 fire hose stations. There are 4 fire hose stations located around the house complex near the following structures: the cabin, house, barn, and water system. There is also 1 fire hose station near the condor holding facility.

The spring water flows from the side of a hill into a 5,000-gallon holding tank. From there, a solar powered water pump moves the water uphill into a larger 20,000-gallon holding tank. Approximately 15,000 gallons from this tank is reserved for the fire hose stations for fire protection. The other 5,000 gallons pass through a water filtration system before entering the house. Water from the 5,000-gallon holding tank also flows downhill through a pipe to 2 2,500-gallon storage tanks that provide water to a condor holding facility and the fifth fire hose station. The Service has the water supply to the house and cabin tested for contaminants 4 times per year by an independent laboratory. In 2011, independent test results for inorganic chemicals in the water supply for the house were below quantifiable levels for arsenic, lead, and mercury; and 11 micrograms/liter (L) (0.011 milligrams (mg/L)) for copper and 1,200 micrograms/L (1.2 mg/L) for zinc. The pH of the water is approximately 9.0 (basic). The pH of the water supply to the house and cabin is above the U.S. Environmental Protection Agency's (EPA) 6.5 to 8.5 pH maximum levels for drinking water. The levels of arsenic, lead, mercury, copper, and zinc are below the EPA's maximum contaminant levels for drinking water.

The Service defers to the EPA's primary and secondary drinking water standards. The levels also comply with State of California drinking water standards (Pers. Comm. Morris, C. 2011). The maximum contaminant levels (MCL) for safe drinking water are as follows (in *milli*grams per liter):

- Arsenic – 0.010 mg/L
- Lead – 0.015 mg/L
- Copper – 1 mg/L
- Zinc – 5 mg/L
- pH – 0.5–8.5
- Coliform – absent

The EPA sets standards to ensure safe drinking water, called the National Primary Drinking Water Regulations. The state also has MCLs, as found in Title 22 of the California Code of Regulations. While in the past the water contaminant levels at the house have tested below the maximum contaminant levels for drinking water, due to uncertainties in the condition of the house water piping and other variables, the Service does not consider the water supply at the house to be potable at this time. Water quality has not been a concern for condor use. The Service provides bottled drinking water at the house and the water filtration system described previously.

Hopper Mountain NWR. Photo: USFWS

▼ Hopper Mountain NWR Biological Environment

3.1.6 Vegetation

The Refuge Complex's calendar year 2002 Annual Narrative included a plant list, which was updated in 2010 and again in May 2011. The most comprehensive vegetation sampling and vegetation surveying of Hopper Mountain NWR occurred in May 2011. Nomenclature for vegetation types generally follows that of *A Manual of California Vegetation*, Second Edition (Sawyer et al. 2008) with classifications provided at both the group and macrogroup and alliance levels. See Appendix E for plant lists.

Based on the field sampling work from the spring of 2011, as well as interpretation of aerial photography, the vegetation at Hopper Mountain NWR is composed of approximately 679 acres of coastal sage scrub, 673 acres of California black walnut (*Juglans californica* var. *californica*) woodland, 627 acres of annual and perennial grassland, 278 acres of chsmise chaparral, 47 acres of coast live oak woodland, and 29 acres of riparian vegetation. In addition, the refuge has a small, 1-acre fresh-water marsh, dominated by bulrushes and other emergent vegetation and surrounded by approximately 5 acres of willow-dominated wetlands. Developed areas, roads, and rock outcroppings make up the remainder of the refuge lands.

Coastal Sage Scrub
Coastal sage scrub covers approximately 28% of the refuge, or approximately 679 acres, and is typically dominated by purple sage (*Salvia leucophylla*). Common species within this community on the refuge include coffeeberry (*Rhamnus californica*), golden yarrow (*Eriophyllum confertiflorum*), giant wildrye (*Leymus condensatus*), grape soda lupine (*Lupinus excubitus*), sugar sumac (*Rhus ovata*), and California sagebrush (*Artemisia californica*). Coastal sage scrub is found primarily on the Calleguas shaly loam and Castaic-Balcom complex soil types at the refuge, often on very steep slopes.

Coastal sage scrub is a threatened vegetation community in the southwest region of California, and the type that occurs on Hopper Mountain NWR is the least protected type of coastal sage scrub (Davis et al. 1994; Davis et al. 1995). A large proportion (approximately 87%) of the coastal sage scrub landscapes dominated by purple sage are on private lands within the western Transverse Ranges. Hopper Mountain NWR is located where the South Coast Range meets the western Transverse Ranges—publically owned lands that are geographically near the 87% of the community that is under private ownership. The greatest threats to coastal sage scrub are habitat loss, fragmentation, and degradation, which typically are associated with increasing fire frequencies, invasion of non-native plant species, and unregulated livestock grazing (CalPIF 2004).

California Walnut Woodland
California walnut groves (or woodlands) (classified in the Manual of California Vegetation as the *Juglans californica* alliance), are endemic to southern California and are primarily dominated by California black walnut. This vegetation type covers approximately 673 acres or approximately 27% of the refuge and is the most common woodland plant community present. In more open-canopy areas, California black walnuts associate almost exclusively with blue elderberry (*Sambucus nigra*

California black walnut. Photo: 2012 Daniel Passarini

ssp. *cerulea*). In canyons and the northeastern portion of Hopper Mountain NWR, black walnut mixes with other species, including coast live oak (*Quercus agrifolia*) and canyon oak (*Quercus chrysolepis*). Other species associated with California walnut groves at Hopper Mountain NWR include hollyleaf redberry (*Rhamnus ilicifolia*) and California flowering ash (*Fraxinus dipetala*).

California walnut woodland is a plant community that is endemic to southern California. Southern California black walnut *(Juglans californica* var. *californica*) is the dominant tree species in this community and it is state-listed as vulnerable. The California black walnut stands located on Hopper Mountain NWR exist as some of the last and largest remaining stands in southern California. See also Special Status and Culturally Important Vegetation in this chapter.

California Annual and Perennial Grassland
California annual and perennial grassland covers approximately 627 acres or approximately 25% of the refuge. The grasslands at the refuge are predominately composed of non-native annual grasses such as wild oats (*Avena* spp.), brome grasses (*Bromus* spp.), and foxtail barley (*Hordeum* murinum), but native species such as perennial needle grasses (*Nassella* spp.) and small fescue (*Vulpia microstachys*) are also present. Grasslands on the refuge contain numerous forb speciess, including native wildflowers like butterfly Mariposa lily (*Calochortus venustus*), checkerbloom (*Sidalcea* sp.), and golden stars (*Bloomeria crocea*). Some areas of the refuge also have a high percentage of non-native herbaceous species such as mustards (*Brassica nigra* and *Hirschfeldia incana*) and Italian thistle (*Carduus pycnocephalus*). Mustard species are especially prevalent in the grassland area between the wetland and the house.

Grasslands cover only 3% of the vegetation in the southwest region of California (Davis et al. 1995). Almost all of those grasslands are non-native grasslands. According to Davis and others (1995), non-native grasslands [not only native grasslands] are at risk in this region because only 6% are found in areas managed for maintenance of biodiversity, and 21% are on public lands managed for multiple uses. A large proportion (73%) is found on private lands not managed primarily for maintenance of biodiversity. The greatest threats to California grasslands are habitat loss and habitat fragmentation (CalPIF 2000). Most grasslands in California have been converted to agricultural or urban lands. In addition to loss of habitat, the patch size of remaining grasslands has decreased. Research from other regions in North America has demonstrated that grassland bird species (including some that breed in California) can be sensitive to patch size (CalPIF 2000).

Chamise Chaparral
Chaparral on the refuge is typically dominated by chamise (*Adenostoma fasciculatum*) and is generally found on steep slopes with rocky, poorly developed soils in the southern portion of the refuge. The far southern and much of the far eastern portions of the refuge have no roads or only very narrow ATV trails, which are difficult and dangerous to traverse. In addition, the terrain in these areas is extremely steep, with much exposed and loose rock. Because of these conditions, this plant community was not well sampled in field surveys. It is estimated to cover approximately 278 acres or approximately 11% of the refuge.

Chamise chaparral includes a diverse mix of plants, with common species such as manzanita (*Arctostaphylos* spp.), white sage (*Salvia apiana*), black sage (*Salvia mellifera*), yerba santa (*Eriodictyon crassifolium*), coyote brush (*Baccharis pilularis*), hoary ceanothus (*Ceanothus oliganthus*), poison oak (*Toxicodendron diversilobum*), penstemon (*Penstemon* sp.), deerweed (*Acmispon glaber* var. *glaber* [*Lotus scoparius* var. *scoparius]*), buckwheats (*Eriogonum* spp.), and spineflower (*Chorizanthe* sp.).

There are 17 types of chaparral in the southwest region of California covering approximately 36% of the current land cover (Davis et al. 1995). Chamise, the most widespread chaparral plant species in the region, is found in many types of chaparral and occurs as a dominant or co-dominant species on approximately 67% of the chaparral in the region. The chamise chaparral vegetation type specifically constitutes 10% of the chaparral in the region. Chamise chaparral is fairly well represented in areas managed for maintenance of biodiversity (11%) and public lands managed for multiple uses (47%). Only 42% is found on private lands not

managed primarily for maintenance of biodiversity. The greatest threats to chamise chaparral are the same as those of coastal sage scrub. These threats are habitat loss, fragmentation, and degradation such as sometimes occurs with increasing fire frequencies, invasion of non-native plant species, and unregulated livestock grazing (CalPIF 2004).

Coast Live Oak Woodland and Riparian Forest
Coast live oaks are found scattered throughout the refuge in areas with more developed soils and more moisture. In canyon bottoms and in areas with flowing water, they form riparian forest, whereas in other parts of the refuge, they are described as coast live oak woodlands. Both the riparian and non-riparian woodlands are part of the *Quercus agrifolia* alliance, but are separated here because of the important nature of riparian forests on the refuge and due to differences in management actions for those areas. The coast live oak woodlands cover approximately 47 acres, or nearly 2% of the refuge, while the coast live oak riparian forests cover approximately 29 acres, or a little more than 1% of the refuge. While there is much less than 1% cover of southern coast live oak riparian woodlands throughout the southwest region of California, this vegetation type is fairly well represented (16%) in areas managed primarily for maintenance of biodiversity in this region (Davis et al. 1995).

In the northeastern part of the refuge, at some of the highest elevations of Hopper Mountain NWR, coast live oak are associated with other large tree species such as bigleaf maple (*Acer macrophyllum*) and bigcone Douglas-fir (*Pseudostuga macrocarpa*). On north-facing slopes, this alliance may contain species associated with coastal sage scrub, whereas on hotter, drier slopes, the understory vegetation is composed of grassland species. Several of the oak trees in the central part of the refuge (south of the southernmost end of the refuge road) burned in the 2003 Piru Fire. Some of those oaks were killed, but many have resprouted and are showing vigorous growth.

Coast live oaks in the riparian areas of the refuge are associated with other riparian species such as willow (*Salix lasiolepis* and *S. exigua*), as well as a small number of California sycamore (*Platanus racemosa*) and Fremont cottonwoods (*Populus fremontii* subsp. *fremontii*).

Riparian ecosystems in arid western landscapes are ecologically important because they have the most diverse bird communities and are critical in maintaining the quality of in-stream habitat (Riparian Habitat Joint Venture 2004). Riparian areas in California provide important breeding and over-wintering grounds, migration stopover areas, and corridors for dispersal of birds. In fact, the loss of riparian habitats may be the most important cause of population decline among landbird species in western North America (DeSante and George 1994). Riparian habitats have been lost and degraded over the past 100 years through water management practices, agricultural conversions, channelization, recreation development, and the introduction of non-native species (Knopf et al. 1988).

Arroyo Willow Thickets
Arroyo willow thickets (*Salix lasiolepis* alliance) are found in the area surrounding the man-made marsh in the central part of the refuge. They cover roughly 5 acres, or less than 1% of the refuge land. A natural spring to the northwest of the house complex creates the wet conditions that these willows require. Within the arroyo willow thickets, *Salix lasiolepis* may form pure to nearly-pure stands. However, arroyo willows are also found in the riparian forests as an understory species.

Freshwater Marsh
In 1989, a stone wall, made from large chunks of mineral deposits from the riparian areas, was constructed around a 330-foot by 225-foot marsh at the refuge, in close proximity to the house. This wall was built to keep cattle from grazing in this area and trampling the vegetation. Cattle were removed completely from refuge property in 1991, and the marsh began to grow and expand. The stone wall remains and continues to impound water that supports the marsh.

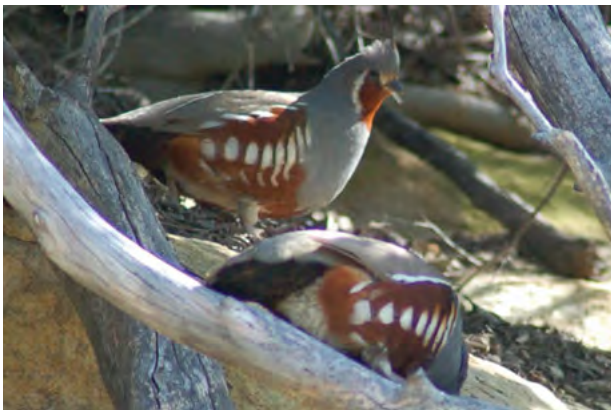
Since 1991, the marsh and surrounding wetland area has expanded to over 5 acres, and it continues to expand. The freshwater marsh portion of this wetland area covers approximately 1 acre and is dominated primarily by bulrushes (*Scirpus americanus* and *S. microcarpus*), but other wetland plants are found here, including nettles (*Urtica* spp.), broad-leaved cattail (*Typha latifolia*), hemp dogbane (*Apocynum cannabinum*), and poison oak (*Toxicodendron diversilobum*). Together, the

vegetation of the freshwater marsh and arroyo willow thicket provide important wetland habitat for many avian, amphibian, reptilian, invertebrate, and mammalian species.

3.1.7 Wildlife

Various monitoring activities have been conducted on Hopper Mountain NWR (see Appendix D). Twenty-four mammal species have been documented on the refuge, including coyote (*Canis latrans*), bobcat (*Lynx rufus*), mountain lion (*Puma concolor*), mule deer (*Odocoileus hemionus*), black bear (*Ursus americanus*), big brown bat (*Eptesicus fuscus*), and Pacific kangaroo rat (*Dipodomys agilis*) (USFWS 2002a). A list of species found on the refuge is included in Appendix E.

A total of 103 bird species have been recorded on or near the refuge. Some of the more common resident birds of the area include the black phoebe (*Sayornis nigricans*), western scrubjay (*Aphelocaoma californica*), California quail (*Callipepla californica*), mourning dove (*Zenaida macroura*), and canyon wren (*Catherpes mexicanus*). Aside from the California condor, common raptors include the great horned owl (*Bubo virginianus*), golden eagle (*Aquila chrysaetos*), and red tailed hawk (*Buteo jamaicensis*) (USFWS 2002a).



Mountain quail, Hopper Mountain NWR. Photo: USFWS

Three amphibian species have been documented on Hopper Mountain NWR, including Baja California treefrog (*Pseudacris hypochondriaca*) (formerly recognized as *P. regilla*), California treefrog (*Pseudacris cadaverina*), and southern California toad (*Anaxyrus boreas halophilus*).

Common side-blotched lizards. Photo: USFWS

Fifteen reptile species have been observed on Hopper Mountain NWR: tiger whiptail (*Aspidoscelis tigris*), southern alligator lizard (*Elgaria multicarinata*), western skink (*Plestiodon skiltonianus skiltonianus*), Blainville's horned lizard (*Phrynosoma blainvillii*), western fence lizard (*Sceloporus occidentalis*), common side-blotched lizard (*Uta stansburiana*), southern Pacific rattlesnake (*Crotalus oregonanus helleri*), ring-necked snake (*Diadophis punctatus*), coast night-snake (*Hypsiglena ochrorhyncha*), California kingsnake (*Lampropeltis getula californiae*), San Diego gopher snake (*Pituophis catenifer annectens*), western patch-nosed snake (*Salvadora hexalepis*), western black-headed snake (*Tantilla planiceps*), gartersnake (*Thamnophis* sp.), and Western pond turtle (*Actinemys marmorata*) (USFWS 2002a). A list of species found on the refuge is included in Appendix E.

3.1.8 Special Status Species

The Hopper Mountain NWR was established to conserve fish, wildlife, or plants which are listed as endangered species or threatened species and to protect habitat for the endangered California condor. Strategically located adjacent to the Sespe Condor Sanctuary, the refuge helps buffer condor nesting and roosting habitat from human disturbance. For a list of threatened and endangered species and species of special concern found or potentially present on the refuge, refer to Appendix E. For Endangered Species Act compliance, refer to Appendix F.

Special Status Plants

This section includes special status plants that are: a) plants that are federally listed or proposed for listing as threatened or endangered, and species that are "candidates" for listing by the Service under the provisions of the Endangered Species Act; b) species listed by the state as threatened or endangered; and c) species that have been observed on Hopper Mountain NWR and are ranked 1B in the California Native Plant Society's (CNPS) California Rare Plant Rank *(http://www.cnps.org/cnps/rareplants)*.

Plant lists were prepared in 2011, during vegetation mapping for this CCP; the plant lists were updated in 2012. Rare or threatened plant communities are discussed in section 3.1.6 Vegetation, in this chapter.

Round-leaved filaree
Round-leaved filaree (*California macrophylla* [*Erodium macrophyllum*]) is ranked by CNPS as a California Rare Plant Rank 1B.1 (considered to be seriously endangered in California). Habitat for this annual herb is clay soils in cismontane woodland and valley and foothill grassland (CNPS 2012). Although round-leaved filaree was documented on Hopper ranch in 1890, round-leaved filaree was not observed during the 2011 survey.

San Fernando valley spineflower
San Fernando Valley spineflower (*Chorizanthe parryi* var. *fernandina*) is listed by the state as endangered, and is ranked by CNPS as a California Rare Plant Rank 1B.1. This annual herb was rediscovered in 1999 and now known from only 3 occurrences. Habitat for this plant is coastal scrub (sandy soil) and valley and foothill grasslands (CNPS 2012). Habitat for this plant occurs on Hopper Mountain NWR. Surveys would be needed to determine if San Fernando Valley spineflower grows on the refuge.

Slender-horned spineflower
Slender-horned spineflower (*Dodecahema leptoceras*) is federally-listed as endangered, a candidate for listing by the state, and is ranked by CNPS as a California Rare Plant Rank 1B.1. Habitat for this annual herb is sandy soils in chaparral, cismontane woodland, and coastal scrub (alluvial fan) (CNPS 2012). Habitat for this plant occurs on Hopper Mountain NWR. Surveys would be needed to determine if slender-horned spineflower grows on the refuge.

Conejo dudleya
Conejo dudleya (*Dudleya parva*) is federally-listed as threatened and is ranked by CNPS as a California Rare Plant Rank 1B.2 (fairly endangered in California). The perennial herb is only known to occur from the western end of Simi Hills to Conejo Grade. Habitat for this plant is rocky or gravelly, clay or volcanic soils in coastal scrub and valley and foothill grasslands (CNPS 2012). Habitat for this plant occurs on Hopper Mountain NWR. Surveys would be needed to determine if conejo dudleya grows on the refuge.

Ross's pitcher-sage
Ross's pitcher-sage (*Lepechinia rossii*) is ranked by CNPS as a California Rare Plant Rank 1B.2. Habitat for this perennial shrub is chaparral (CNPS 2012). Ross's pitcher-sage has been observed on Hopper Mountain NWR.

California Orcutt grass
California Orcutt grass (*Orcuttia californica*) is federally-listed as endangered, a candidate for listing by the state, and is ranked by CNPS as a California Rare Plant Rank 1B.1. Habitat for this annual herb is vernal pools (CNPS 2012). There is no known vernal pool habitat on Hopper Mountain NWR; therefore, this species is not expected to occur within the refuge.

Lyon's pentachaeta
The Lyon's pentachaeta (*Pentachaeta lyonii*) is federally-listed as endangered, a candidate for listing by the state, and is ranked by CNPS as a California Rare Plant Rank 1B.1. Habitat for this annual herb is rocky, clay soils, in chaparral (openings), coastal scrub, and valley and foothill grasslands (CNPS 2012). Habitat for this plant occurs on Hopper Mountain NWR. Surveys would be needed to determine if Lyon's pentachaeta grows on the refuge.

Nuttall's scrub oak
Nuttall's scrub oak (*Quercus dumosa*) is ranked by CNPS as a California Rare Plant Rank 1B.1. Habitat for this perennial evergreen shrub is sandy, clay loam soils in closed-cone coniferous forest, chaparral,

and coastal scrub. Nuttall's scrub oak was observed on the refuge by Burgess, but was not observed during surveys in 2011.

Greata's aster
Greata's aster (*Symphyotrichum greatae*) is ranked by CNPS as a California Rare Plant Rank 1B.3 (considered to be not very endangered in California). Habitat for this perennial rhizomatous herb is mesic, broadleafed upland forest, chaparral, and cismontane woodland (CNPS 2012). Although Greata's aster was collected in Hopper Canyon in 1890, insufficient information was available for the Service to determine whether this was on what is now Hopper Mountain NWR.

In May 2011, a plant list was prepared during vegetation mapping for this CCP. For the Hopper Mountain NWR plant list, see Appendix E.

Culturally Important Plants

Appendix E - Plants and Wildlife includes a list of Culturally important plants for each refuge.

Southern California black walnut
The southern California black walnut (*Juglans californica*) is ranked in CNPS's Inventory of Rare and Endangered Plants, as "Vulnerable"—in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors (CNPS 2012).

Regional Trends: Southern California walnut is a California endemic species (Holstein 1984). The current distribution of southern California black walnut-dominated forests and woodlands is limited to the Santa Clarita River drainage in the vicinity of Sulphur Mountain, small stands in the Simi Hills and Santa Susana Mountains, the north slope of the Santa Monica Mountains, and the San Jose, Puente, and Chino hills. The healthiest remaining stands are in the San Jose Hills (Griffin 1977). Outside of this range, southern California black walnut occurs in Santa Barbara, western San Bernardino, and northern San Diego counties (Quinn 1990). It is conspicuously absent from the coastal foothills of the Santa Ana Mountains in San Diego County (Vogl 1976). It is closely related to the northern California black walnut, which only occurs in the northern portion of the state. Southern California black walnut generally grows in woodlands between 150 and 3,000 feet in elevation. Typically, the understory is limited. Heavy grazing has occurred throughout most of the historical range where this tree is concentrated. Clays seem to be prevalent in many of the locales where this small tree is concentrated, and this walnut may be more tolerant of clay soils than are most trees and woody shrubs.

The current distribution of California black walnut is highly fragmented and almost entirely (89%) on private land. Southern California walnut communities are in decline (Brown 1982; Holstein 1984). Threats include urban and rural development, overgrazing, and increased recreational use of walnut woodlands (Keller 1993; Quinn 1990). The greatest current threat to the few remaining stands is urbanization. Because this species occurs in one of the most populated places in the country, its habitat has been heavily fragmented. Southern California black walnut is classified by the state of California as "Vulnerable."

Local Trends: Southern California black walnut woodland (forest) is a much fragmented, rare, and declining vegetation community. Southern California black walnut woodlands are threatened by urbanization and grazing, non-native plants, and possibly by lack of natural reproduction. They are possibly threatened by hybridization with horticultural varieties of walnut (CNPS 2012). The Nature Conservancy, in cooperation with the state of California, is giving high priority to acquiring vegetation/habitat data on the woodland.

Current Refuge Conditions: The abundance and health of southern California black walnut trees at Hopper Mountain NWR represents an important stronghold for this state species of concern.

Hemp dogbane
Hemp dogbane (*Apocynum cannabinum*), was the most important fiber plant of Chumash peoples, and it had many uses in early times (Timbrook 2007). Hemp dogbane was found growing in damp places, including Saticoy, Matilija, Cuyama, and Sitoptopo (now Topatopa), a mountain range just north of Ojai. The Chumash typically collected hemp dogbane in September by cutting or pulling the stalks, then discarding the tops and leaves and processing the

stalks. To prepare the fiber, the Chumash dried the stalks and then pounded them with a stick or rolled them on stones. After the fiber was shredded and twisted, it was tied together in bunches. Both men and women made string by rolling moistened, twisted pieces into 2-ply cord. More fiber could be spliced onto the strand to make cord of any length. Two-ply string was most common, but 2 or 3 2-ply strands could also be twisted together for thicker, stronger cordage. The Chumash also made 3- and 4-strand braid from hemp dogbane fiber. The Chumash used hemp dogbane fiber string as a sewing thread, as bowstrings, as lashing for plank canoes, and for all types of fishing equipment. They considered it the best fiber for this purpose since the action of the water hardens it. They also used it to make carrying nets and bags, tumpline (lashes for carrying loads of firewood, etc.), slings, cradle laces, belts, bracelets, necklaces, ceremonial paraphernalia, and dance regalia (Timbrook 2007).

Regional Trends: Hemp dogbane proliferates in moist places near riparian areas along streams, springs, levees, and roadsides, and in waste places at elevations below 6,500 feet. It grows throughout California, north to British Columbia, and east across the United States.

Local Trends: According to a local Chumash Indian tribe, this plant is difficult to find in the Ventura and Santa Barbara, California, area.

Current Refuge Conditions: Hemp dogbane is currently found on the Hopper Mountain NWR at the edges of the freshwater marsh south of the house. Because plants spread by way of creeping horizontal roots, it can be harvested and grow back the next season. Some of it is harvested yearly by a Chumash Indian tribe and used for cultural purposes.

Special Status Wildlife

For the purposes of this CCP, special status wildlife include species that is listed or proposed for listing as threatened or endangered by the Service under the provisions of the Endangered Species Act; species designated by the Service as a "candidate" and any species that is listed by the state in a category implying potential danger of extinction; or species designated as a listed as a California Species of Special Concern (*http://www.dfg.ca.gov/wildlife/nongame/ssc*). Special status plants are discussed in the following section.

A species list of federally-listed, proposed, and candidate species from the Service's Ventura Fish and Wildlife Office that may occur in the vicinity of Hopper Mountain NWR includes: California condor (endangered, designated critical habitat), coastal California gnatcatcher (*Polioptila californica californica*, threatened, designated critical habitat), California red-legged frog (*Rana draytonii,* threatened), Least Bell's vireo (*Vireo bellii pusillus*, endangered), and southwestern willow flycatcher (*Empidonax traillii extimus*, endangered, designated critical habitat). See also Appendix F, Endangered Species Act, Section 7 Compliance.

The California condor is the only federally-listed species known to occur on Hopper Mountain NWR. There is coastal sage scrub on the refuge; however, the threatened California gnatcatcher has not been documented at the refuge. Surveys would be needed to determine if the California red-legged frog is present on the refuge. Based on their range and lack of habitat, the Least Bell's vireo and southwestern willow flycatcher are not expected to occur on the refuge.

State-listed wildlife that occur on Hopper Mountain are: bald eagle (*Halianeetus leucocephalus*, endangered) and Swainson's hawk (*Buteo swainsoni,* threatened).

The golden eagle (*Aquila chrysaetos*), which is listed as a fully protected species in California, and the western burrowing owl (*Athene cunicularia hypugaea*), designated by the CDFG as a California Species of Special Concern, occur on Hopper Mountain NWR. Oak titmouse (*Baeolophus inornatus*) is a Partners in Flight priority bird. They are not state-listed species.

Species that have been observed and documented on or near Hopper Mountain NWR from 1995 to present are included in the wildlife list in Appendix E. The species accounts that follow are for special status species that occur or may occur at the refuge, or for which there is habitat.

California condor

Hopper Mountain NWR has roosting, foraging, and nesting habitat for the endangered California condor. The California condor is a member of the New World Vulture family (Cathartidae). During the Pleistocene Era, 10,000 years ago, the condor's range extended across much of North America. At the time of the arrival of pioneers, the condor ranged along the Pacific coast from British Columbia south through Baja California, Mexico, and eastward to Colorado. By 1940, the range had been reduced to the coastal mountains of southern California with nesting occurring primarily in the rugged, chaparral-covered mountains, and foraging in the foothills of the San Joaquin Valley. By 1982, the total population of condors had dropped to 23 individuals. All remaining wild condors were brought into captivity, with the last captured on Bitter Creek NWR in April 1987. Reintroduction of birds into the wild began in 1992 on the Hopper Mountain NWR. The release program expanded over the years, and condor populations today have been established in mountainous regions of California (Los Angeles, Ventura, Santa Barbara, Kern, San Luis Obispo, Tulare, Monterey, and San Benito counties), in Northern Arizona and Southern Utah, and in Baja California Norte, Mexico. Breeding has resumed in the wild, but the annual number of wild fledged individuals has yet to exceed annual mortalities. However, due to the continued release of captive bred individuals, all populations are exhibiting positive growth. The California condor is listed as an endangered species under both the federal and state Endangered Species Acts.

Condors frequently occur on Hopper Mountain NWR. The condor population in California is increasing but only as a result of continued intensive management of the species. The release of captive bred individuals augments the population's size, while the treatment of lead contaminated birds prevents mortalities. A nest guarding program, which began in 2007, maximizes wild reproductive success. Reproduction in the wild resumed in 2001, though a number of factors limited success of nests in early years. Since the 2007 initiation of nest guarding, nesting success has dramatically increased. Hopper Mountain is located central to an abundance of condor nesting habitat and serves as a base of field operations for the recovery effort. Nearly all active condor nests for this population have been within 6 miles of the refuge boundary, though none have been on the refuge.

Hopper Mountain NWR makes up a very small portion of the home range of a single condor. However, the refuge is a part of a larger conglomerate of protected lands inhabited by condors. For the location of the refuge and other protected lands, see Figure 1-1. Hopper Mountain National Wildlife Refuge Complex Location. The refuge is central to nesting, foraging, and roosting habitat that is heavily utilized by condors found in the region. Much of this surrounding nesting and roosting habitat is also protected as part of the Los Padres National Forest Sespe Condor Sanctuary or the Sespe Wilderness. The most bountiful foraging habitat in the area has been the privately owned ranchlands to the south and east of the refuge, where mortality from livestock operations provides a reliable source of carrion. The relatively small amount of roosting and foraging habitat that exists on the refuge has received frequent use due to intensive management of the reintroduced population. In the past, housing pre-released birds on the refuge, as well as the use of supplemental feeding on the refuge, has concentrated condor activity in the Hopper Mountain NWR area. The range for condors is currently expanding as their numbers increase and as management activities have become more diffuse throughout historic range. This expansion has meant a relative decrease of condor activity in the Hopper area. However, it still remains an important area for the majority of the nesting pairs, which have established territories in the area. Further, the remaining ranches, the hunted lands neighboring the refuge, and the refuge have become an important source of non-proffered carrion on which condors feed.

The nearest municipality to Hopper Mountain NWR is Fillmore, California. Like the condor range and population, Fillmore and the other small population centers in the area are also growing. While this development poses little risk to the availability of nesting and roosting habitat, much of the grazing and ranchlands neighboring the refuge could be at risk of development, which would, in effect, decrease or degrade the available foraging habitat in this part of the range. These foraging

areas are of particular importance during the fall and winter seasons and are in close proximity to heavily used nesting habitat. This allows potential breeding birds to remain close to their territories during periods of courtship and post-fledgling care in the fall and winter months.

Coastal California gnatcatcher

Hopper Mountain NWR supports habitat for the coastal California gnatcatcher, coastal sage scrub. It is a small blue-gray, non-migratory songbird (passerine). The bird belongs to the old-world warbler and gnatcatcher Sylviidae family. Coastal California gnatcatchers occur in or near coastal scrub vegetation communities (Woods 1921, p. 173; Atwood 1980, p. 67). At the time of listing in 1993, the information available suggested the northernmost populations in southern Ventura County were extirpated (extinct locally), but observations since listing have shown that the bird exists there (USFWS 2009).

The following information is excerpted from the Service's 5-year review of the threatened coastal California gnatcatcher (USFWS 2010c). The bird appears susceptible to threats associated with reduced habitat fragment size and length of time the fragment has been isolated, but the mechanisms causing this are not clear. The coastal California gnatcatcher is closely tied to its habitat—coastal sage scrub, in the northern portion of its range. In terms of habitat, fragmentation promotes habitat degradation, which is a process that ends in habitat type conversion. Several stressors, including livestock grazing, anthropogenic atmospheric pollutants, and wildland fire promote habitat type conversion within the range of the gnatcatcher. The magnitude of the threat posed by habitat type conversion remains high at this time. Another threat includes the immediate effects of wildland fire (i.e., the temporary destruction of the plants upon which the gnatcatcher depends for foraging, sheltering, and nesting), the magnitude of which has increased as the number of wildland fires has increased (USFWS 2010c).

California red-legged frog

Surveys would be needed to determine whether the California red-legged frog or its habitat exists on Hopper Mountain NWR. The California red-legged frog was federally listed as a threatened species in 1996. It is also listed as a state species of concern. This taxa has been extirpated or nearly extinct from 70 percent of its former range. Habitat loss and alteration, combined with over-exploitation and introduction of invasive predators, were important factors in the decline of this frog in the early to mid-1990s. Primary threats that led to its listing status included urban encroachment, construction of reservoirs and water diversions, contaminants, agriculture, and livestock grazing (USFWS 2002b). At present, California red-legged frog is known to be present in approximately 243 streams or drainages from 22 counties, primarily in central coastal California.

Breeding sites of the California red-legged frog are in a variety of aquatic habitats; larvae, tadpoles, and metamorphs have been collected from streams, deep pools, backwaters within streams and creeks, ponds, marshes, and other types of water bodies. Breeding adults are often associated with deep (greater than 2 feet) still or slow moving water and dense, shrubby riparian or emergent vegetation (Hayes and Jennings 1988), but frogs have been observed in shallow sections of streams that are not cloaked in riparian vegetation. California red-legged frogs also frequently breed in artificial impoundments such as stock ponds (USFWS 2002b).

Bald eagle

Bald eagles occur at Hopper Mountain NWR. The bald eagle is protected under the Federal Bald and Golden Eagle Protection Act (Eagle Protection Act) (16 U.S.C. 668–668c), the Migratory Bird Treaty Act (MBTA) (50 CFR 21.11), and the Lacy Act, as amended (16 U.S.C. 3371–3378). The Eagle Protection Act prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. "Take" includes pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb (16 U.S.C. 668c; 50 CFR 22.3).

The MBTA applies to the bald eagle and all migratory birds. MBTA carries out the United States' commitment to 4 international conventions with other countries to protect birds that migrate across international borders. The take of all migratory birds, including bald eagles, is governed by the MBTA's regulations. The MBTA prohibits the taking, killing, possession, transportation, and

importation of migratory birds, their eggs, parts, and nests except as authorized under a valid permit. As amended, the Lacey Act now makes it unlawful to import, export, transport, sell, receive, acquire, or purchase in interstate or foreign commerce any plant, with some limited exceptions, taken in violation of any federal, state, tribal, or foreign law that protects plants. Bald eagles live near rivers, lakes, and marshes where they can find fish, their staple food. Bald eagles will also feed on waterfowl, turtles, rabbits, snakes, and other small animals and carrion. Bald eagles require a good food base, perching areas, and nesting sites. Their habitat includes estuaries, large lakes, reservoirs, rivers, and some seacoasts. In winter, the birds congregate near open water in tall trees for spotting prey and night roosts for sheltering.

Eagles mate for life, choosing the tops of large trees to build nests, which they typically use and enlarge each year. Nests may reach 10 feet across and weigh a half ton. They may also have one or more alternate nests within their breeding territory. In treeless regions, they may also nest in cliffs or on the ground. The birds travel great distances but usually return to breeding grounds within 100 miles of the place where they were raised. Bald eagles may live 15 to 25 years in the wild, longer in captivity. Breeding bald eagles typically lay 1–3 eggs once a year and they hatch after approximately 35 days. The young eagles are flying within 3 months and are on their own about a month later. However, disease, lack of food, bad weather, or human interference can kill many eaglets. Recent studies show that approximately 70% survive their first year of life.

Swainson's hawk

Swainson's hawks are rare migrants at Hopper Mountain NWR. The Swainson's hawk was listed as a threatened species in 1983 by the California Fish and Game Commission. Swainson's hawk is a Partners in Flight priority bird species. Although the Hopper Mountain NWR Complex calendar year 2002 Annual Narrative Report documented Swainson's hawk as a wintering raptor at Hopper Mountain NWR, this record is suspect. The Swainson's hawk is an uncommon to rare spring migrant at the refuge and can easily be confused with some red-tailed hawks, rough-legged hawks, or ferruginous hawks.

Golden eagle. Photo: USFWS

Golden eagle

Hopper Mountain NWR supports habitat for the golden eagle, which is listed as a fully protected species in California. The golden eagle is an uncommon permanent resident and migrant throughout California, except in the center of the Central Valley. It is perhaps more common in southern California than in northern. The golden eagle ranges from sea level up to 0–11,500 feet mean sea level (msl) (Grinnell and Miller 1944). Habitat typically includes rolling foothills, mountain areas, sage-juniper flats, and desert. Secluded cliffs with overhanging ledges and large trees are used for cover. Golden eagles nest on cliffs of all heights and in large trees in open areas. Alternative nest sites are maintained, and old nests are reused. They build large platform nest, often 10 feet across and 3 feet high, of sticks, twigs, and greenery. Rugged, open habitats with canyons and escarpments are used most frequently for nesting. Golden eagles occasionally prey on domestic calves and lambs. They may compete with ferruginous hawks for small mammals, and with California condors for carrion. If disturbed by humans, golden eagles may desert their nest in early incubation (Thelander 1974).

Western burrowing owl

Hopper Mountain NWR supports habitat for the western burrowing owl. In California, western burrowing owl is a yearlong resident of flat, open, dry grassland and desert habitats at lower elevations. They may be found in areas that include

trees and shrubs if the cover is less than 30%; however, they prefer treeless grasslands. Although burrowing owls prefer large, contiguous areas of treeless grasslands, they have also been known to occupy fallow agriculture fields, golf courses, cemeteries, road allowances, airports, vacant lots in residential areas and university campuses, and fairgrounds when nest burrows are present. They typically require burrows made by fossorial mammals, such as the California ground squirrel.

The burrowing owl is designated by CDFG as a California Species of Special Concern due to declining population levels, limited ranges, and/or continuing threats.

Oak titmouse

The oak titmouse is a common resident of Hopper Mountain NWR. Oak titmouse is a Partners in Flight priority bird. The oak titmouse is a common resident in a variety of habitats, but is primarily associated with oaks. This bird occurs in montane hardwood-conifer; montane hardwood; blue, valley, and coastal oak woodlands; and montane and valley foothill riparian habitats in cismontane California, from the Mexican border to Humboldt County. Its range encircles San Joaquin Valley, extending east from the coast through Kern County onto the western slope of the Sierra Nevada, north to Shasta County (Kucera 1998). The composition of oak woodland habitat used by the oak titmouse varies, but arboreal species dominate, and the woodland is generally open. The bird may use scrub oaks or other brush as long as woodland occurs nearby. Its pattern of utilization of oaks, both in tree species and in foraging and perching substrates, varies geographically (Block 1990). Trees with natural cavities are especially important for oak titmouse (Wilson et al. 1990). High richness of tree species also is important in maintaining variety of cavity-nesting opportunities (Wilson et al. 1990) and for accommodating interspecific and annual variability in acorn crop production (Koenig et al. 1994; Cicero 2000).

Oak titmouse. Photo: Tom Gray

3.1.9 Contaminants

No documented contaminant issues have been reported for Hopper Mountain NWR. Preventing or minimizing exposure of wildlife and plants to environmental contaminants is important for the recovery of the California condor and the biological integrity, diversity, and environmental health of refuges. In 1997, the Service conducted a contaminant assessment process (CAP) on Hopper Mountain NWR. The following includes highlights of the contaminants assessment.

Oil and gas extraction activities take place both on and adjacent to Hopper Mountain NWR. The extraction activities are the largest potential contaminant threat to refuge resources. The results of the CAP indicated that the potential for significant seismic events (earthquakes) in the area make the threat of oil spills a great concern to the Service. Because the refuge is bisected by steep-sided canyons, large vehicle access would be very difficult, and cleanup of a sizable oil spill on the refuge would be very difficult.

Tributaries running through the refuge drain to the Santa Clara River. One source of local spill-related effects information is *The Rehabilitation of Sora and Virginia Rails Following a Spill in the Santa Clara River* (Rineer-Garber et al. 1995). This reference looks at the number of wildlife collected during the Santa Clara River spill of 1994 and the success of rehabilitation efforts.

Baseline information on habitat characteristics is important to have in the event of accidental releases of oil or other hazardous substances. Habitat information and the characteristic wildlife species that particular habitats support is important in determining what species may be most susceptible to environmental contaminants. It also provides information on rare habitats that may need special protection measures in the event of spills.

The CAP results also indicated that sensitive habitats and/or sensitive species are important "biomarkers" for changes in environmental conditions. Reduction in sensitive species may be indications that environmental contaminants are having adverse effects on or adjacent to the refuge. Monitoring of aquatic plants after exposure to oil would be important in determining the recovery of ecosystem function and health. In general terms, amphibians are highly sensitive to environmental contaminants. The respiratory function of amphibians' skin makes the transfer of contaminants from the water column to tissue rapid and causes contaminant sensitivity. It is important to monitor aquatic habitats in the event an oil spill occurs.

▼ Hopper Mountain NWR Socioeconomic Environment

3.1.10 Local Population Base

Fillmore is a small city in southeastern Ventura County just below the San Cayetano Mountain peak in the Los Padres National Forest. Fillmore is located in the Santa Clara River Valley, approximately 4 miles from the refuge. It is primarily served by State Highways 126 and 23. Fillmore is also located within a historic Ventura County agricultural and tree-farming belt. Educational facilities include a high school, a middle school, and 5 elementary schools. The Sespe Condor Sanctuary lies to the north. The nearby Sespe Creek is a tributary of the Santa Clara River.

The small farming community of Bardsdale is located approximately 3 miles from Fillmore, directly across the Santa Clara River. Also located nearby are a fish hatchery and the Sespe Creek and Sespe Wilderness, home to the Sespe Condor Sanctuary.

On January 1, 2010, the population of Fillmore was 14,902, and on January 1, 2011, it was 15,120. In January 2011, the total population of Ventura County was 828,383 (California Department of Finance 2011). In 2009, the estimated median income for a household in Fillmore was $56,997.

3.1.11 Industry and Economy

Fillmore's economy is still largely driven by agriculture. Most agricultural industry in the Fillmore area is related to orange, lemon, and avocado orchard farming and packing and, more recently, specimen tree farming. To a lesser extent, row crop farming and small industry and assembly are also present in and near Fillmore and in other parts of the Santa Clara Valley. The single largest employer is the Fillmore Unified School District.

Hopper Mountain NWR is located within Ventura County. The California Employment Development Department's data on the number of individuals employed by industry in Ventura and adjacent counties is presented in Table 3-1.

Table 3-1. Number of individuals employed by industry (not adjusted seasonally) for December 2011.

Employment Categories	Kern Co.	Santa Barbara Co.	Ventura Co.	Los Angeles Co.
Total Wage and Salary	273,400	177,600	300,900	3,831,800
Total Non-farm	232,600	162,000	280,900	3,826,100
Service Providing	193,000	143,000	237,100	3,350,600
Total Private	169,300	126,000	236,100	3,257,200
Residual-Private Services Providing	129,700	107,000	192,300	2,781,700

Source: California Employment Development Department.

Oil and gas pad at Hopper Mountain. Photo: USFWS

3.1.12 Land Use

The Service does not own the mineral (oil and gas) rights within Hopper Mountain NWR. These rights, along with the right of entry and right of way to develop them, were specifically excluded when the Service purchased the lands. Currently, there are 3 active drilling pads, 1 pad used for storage, and 1 inactive pad on the refuge. All 5 pads were developed prior to refuge establishment. Oil drilling activities on the refuge are covered by 2 conditional use permits (#3470 and #2250) issued by Ventura County.

Oil and Gas Extraction
There are currently 3 oil well pads that contain producing wells and storage facilities on Hopper Mountain NWR fee title lands. Another pad, located in the northwest corner of the refuge, is called a production facility, and has tanks, meters, a trailer, but no wells at this time. The location of the pads is shown in the figure included in the Wilderness Review (Appendix G).

The 3 active oil drilling pads on the refuge are currently operated by Vaquero Energy, Inc., based in Bakersfield, California. The operator is responsible for operation and maintenance of the wells. Vaquero may contract out to other companies to take care of certain day-to-day operations. The western-most pad on the refuge contains 4 wells. The northern-most oil pad on the refuge contains 4 wells. The southern-most oil pad on the refuge contains 8 wells.

While the federal government owns almost all the surface lands in the Refuge System, in many cases, the federal government does not own the subsurface mineral rights. This is the case on Hopper Mountain NWR. Federal mineral estate within wildlife refuges is generally not available for oil and gas exploration and drilling. For those areas where the federal government does not own the mineral estate, there is limited control over oil and gas exploration and drilling. Subject to some restriction, owners of subsurface mineral rights have the legal authority to explore for mineral resources such as oil and gas and, if such resources are found, to extract them. About one-quarter of the refuges included in the 150-million-acre Refuge System have past or current oil and gas activities, some dating to at least the 1920s (Government Accounting Office [USGAO] 2003).

Pursuant to the Service Manual (Part 612 FW2, Oil and Gas), the objectives of oil and gas management on Service lands are to protect wildlife populations, habitats, and other resources; and provide for the exercise of non-federal oil and gas rights while protecting Service resources, to the maximum extent possible.

3.1.13 Public Use

Aesthetics
Hopper Mountain NWR consists of a box canyon and surrounding ridges and valleys located on the southern edge of the Los Padres National Forest and just north of the Santa Clara River Valley. The refuge hosts a variety of habitats, as described earlier in this chapter. Along the southern section of the main ridgeline that extends across the refuge, there are large rock outcroppings and cliffs, referred to as the pinnacles area. There are some year-round and

seasonal springs on the refuge draining through narrow cuts in the hillsides. More information about California condors and other wildlife on the refuge can be found earlier in this chapter.

Wildlife Observation, Photography, and Interpretation
Hopper Mountain NWR is currently closed to the public and has been since its establishment in 1974 due to the sensitive nature of California Condor Recovery Program activities, the sensitivity of its resources, and lack of public access to the site. There are no public roads accessing the refuge. There are no visitor-oriented facilities for the public or interpretive signage on Hopper Mountain NWR. Also, public use could potentially disturb endangered California condors that nest and feed in the area and associated Recovery Program activities.

The biggest obstacle to opening Hopper Mountain NWR to public visitation is the lack of public roadway access to the refuge. Currently, all refuge visitors and staff must travel on private oil company roads access the refuge. These roads are extremely rough, windy, and dangerous, with multiple locked gates. The rugged terrain of the refuge also limits visitation opportunities. The use of four-wheel drive Service vehicles is usually required for clearance over the narrow dirt roads. The refuge is remote, and emergency services are not readily available. Further, unexpected weather or wildfires can cause evacuation of staff and volunteers from the refuge. Refuge personnel are expected to uphold the highest caution while using all-terrain vehicles, especially during muddy, wet weather to avoid accidents and erosion of roads and trails.

As a result of the access constraints, all refuge visitors have been guided by refuge employees or led by partner organizations educated in refuge rules and regulations, such as the Friends of California Condors Wild and Free. Staff and partner-led guided interpretive tours provide limited opportunities for the public to engage in wildlife viewing and photography. Generally, the hiking groups at Hopper Mountain NWR do not exceed 25 people per event, with approximately 100 visitors total per year. Most guided interpretive hikes have taken place on weekends to accommodate visitors' availability. According to California State Parks' Parks and Recreation Trends in California 2005, citizens reported less involvement in recreation activities, with their work schedule becoming the most frequent barrier to their participation. Wildlife-dependent recreation is also available on adjacent public lands, including the Los Padres National Forest, managed by the U.S. Forest Service.

Environmental Education
Environmental education and interpretation are identified in the Refuge Improvement Act as priority uses for refuges when they are compatible with refuge purposes. Because Hopper Mountain NWR is remote and not accessible to the public, its existence and purposes are not well known in the region. However, the Hopper Mountain NWR Complex provides education to both local schools and inner-city schools in Ventura and Los Angeles counties regarding careers with the U.S. Fish and Wildlife Service and California Condor Recovery Program history and condor biology. By conducting community outreach, it is possible for members of the public to understand Hopper Mountain NWR's goals and purposes. There is not enough capacity or staffing, however, to conduct formal environmental education programs at this time.

The future management of public use at the refuge is described in Chapter 4.

3.1.14 Structures and Facilities

Located on the Hopper Mountain NWR are a group of structures which serve as a base of operations for the California Condor Recovery Program. More information on the Recovery Program can be found at the beginning of this chapter and online at *www.fws.gov/hoppermountain/CACORecoveryProgram/CACondorRecoveryProgram.html*. Situated on approximately 2 acres, these structures are part of a historic cattle ranch and include a 1,600-square-foot barn, an 1,800-square-foot house, an 800-square-foot cabin, several metal trailers with attached structures, several tool sheds, and a 20,000-gallon water tank.

Additionally, the refuge includes a condor holding facility constructed in 1995 consisting of a 30-foot by 50-foot flight pen (wire enclosure) and a

new condor care facility that was constructed in 2010. These facilities are used to hold captive-reared condors prior to release and to trap and temporarily hold wild condors for routine health exams and transmitter maintenance. Sick or injured condors are currently transported to veterinary facilities at the Los Angeles Zoo. Together they are approximately 2,000 square feet. There are also 2 2,500-gallon water tanks nearby. This area occupies approximately 1.5 acres. Adjacent to the house are 2 solar arrays, each approximately 9 feet by 9 feet. Both charge batteries that provide electrical power to the house, cabin, 2 storage trailers, water filtration system, and tool shed. An alternate power source is a back-up propane powered generator housed in a building approximately 6 feet by 6 feet. The propane generator charges the batteries when necessary, usually after several cloudy days. There are also 2 propane tanks: a 1,200-gallon tank for the house, and a 500-gallon tank for the cabin powers 4 refrigerators, 2 cooking stoves, and 2 water heaters.

Homestead remnants, Hopper Mountain NWR. Photo: USFWS

3.1.15 Archaeological and Historical Resources

The Service's Region 1 and Region 8 Cultural Resources Team have compiled the following information regarding cultural resource research on the refuge.

Previous Archaeological Research
Little archaeological research has been conducted within the boundaries of Hopper Mountain NWR. Since its establishment in 1972, fieldwork on the refuge has fallen into these categories: 1) third parties fulfilling requirements to obtain conditional use permits for oil exploration, 2) compliance with Section 106 of the National Historic Preservation Act for refuge management and Recovery Program activities, and 3) post-wildfire damage assessment.

In 2010, a search of records held in the California Historical Resources System-South Central Coastal Information Center and a literature review of published articles, maps, and agency files was conducted for a review within a 1-mile radius of the refuge. In addition, the Service's Cultural Resources Team requested a record search of the sacred lands files maintained by the Native American Heritage Commission. The record search included a literature review of published articles, maps, and agency files. Most of the cultural resource investigations that occurred on the refuge have been carried out by other agencies, primarily by the U.S. Forest Service while the land was still under U.S. Forest Service ownership or in response to wildfires that extended into refuge boundaries.

The area of the refuge was historically occupied by Native Americans known as the Chumash. There is one prehistoric-historic era multi-component site recorded within the refuge boundaries in a rock formation. Other historic sites and features, including Hopper Ranch, are known to exist on the refuge but have not been recorded. No other prehistoric or historic sites and/or features have been recorded within 1 mile of the refuge.

The total acreage surveyed is unknown. However, to date the Service's Cultural Resources Team estimates that less than 1% (less than 20 acres) of the 2,471-acre refuge has been systematically surveyed as a result of 5 archaeological research

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The total acreage surveyed is unknown. However, to date the Service's Cultural Resources Team estimates that less than 1% (less than 20 acres) of the 2,471-acre refuge has been systematically surveyed as a result of 5 archaeological research projects. It is highly probable that additional archaeological sites will be exposed by human actions or natural causes in the future. All sites should be treated as eligible for listing on the National Register of Historic Places (NRHP) until listed or formally evaluated as ineligible in consultation with the State Historic Preservation Office (SHPO).

The condor pictograph shown is on the adjacent Los Padres National Forest; it illustrates the types of resources that may be present in the refuge area.

Condor pictograph, Los Padres National Forest. Photo: Keith Allen

3.0 Bitter Creek National Wildlife Refuge

▼ Bitter Creek NWR Physical Environment

3.0.1 Geology and Soils

Bitter Creek NWR is located in the northern reaches of the Transverse Ranges, an ecologically diverse region where the Coast Ranges, Sierra Nevada Mountains, western Mojave Desert, and San Joaquin Valley converge. The 14,097-acre refuge is described as an integral link in the chain of unique habitats that create a vital corridor for wildlife from the deserts of the Mojave to the Pacific Ocean. Bitter Creek Canyon, a major drainage on the refuge, and surrounding lands serve as an important part of California's natural heritage. Elevations at Bitter Creek NWR range from approximately 1,600 to 4,700 feet above msl. Bitter Creek Canyon is approximately 2,250 feet above msl, and the Pelato Mountain benchmark is 4,488 feet above msl. Slopes on the refuge are moderate (less than 30%) in the western part of the refuge but are often steep and abrupt along canyon walls in the eastern part of the refuge, especially along Bitter Creek (Pers. comm. Heitmeyer, M. 2011).

Soils

The refuge has a unique soil profile due to presence of the San Andreas Fault Rift Zone that bisects the refuge northwest to southeast. The rift zone has helped to form a valley parallel to the fault scarp. Uplift during recent geological time has created extremely steep canyons, especially due to fault displacement along the San Andreas Rift. The steep canyons facilitate severe erosion and the movement of sediment (Townsend 1988) (see Figure 3-9. Bitter Creek NWR, Soils).

Rock types on Bitter Creek NWR are sedimentary and consist of sandstone, shale, and conglomerate. The most common geologic formations in the eastern side of the fault are Santa Margarita sandstone, McDonald shale, Maricopa shale, and Bitterwater shale. Ricardo sandstone, conglomerate, and tuff; Pattiway sandstone; and Simmler conglomerate and sandstone formations are found on the western side of the fault (Townsend 1988).

Figure 3-6. Bitter Creek NWR, Location

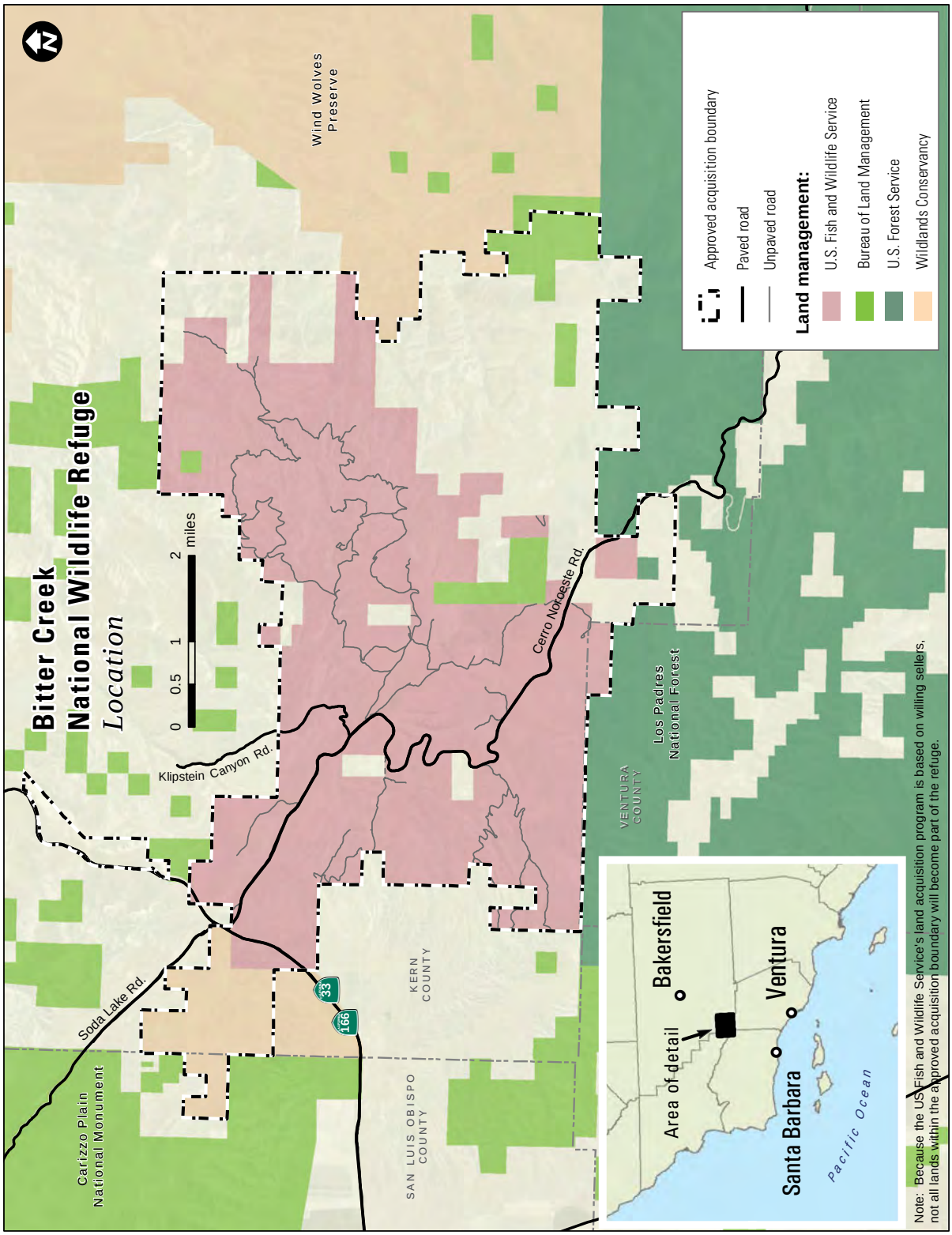


Figure 3-7. Bitter Creek NWR, Facilities

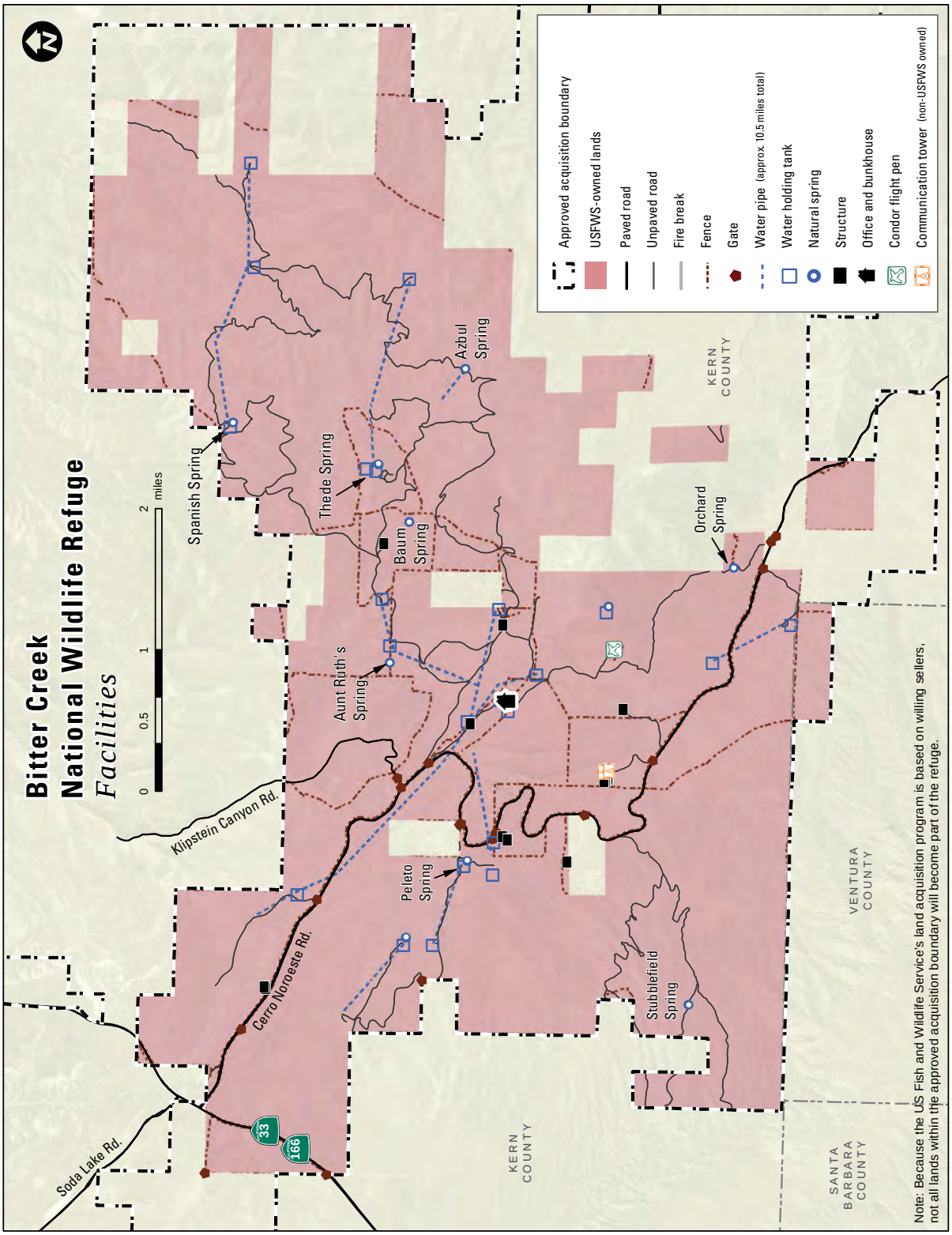


Figure 3-8. Bitter Creek NWR, Slope and Watersheds

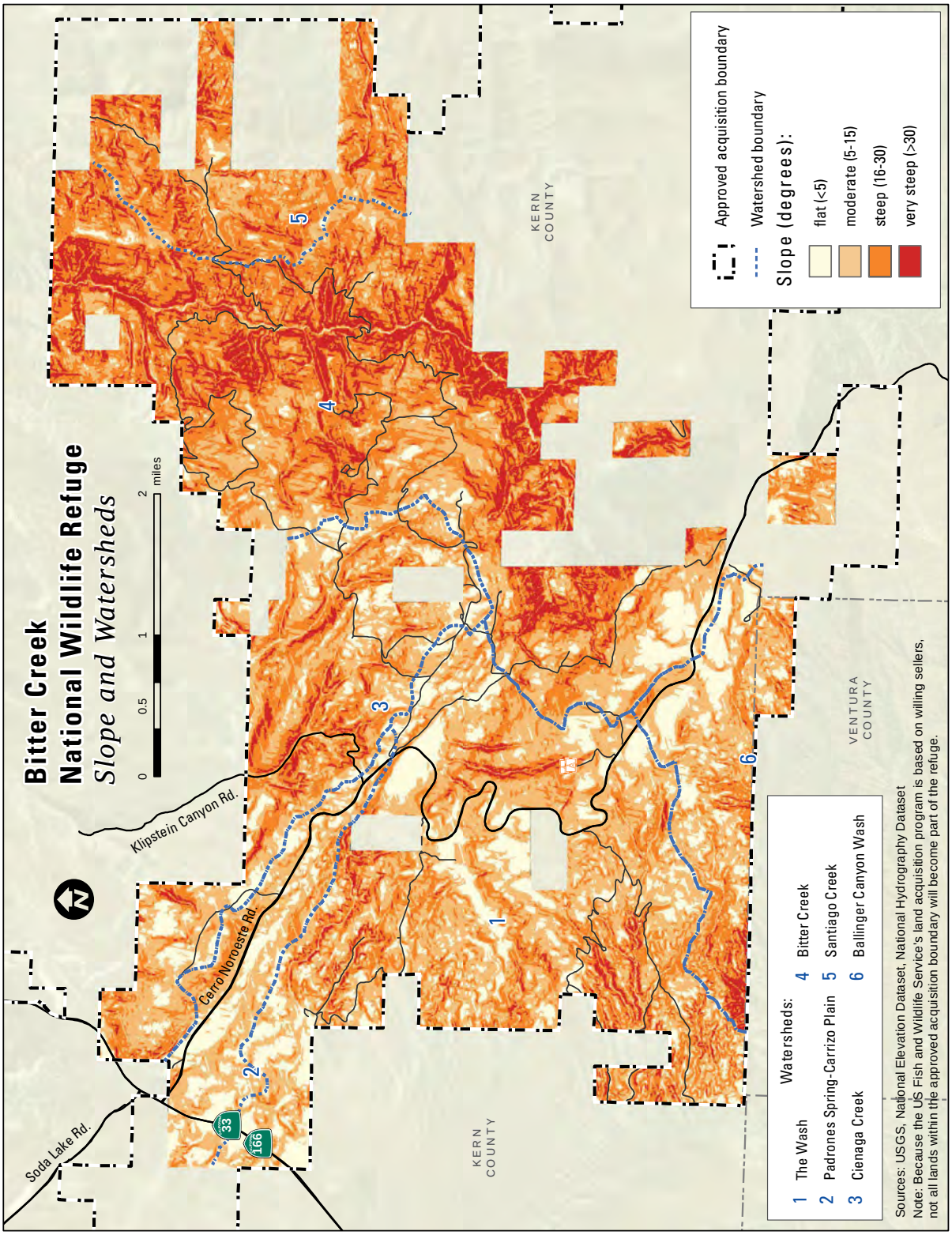


Figure 3-9. Bitter Creek NWR, Soils

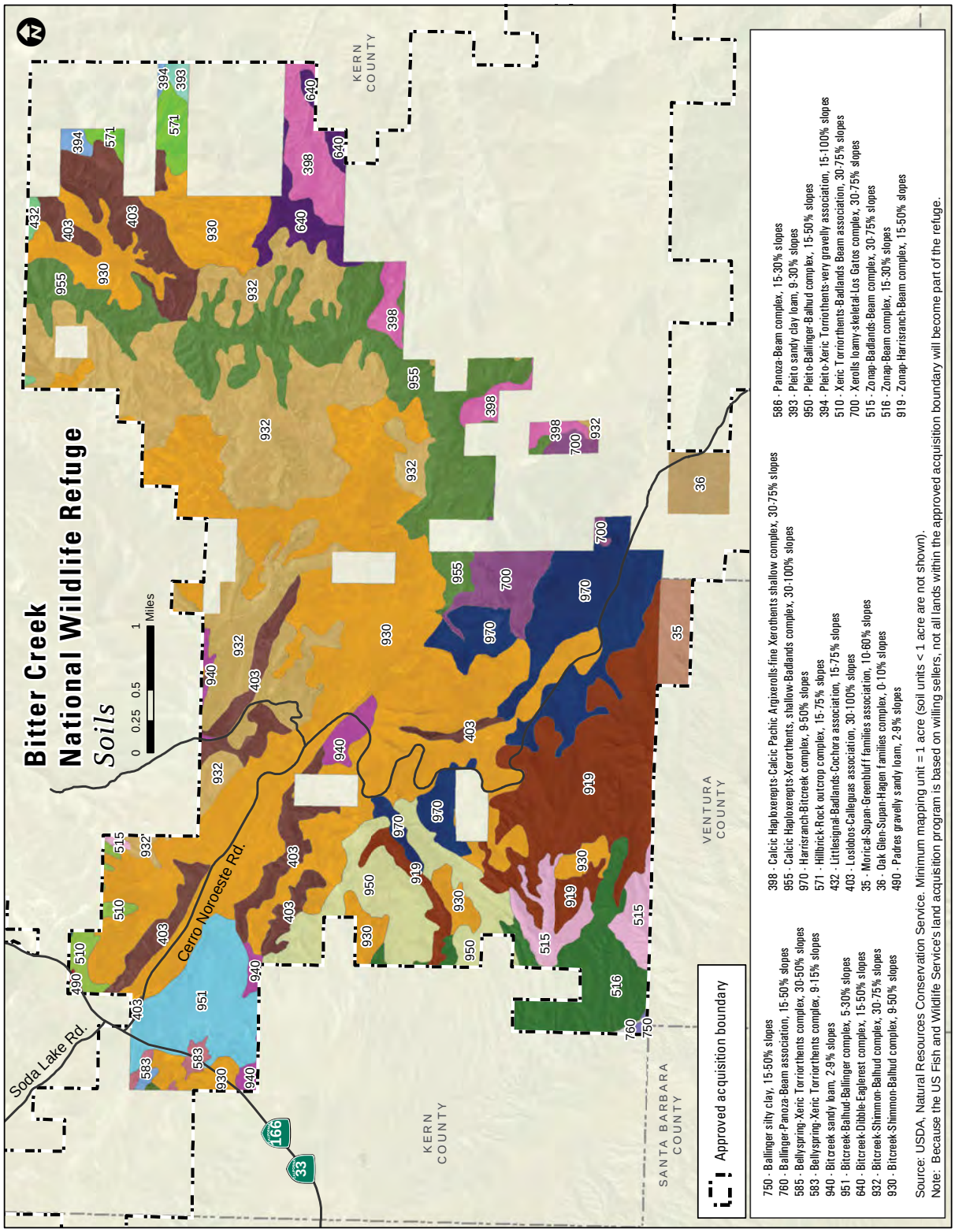
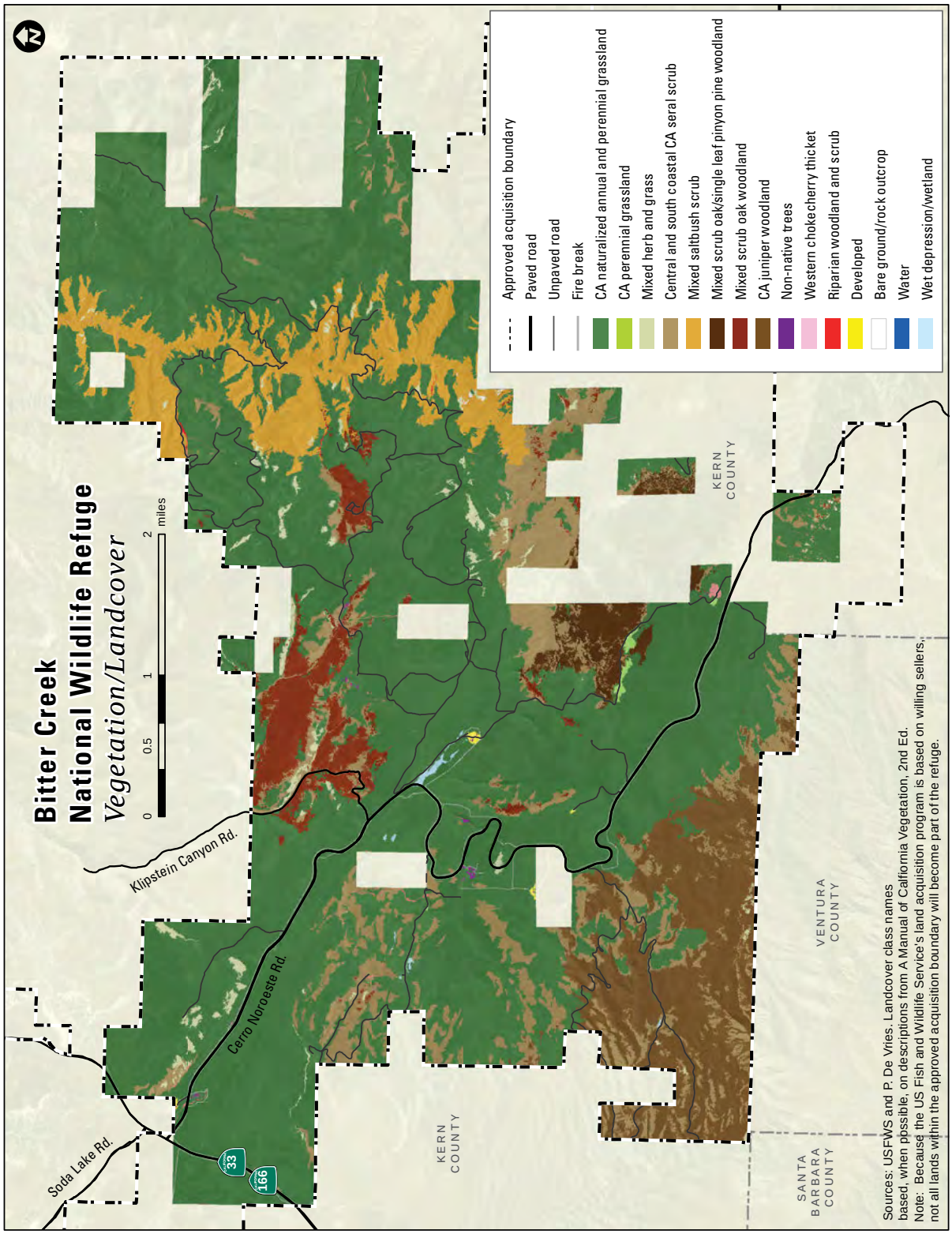


Figure 3-10. Bitter Creek NWR, Vegetation/Landcover



3.2 Bitter Creek National Wildlife Refuge

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3.2.2 Climate and Climate Change

Climate
Bitter Creek NWR, situated in the upper foothills at the southwestern corner of the San Joaquin Valley, is located within the "California Dry Steppe Province" according to Bailey's Life Zones (Bailey 1995). This life zone is characterized by hot, dry summers and mild, foggy winters. Temperature extremes may climb above 100 degrees F in summer and drop below freezing in winter. Precipitation levels peak December through April. Annual average temperature near the refuge ranges from a minimum of approximately 42 degrees F to a maximum of approximately 72 degrees F based on average climate conditions from 1971 through 2000. The lowest temperatures occur in December (ranging from a monthly minimum of 33 degrees F to a monthly maximum 58 degrees F) and the highest temperatures occur in July (ranging from a monthly minimum of approximately 55 degrees F to a monthly maximum of approximately 90 degrees F). The lowest temperature on record is 15 degrees F at the Maricopa, California, weather station in December 1978, and 8 degrees F at the Lebec station in January 2001. The average daily temperature in winter is 48.5 degrees F, and the average daily minimum temperature is 38 degrees F. In summer, average daily temperature is 80.7 degrees F, and average daily maximum is 94.8 degrees F. The highest temperature on record is 116 degrees F at the Maricopa station in July 1950. The average frost-free season for the area is 195 days. Evapotranspiration rates are high in the summer, often 3–4 times annual precipitation rates.

Snow at Bitter Creek NWR. Photo: USFWS

Weather can vary considerably on the refuge, depending on the elevation and specific site. Higher elevations, especially above 4,000 feet, are relatively cool and receive more moisture; snow is common during winter storms. Lower sites, particularly in Bitter Creek Canyon, which range down to 1,600 feet, are warmer, receive less moisture, and rarely receive snow. North-facing slopes are cooler and wetter than slopes with other aspects and, as a result, normally support some type of woody vegetation and denser stands of annual exotic grasses. Increasing trends in minimum temperatures in March were observed from 1895 through 2011, especially since 1975 (see Appendix J – Climate, Figure 4). Decreasing trends in monthly minimum temperatures were observed from selected months from July through November (summer and fall) from 1895 through 2011 (see Appendix J – Climate, Figure 4). Decreasing trends in monthly maximum temperatures were also observed for July and August from 1985 to 2011 (see Appendix J – Climate, Figure 4). No trends in annual minimum or maximum temperature were observed (see Appendix J – Climate, Figure 2).

Several weather stations are in the vicinity of Bitter Creek NWR. The Pattiway station (-119.3833, 34.9333, WGS 1972), located within an in-holding on the refuge, at an elevation of 3,865 feet above msl, was active from 1915 to 1987; 4 additional stations are on adjacent privately owned land. Data from the weather stations indicate widely variable annual precipitation dating to 1912, with alternating peaks and lows of precipitation at approximately 5 to 8-year intervals. Trends suggest a slightly warming and wetter climate over the period of record. Due to the elevation variation of nearly 3,000 feet on the refuge, it is common for snow to occur on higher elevations while some lower elevations receive little or no precipitation from the same event. Rainfall in the western part of the refuge can be substantially less than that received in the eastern Bitter Creek Canyon (Pers. comm. Heitmeyer, M. 2011).

Annual precipitation near the refuge is 9.82 inches per year based on average climate conditions from 1971 to 2000, with the lowest precipitation occurring in July (average of 0.01 inches) and the greatest precipitation occurring in March (2.17 inches) (PRISM 2011). Approximately 80% of precipitation generally occurs from November through March. Increasing trends in March, August, and October precipitation from 1895 to 2011 were observed, especially since 1970.

Climate Change

Bitter Creek NWR is located at the edges of the San Joaquin Valley and Southwestern California Ecoregions (PRBO 2011). Because the refuge is located between ecoregions, climate change forecasts are likely uncertain for this area, in addition to the uncertainty in the projections themselves for a given ecoregion. Therefore, this information is provided to present a range of possible climate change conditions for the refuge. Specific downscaled information at the refuge level was unavailable at the time of this data inventory.

There is substantial uncertainty about the projected effects of climate change on precipitation patterns in southwestern California and San Joaquin Valley. In the Southwestern California Ecoregion, some projections suggest almost no change; others project decreases up to 37%. Southwestern California Ecoregion projections are provided in the Climate Change section for Hopper Mountain NWR. In the San Joaquin Valley, there is some evidence for a slightly drier future climate relative to current conditions.

No published information on the projected effects of climate change on streamflow in southwestern California, or in the San Joaquin Valley near the location of Bitter Creek NWR, is available at this time.

For the San Joaquin Valley Ecoregion, there is general consensus that climate change will result in more and larger fires in central and western California, especially large fires (greater than 494 acres).

Vegetation change. For the San Joaquin Valley Ecoregion the amount of area covered by grasslands is projected to decrease by 6%–11% by 2070.

Threats to wildlife. In the San Joaquin Valley, the predominant effects of climate change on wildlife populations will likely result from changes in water availability. Water availability will be directly affected by climate change and indirectly by management decisions designed to capture and store water for human consumption. High temperature events will become more common

and may result in thermal stress for species with narrow temperature tolerance levels at one or more life stages. PRBO's projected effects of climate change (2011) predicts that because much of the San Joaquin Valley is used for agriculture, the effects of climate change on vegetation communities will probably be of limited importance for most birds. However, as noted previously, Bitter Creek NWR is at the edge of the San Joaquin Valley Ecoregion in the Transverse Ranges.

3.2.3 Historic Role of Fire

Little is known about the structure and composition of native perennial grasslands prior to introduction of non-native annual grasses, and the size and pattern of historical grassland burns (Reiner 2007). It is generally assumed that perennial grasslands were actually a mix of grasses, forbs and some shrubs. Lightning strikes and Native Americans were the primary ignition sources (Blackburn and Anderson 1993). Nearly all Native American groups in California are known to have used fire to improve hunting areas, increase the abundance and quality of plants used for food, medicine, fiber, and basketry, and to improve defense against other tribes (Biswell et al. 1952, Anderson 2005). Native American fires were very frequent in grasslands and oak savannas (Anderson 2007), as many as one every 1-5 years (Greenlee and Langenheim 1990). Fires that burn through a mixture of perennial grasses, forbs, and occasional shrubs are generally cool (low intensity and severity), patchy, and have relatively slow spread rates.

Dramatic changes in California's perennial grasslands have occurred in the last 100 years due to invasion by non-native annual grasses, elimination of Native American ignitions, fire suppression, and intensive grazing. The latter three factors have greatly decreased fire frequency in some areas (Reiner 2007, Greenlee and Langenheim 1990). In the absence of fire, or with decreased fire frequency, grasslands are often invaded by shrubs and trees. Invasion of non-native species has resulted in widespread conversion of native perennial grasslands to non-native annual grasslands. Fires in grasslands dominated by non-native annuals are typically higher intensity and severity, less patchy, and can occur much earlier in the growing season (Reiner 2007). These conditions select against native perennial grasses and favor increased dominance by non-native annuals (Marty et al. 2005). Near urban areas, fire frequency has generally increased in annual grasslands due to accidental ignitions. Increased fire frequency and severity in shrublands often results in conversion to annual grasslands, which further promotes frequent fires (Keeley 2001). At Bitter Creek, fire suppression and fuelbreaks have limited the frequency and size of wildfires in annual grasslands. Very few fires have occurred since Bitter Creek NWR was established, and all have been held to less than 100 acres.

Because Bitter Creek NWR's central and south coastal California seral scrub cover types are generally interspersed with annual and native perennial grasslands, the fire regime is very similar to that of the grasslands. However, fire intensity is expected to be slightly higher due to the increased presence of woody fuels. Associated shrub species have a wide range of response to fires. Rubber rabbitbrush (*Chrysothamnus nauseosus* [*Ericameria nauseosa*]) is a fire-adapted species that readily resprouts after low to moderate intensity fires (Tirmenstein 1999), while California buckwheat (*Eriogonum fasciculatum*) typically regenerates from buried seed only after low severity and low frequency fires (Sawyer et al. 2009). If fires occur too frequently in seral scrub cover types, conversion to non-native annual grasslands is possible.

California juniper woodlands of the central coast ranges and southern California mountains and valleys likely experienced low-severity surface fires every 50-100 years (Sawyer et al. 2009, Van de Water and Safford 2011). Spatially, fires were medium to large in size and highly complex. Stands were typically small and mixed with sage scrub, chaparral, or other shrub or grassland types. The largest stands occurred in dry, rocky areas where lack of surface fuels protected them from fire. Stand-replacing fires were likely rare (Sawyer et al. 2009). Fire suppression efforts in the last 100 years have likely resulted in the expansion of California juniper's range into areas previously dominated by grassland vegetation (Cope 1992). However, many of these California juniper woodlands are now at increased risk due to fine fuel buildup from non-native annual grasses (Sawyer et al. 2009).

California juniper is very sensitive to fire; it is easily killed by moderate- to high-intensity fire and does not resprout (Cope 1992). Fires today would burn with higher intensity and severity, and large, stand-replacing crown fires are possible. Recovery after such a fire event could take as long as 125 years (Sawyer et al. 2009). Historic fire regime information for Alvord oak woodlands is lacking. However, the similarity of Alvord and Tucker oaks to other scrub oak species in southern California has allowed ecologists to make some generalizations. Depending on scrub cover, which can range from intermittent to continuous, and other factors such as fuel moisture, historic fires were surface or active-independent crown fires, medium to large in size, low or high intensity, and low or very high severity, with a return interval of 30-100+ years (Sawyer et al. 2009). Both Alvord oak and Tucker oak resprout after fires, but can be inhibited by frequent fires. Prior to the introduction of non-native annual grasses, the herbaceous layer under and between trees was likely sparse to intermittent (Sawyer et al. 2009). In high rainfall years, increased production of non-native annual grasses can allow fires to climb into the shrub canopy. This cover type is at risk from increased fire frequency and severity, which is likely to result in stand reduction through type conversion (Sawyer et al. 2009).

Mixed scrub oak/single leaf pinyon woodlands are found on the steep slopes of the Bitter Creek Canyon Headwall. This cover type is similar to Alvord oak woodlands with the addition of pinyon pine. The presence of pinyon pine likely increases overall flammability, and the steep slopes almost certainly increase fire size and severity. A fire starting at the bottom of the Headwall would likely make sustained long runs as a crown fire, but also create a mosaic of low and high severity patches. In exceptionally dry years, or years in which the production of non-native annual grasses is high, the proportion of high severity to low severity areas can be expected to significantly increase. Complete stand replacement is a possibility.

Fire has not been an important disturbance agent in the Bitter Creek NWR's mixed saltbush scrub cover types (Quailbush scrub and Allscale scrub alliances). *Atriplex lentiformis*, the principal species of Quailbush scrub alliance, can survive some fires, but has the best chance to persist when fires are infrequent and low-severity (Sawyer et al. 2009). This species also has a high moisture content, which reduces its flammability (Meyer 2005). The natural fire regime in Quailbush scrub is characterized by crown fires of medium to large size, moderate to high intensity, and high to very high severity, and the fire return interval is long (35-100 years; Sawyer et al. 2009). *Atriplex polycarpa*, the principal species of Allscale scrub, is more sensitive to fire than is *A. lentiformis*. However, fires in Allscale scrub are typically surface or crown fires of small size, low intensity, and moderate severity (Sawyer et al. 2009). Both saltbush species are prolific seeders and can quickly colonize burned areas (Meyer 2005, Sawyer et al. 2009). The presence of non-native annual grasses in mixed saltbush scrub can lead to increased fire size, frequency, and severity in mixed saltbush scrub (Meyer 2005, Brooks and Minnich 2006).

3.2.4 Air Quality

Bitter Creek NWR is in California's San Joaquin Valley Air Basin (Valley). Air quality in the Valley is among the worst in the United States. The San Joaquin Valley Unified Air Pollution Control District is the agency responsible for ensuring compliance with federal and state air quality standards in the Valley. The federal and state governments have each established ambient air quality standards for several pollutants. Most standards have been set to protect public health. However, standards for some pollutants are based on other values, such as protecting crops and materials and avoiding nuisance conditions. Currently, the Valley is federally classified as a nonattainment area for both ground-level ozone and PM10. In addition, the Valley is classified as a severe nonattainment area for the California ozone standard and nonattainment for the PM10 standard. The Valley is in attainment or has not been classified for all other criteria pollutants.

Background information about ozone, NOx, carbon monoxide (CO), and particulate pollutants (including PM10) is presented in the Air Quality section for Hopper Mountain NWR.

On-road motor vehicles are the largest contributors to NOx emissions in the Valley. The majority of the CO emitted in the Valley comes

from motor vehicles. The primary sources of PM10 in the Valley are fugitive dust from paved and unpaved roads and agricultural operations. Towns within the Valley located in proximity to the refuge are Maricopa, Taft, Cuyama, New Cuyama, Ventucopa, and Pine Mountain Club; they are considered sensitive areas.

3.2.5 Water

Bitter Creek NWR has an intricate and expansive water system of 22 water tanks and nearly 10.5 miles of pipes. Almost all of the springs on the refuge have been diverted or otherwise tapped to provide water for troughs and tanks throughout the refuge (Pers. comm. Heitmeyer, M. 2011). Springs provide much of the water to riparian habitats on Bitter Creek NWR. In general, 2 types of springs occur: 1) springs whose origins are derived from the precipitation within the watershed, and 2) springs whose origins are derived from deep within the earth and make their way to the surface, which may be associated with the fault line. The refuge includes most of the Cienaga (Klipstein) Canyon and Bitter Creek watersheds and a portion of the Santiago Creek watershed. All of these streams flow northward intermittently but only during the wet season. They carry only small amounts of flow. A shallow depression, approximately half-acre in size, on the western portion of the refuge, often contains standing water.

The Service regularly has the domestic water supply for the bunkhouse and condor facility tested by an independent laboratory for contaminants. In 2011, independent test results for inorganic chemicals in the water supply for the bunkhouse were below quantifiable levels for arsenic, lead, and mercury; and 26 micrograms/liter (0.026 mg/L) for copper and 290 micrograms/L (0.29 mg/L) for zinc. The levels of arsenic, lead, mercury, copper, and zinc are below the federal EPA's maximum contaminant levels for drinking water. Safe drinking water standards are discussed under the section on water for Hopper Mountain NWR. No water quality sampling has been conducted at other water sources, such as the springs. At this time, the Service does not consider the water supply at the bunkhouse to be potable and bottled drinking water for staff is provided.

▼ Bitter Creek NWR Biological Environment

3.2.6 Vegetation

Plant surveys were conducted throughout Bitter Creek NWR between March 2009 and October 2010 (De Vries 2009; De Vries 2010). Descriptions and general locations of vegetation types were included in field notes compiled during the 2009 surveys. Nomenclature for vegetation types generally follows that of *A Manual of California Vegetation*, Second Edition (Sawyer et al. 2008) with classifications provided at both the group/macrogroup and alliance levels. In some cases, vegetation types did not fit well into the currently defined alliances, and other sources were used, such as vegetation types described in A Flora of Kern County (Moe and Twisselmann 1995) or The Vegetation Classification and Mapping Program: List of California Terrestrial Natural Communities recognized by the CNDDB (CDFG 2003). A list of all plant species observed during the surveys conducted in 2009 and 2010 is provided in Appendix E. The Service's Pacific Southwest Region compiled the following information about the plant communities and percentage of various vegetation cover types on the refuge based on interpretation of aerial photography and field sampling. Acreages and percentages of cover type are approximate and based on the currently defined refuge boundaries.

California Naturalized Annual and Perennial Grassland

California naturalized annual and perennial grassland is the most abundant vegetation type on the refuge, covering approximately 9,800 acres or about 67% of the refuge. It is dominated by a variety of annual grass species, mainly of Mediterranean origin. Typical grass species found in this vegetation type include red brome (*Bromus madritensis* subsp. *rubens* [*B. rubens*]), soft chess (*Bromus hordaceus* [*B. mollis*]), ripgut brome (*Bromus diandrus* [*B. rigidus*]), wild oats (*Avena fatua* and *Avena barbata*), cheat grass (*Bromus tectorum*), and smooth barley (*Hordeum murinum* subsp. *glaucum* [*H. glaucum, H. stebbinsii*]), among others. Common forbs and perennials found in this vegetation type include red-stemmed filaree (*Erodium cicutarium*), miniature lupine (*Lupinus bicolor*), wild parsnip (*Lomatium utriculatum*), devil's lettuce (*Amsinckia tessellata*

Kern mallow. Photo: Mark W. Skinner, USDA-NRCS PLANTS Database

var. *gloriosa*), California mustard (*Caulanthus lasiophyllus* [*Guillenia lasiophylla*]), California poppy (*Eschscholzia californica*), cream cups (*Platystemmon californicus*), and common sand aster (*Coreothrogyne filaginifolia* [*Lessingia filaginifolia*]) (De Vries 2009). Scattered native perennial grasses such as one-sided blue grass (*Poa secunda* var. *secunda*) and nodding needlegrass (*Nassella cernua*) occur in many areas of the California annual grasslands at low densities. Individuals of shrub species, such as rubber rabbitbrush (*Ericameria nauseosa* var. *mohavensis* [*Chrysothamnus nauseosus* susp. *mohavensis*]) and interior goldenbush (*Ericameria linearifolia*), are also common within the California annual grassland vegetation type (De Vries 2009). The composition of the California naturalized annual and perennial grassland vegetation type matches CNDDBs' descriptions of Non-native Grassland, California Annual Herb-land and Wildflower Field vegetation types. The Wildflower Field vegetation type is considered to be of high priority for inventory by the California Department of Fish and Game (CDFG 2003).

The floristic variation in the region was sampled as a part of the California Native Plant Society's Carrizo Plain National Monument Vegetation Classification and Mapping Project (Buck-Diaz et al. 2011).

California Perennial Grassland

Native perennial grasslands, defined here as grasslands with an estimated 50% or greater cover of native perennial grass species, occur in patches within and adjacent to the California annual grassland vegetation type. Native perennial grasslands on the refuge that were large enough to be mapped are dominated by either California brome (*Bromus carinatus* var. *carinatus*) or creeping ryegrass (*Leymus triticoides*). Both of these grassland types are found where soil moisture remains high even in the dry summer months. The largest of these patches occurs adjacent to the Headwall Oaks unit. These scattered areas are typically associated with natural seeps and outflow areas (De Vries 2009). Native perennial grasslands are generally considered to be of high priority for inventory by the California Department of Fish and Game (CDFG 2003).

Central and South Coastal Seral Scrub

Central and south coastal seral scrub covers approximately 1,477 acres or about 10% of the refuge. This cover type is a group-level classification that includes several shrub alliances. These include goldenbush (*Ericameria linearifolia*) scrub, bush lupine (*Lupinus excurbitus*) scrub, California buckwheat (*Eriogonum fasciculatum*) scrub, and rubber rabbitbrush (*Ericameria nauseosa* var. *mohavensis* [*Chrysothamnus nauseosus* subsp. *mohavensis*]) scrub. These shrub types often inter-mix with the California naturalized annual and perennial grassland and include a diverse array of annual and perennial forbs, including phacelias (*Phacelia* spp.), Mexicali onion (*Allium peninsulare* var. *peninsulare*), California matchweed (*Gutierrezia californica*), suncups (*Camissonia* sp.), popcorn flowers (*Cryptantha* spp.), and owl's clover (*Castilleja exserta* subsp. *exserta*).

California Juniper Woodland

California juniper woodland, or the *Juniperus californica* alliance, is the third most common landcover type on the refuge, covering approximately 1,252 acres or nearly 9% of the

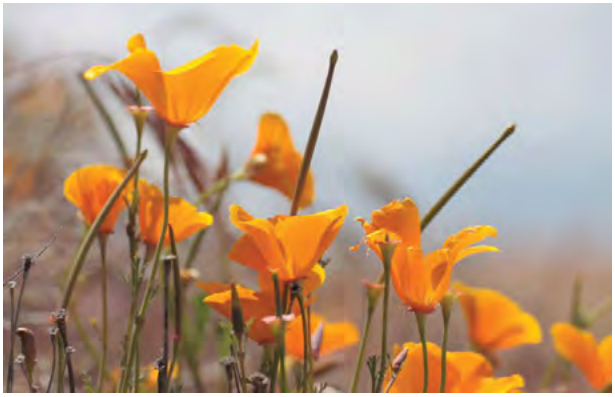
refuge. It is characterized by dense to widely spaced California juniper. Openings between stands of juniper are dominated by annual grassland or by various shrub associations including areas dominated by interior goldenbush, California buckwheat, rubber rabbitbrush, California matchweed, or blue witch (*Solanum umbelliferrum*). Native perennial grasses, including desert needlegrass (*Achnatherum speciosum*) and one-sided blue grass, are also present. California juniper woodland is the most predominant vegetation type in Unit 11 (De Vries 2009).

Mixed Saltbush Scrub (*Atriplex polycarpa* and *A. lentiformis* Alliances)
Mixed saltbush scrub covers approximately 948 acres or less than 7% of the refuge and is comprised of both the *Atriplex polycarpa* (Allscale scrub) and *Atriplex lentiformis* (Quailbush scrub) alliances. These shrub-dominated vegetation types are found in the eastern portion of the refuge around the Bitter Creek drainage. *Atriplex polycarpa* is found in the drier portions of the drainage, on canyon walls and at the top of the canyon, whereas *Atriplex lentiformis* is found in wetter areas generally closer to the creek bottom.

Mixed Scrub Oak Woodland
Mixed scrub oak woodland is dominated by Alvord oak (*Quercus x alvordiana*) and/or Tucker oak (*Quercus john-tuckeri*). This vegetation type occurs on approximately 469 acres or about 3% of the refuge. Alvord oak is a semi-deciduous small tree or large shrub that is a fertile hybrid between Tucker oak and blue oak (*Quercus douglasii*), a large deciduous tree species. Together, these 2 species make up the *Quercus john-tuckeri* alliance, as described in A Manual of California Vegetation (Sawyer et al. 2008), which includes both the Tucker oak chaparral and Alvord oak woodland communities. Other species commonly found in the mixed scrub oak series include oak gooseberry (*Ribes quercetorum*), miner's lettuce (*Claytonia* spp.), fiesta flower (*Pholistoma membranaceum*), and Brewer's butterweed (*Senecio breweri*). California juniper (*Juniperus californica*) is also frequently present in this vegetation type. Mixed scrub oak vegetation, dominated primarily by Tucker oak, occurs in Klipstein Canyon in Units 10A and 10B; a scrub oak series dominated primarily by Alvord oak occurs in the Timbers area on steep, north-facing slopes in Units 2 and 3. In some areas, the larger stature of the dominant oaks forms a vegetation type that is more woodland than scrub in character (De Vries 2009).

Mixed Scrub Oak/Single Leaf Pinyon Pine Woodland
This vegetation type is similar to the mixed scrub oak woodland, but differs in the presence of single leaf pinyon pine (*Pinus monophylla*). Mixed scrub oak/single leaf pinyon pine covers approximately 217 acres or less than 2% of the refuge. This vegetation type forms a dense, extensive woodland on steep slopes at the head of Bitter Creek Canyon in Unit 3. In addition to the associated species described in the mixed oak series, other species found in this scrub/woodland vegetation type are green ephedra (*Ephedra viridis*), golden yarrow (*Eriophyllum confertiflorum* var. *confertiflorum*), big sagebrush (*Artemisia tridentata*), and California man-root (*Marah fabaceus*). A wide variety of spring annuals, including wind poppies (*Papaver heterophyllum* [*Stylomecon heterophylla*]), common phacelia (*Phacelia distans*), and small-flowered leptosiphon (*Leptosiphon parviflorus* [*Linanthus parviflorus*]), are also present. Non-native annual grasses (*Bromus* spp.) generally dominate open spaces between larger trees and shrubs (De Vries 2009). The vegetation type described here does not currently match any alliance-level description in *A Manual of California Vegetation*.

The mixed scrub oak/single leaf pinyon pine vegetation is a particularly important roosting habitat for condors because of its undisturbed location opposite historic feeding areas across the



California poppies. Photo: USFWS

canyon. Condors historically have roosted in some of the larger pinyon pines in this area. This habitat also represents the core area for the small, resident mule deer population.

Riparian Woodland and Scrub
Riparian woodland and scrub covers approximately 12 acres of the refuge. Due to nearly a century of land-use practices designed for the management of cattle grazing, the riparian areas on the refuge are degraded, and the cottonwood community is not well developed. Natural springs have been diverted through underground pipes across the refuge, and the largest natural spring, Spanish Spring, has had much of its flow diverted across Bitter Creek Canyon to the far eastern side of the refuge. Therefore, only small riparian areas exist currently. These are mostly dominated by red willow (*Salix laevigata*), with other wetland or riparian species also present, including hoary nettle (*Urtica dioica* subsp. *holosericea*), mule fat (*Baccharis salicifolia*), and cattail.

In the regional context, riparian ecosystems make up less than 1% of the total land area of California (Smith 1977) and have been identified as the most critical habitat for the conservation of many wildlife species (Manley and Davidson 1993). It is estimated that over 90% of California riparian forests have been lost in the past century (Katibah 1984), resulting in the decline or local extirpation of many bird species and other riparian dependent wildlife (Martin and Chambers 2001).

Other Vegetation Types
Several other vegetation types are found on the refuge. Small areas dominated by remnant ornamental (*Ailanthus* sp. or tree of heaven) or orchard trees (totaling approximately 5 acres) grow near some prior homestead sites. Marsh vegetation can also be found around man-made ponds and tanks and also in a natural setting in a wet depression northwest of the refuge office and bunk house. These are mostly dominated by species of rushes (*Juncus* spp.). A pure stand of western chokecherry (*Prunus virginiana* var. *demissa*) is found at the far eastern edge of the refuge, north of Cerro Noroeste Road. This stand covers 4 acres and is most likely a clone, as this species is able to reproduce through suckers.

In addition to vegetation cover, there are several landcover classes related to development or disturbance. These include paved or graded roads, fire breaks—which generally parallel the roads and fences—buildings, and other structures and areas that are essentially devoid of vegetation.

3.2.7 Wildlife

Mammals of the general Bitter Creek area include tule elk (*Cervus* elaphus *nannodes*), mule deer, pronghorn (also known as American antelope; *Antilocapra americana*), American badger (*Taxidea taxus*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), western spotted skunk (*Spilogale putorius*), coyote, bobcat, and mountain lion. Other mammals include black-tailed jackrabbit (*Lepus californicus*), desert cottontail (*Sylvilagus audubonii*), long-tailed weasel (*Mustela frenata*), gray fox (*Urocyon cinereoargenteus*), and several species of bats. Several rodent species have been observed, including Heermann's kangaroo rat (*Dipodomys heermanni*), Botta's pocket gopher (*Thomomys bottae*), pinyon mouse (*Peromyscus truei*), and California mouse (*Peromyscus californicus*).Tule elk originally dispersed from the privately owned Wind Wolves Preserve to the east of the refuge. The elk were part of two herds reintroduced at the Wind Wolves Preserve in 1998 and 2005 (Pers. comm. Stockton, M. 2011).

For federally-listed species, see Special Status Wildlife in the next section. A list of wildlife species found on Bitter Creek NWR is included in Appendix E.

Some of the more common resident birds of the area include California quail, common raven (*Corvus corax*), horned lark (*Eremophila alpestris*), lark sparrow (*Chondestes grammacus*), and western meadowlark (*Sturnella neglecta*). The American pipit (*Anthus rubescens*), and white-crowned sparrow (*Zonotrichia leucophrys*) are winter visitors. The area also supports many Neotropical migratory songbirds, including the olive-sided flycatcher (*Contopus borealis*), western tanager (*Piranga ludoviciana*), and Bullock's oriole (*Icterus bullockii*). Aside from the California condor, common raptors include the great horned owl (*Bubo virginianus*), barn owl (*Tyto alba*), golden eagle (*Aquila chrysaetos*), red-tailed hawk

American badger. Photo: USFWS

(*Buteo jamaicensis*), northern harrier (*Circus cyaneus*), American kestrel (*Falco sparverius*), prairie falcon (*Falco mexicanus*), and Cooper's hawk (*Accipiter cooperii*). A list of bird species found on the refuge is included in Appendix E.

Two species of amphibian have been documented on Bitter Creek NWR, including Baja California treefrog (*Pseudacris hypochondriaca*) and southern California toad (*Anaxyrus boreas halophilus*). At least 12 species of reptiles have been found on the refuge, including tiger whiptail (*Aspidoscelis tigris*), Pacific gopher snake (*Pituophis catenifer catenifer*), California mountain kingsnake (*Lampropeltis zonata*), Blainville's night snake (*Hypsiglena ochrorhyncha*), and western rattlesnake (*Crotalus oreganus*). For more information about federally-listed species, see Special Status Wildlife in the next section.

3.2.8 Special Status Species

The Bitter Creek NWR was established to conserve fish, wildlife, or plants which are listed as endangered species or threatened species and to protect habitat for the endangered California condor. Strategically located in the historic range of the California condor in the Transverse Ranges, the refuge helps to buffer foraging and roosting areas from human disturbance. The refuge protects a portion of the foraging habitat within a much larger area on which California condors are known to forage and feed. Besides the condor, populations of other endangered and threatened species and species of special concern known to occur in the area have been adversely affected by habitat loss and conversion and invasion of exotic species (Germano et al. 2001). For a list of threatened and endangered species and species of special concern found or potentially present on the refuge, refer to Appendix E. For Endangered Species Act compliance, refer to Appendix F.

Special Status Plants

This section includes special status plants that are: a) plants that are federally listed or proposed for listing as threatened or endangered, and species that are "candidates" for listing by the Service under the provisions of the Endangered Species Act; b) species listed by the state as threatened or endangered; and c) species that have been observed on Bitter Creek NWR and are ranked 1B in the California Native Plant Society's (CNPS) California Rare Plant Rank *(http://www.cnps.org/cnps/rareplants)*.

Rare or threatened plant communities are discussed in section 3.2.6 Vegetation, in this chapter.

According to the Service's Sacramento Fish and Wildlife Office, there are 3 federally-protected plants that have the potential to occur in the Bitter Creek area: the federally-listed as endangered California jewelflower (*Caulanthus californicus*), Kern mallow (*Eremalche parryi* subsp. *kernensis*), and San Joaquin woollythreads (*Monolopia congdonii*). Eight special status plant species, including one of the federally-listed as endangered plants (Kern mallow), have been observed on Bitter Creek NWR. Appendix E includes an expanded special status species list with additional plants that have been reported on the refuge and other plants that may occur on the refuge, based on a review of the California Natural Diversity Database (CDFG 2010a) and California Native Plant Society's (CNPS) 2009 Electronic Inventory for the Cuyama, Ballinger Canyon, Santiago Creek, Apache Canyon, Elkhorn Hills, Pentland, Cuyama Peak, Eagle Rest Peak, Maricopa, Sawmill Mountain, and Fox Mountain, California U.S. Geological Survey (USGS) 7.5-minute quadrangles. Plant surveys were conducted in various areas throughout Bitter Creek NWR between March 2009 and October 2010, including focused surveys for 2 federally-listed as endangered species, California jewelflower and San Joaquin woollythreads (De Vries 2009; De Vries 2010). In 2010, the Service compiled information about plant species on the refuge based

on field sampling for the CCP vegetation mapping (see Figure 3-10. Bitter Creek NWR, Vegetation/ Landcover and Appendix E).

Federally-listed plants and special status plants observed on the refuge are discussed in this section. Much of the information in this section on special status plants is from the Reconnaissance and Focused Plant Surveys on the Bitter Creek National Wildlife Refuge (De Vries 2009) (De Vries 2010) as cited. Special status plants that have been documented, previously observed, or with potential to occur on the refuge are summarized in Appendix E. CNPS's California Rare Plant Rank categorizes the degree of concern for the species and is included in the special status plant descriptions in this section. Descriptions of the ranking categories (e.g., 1B.1, 1B2) are available online at: *http://www.cnps.org/cnps/rareplants/ranking.php.*

Typical Horn's milkvetch
Typical Horn's milkvetch (*Astragalus hornii* var. *hornii*) is ranked by CNPS as a California Rare Plant Rank 1B.1 (considered to be seriously endangered in California). This plant was subject to eradication efforts in the early 1900's because it was poisonous to sheep. Habitat for this annual herb is lake margins, alkaline soils, meadows, seeps, and playas (CNPS 2012). Typical Horn's milkvetch was reported on Bitter Creek NWR in 1983 (Lawrence 1983) and in 1997 (Werner 1997), but this species was not observed during the 2009 or 2010 surveys (De Vries 2010).

California jewelflower
California jewelflower (*Caulanthus californicus*) is a federal and state listed endangered species and is ranked by CNPS as a California Rare Plant Rank 1B.1. This annual species grows on dry plains and slopes in grassland, saltbush scrub, and cismontane juniper woodland vegetation types at elevations below 3,280 feet msl (CNPS 2012). California jewelflower historically occurred in Fresno, Kern, Santa Barbara, San Luis Obispo, Tulare, Ventura, and King counties. It is currently known from 3 natural occurring populations and 1 introduced colony (USFWS 1998). The extant populations occur in Santa Barbara Canyon, the Carrizo Plain in San Luis Obispo County, and the Kreyenhagen Hills in Fresno County (USFWS 1998). The introduced colony is in Paine Preserve in Kern County. California jewelflower was not observed during focused surveys of Units 9, 10B, and 12 in 2009 or 2010 (De Vries 2010). Marginally suitable habitat is present within the refuge in grassland vegetation types at lower elevations in Bitter Creek Canyon in Unit 2; this area was not included in the focused surveys in 2009 as the canyons could not be accessed during the time that this species was known to be in flower and only a small portion of this area could be accessed during 2010 surveys. California jewelflower has limited potential to occur within the refuge in these lower canyon areas (De Vries 2010).

Lemmon's jewelflower
Lemmon's jewelflower (*Caulanthus coulteri* var. *lemmonii*) is ranked by CNPS as a California Rare Plant Rank 1B.2 (fairly endangered in California). This annual herb occurs in pinyon and juniper woodland and grassland vegetation types at elevations between 260 to 4,000 feet above msl. It has been reported over a large range from San Joaquin County to Ventura County. In the vicinity of the refuge, it has been reported from the hills northeast of the campground in Ballinger Canyon

California jewelflower. Photo: B. Moose Peterson

(CCH 2010). A large population of Lemmon's jewelflower was documented on the refuge in the west portion of Unit 10B during the 2010 surveys. A smaller population of this species was documented at the base of a short canyon in Unit 3 (De Vries 2010). Habitat for Lemmon's jewelflower is present on the refuge in several vegetation types; therefore, Lemmon's jewelflower has potential to occur elsewhere on the refuge (De Vries 2009). CNPS (2012) lists development and grazing as threats to this species.

Kern mallow

Kern mallow (*Eremalche parryi* subsp. *kernensis* =*Eremalche kernensis*) is a federally-listed endangered and is ranked by CNPS as a California Rare Plant Rank 1B.1. It is a small, annual flowering between March and May. Based on the most recent taxonomic treatment, submitted for the 2nd Edition of the Jepson Manual (Andreasen 2011, in press), Kern mallow occurs on eroded hillsides and on alkali flats with shadscale (*Atriplex confertiflora*) at elevations ranging from approximately 300 to 3,300 feet above msl. Regardless of the circumscription used, Kern mallow has historically been known only from the San Joaquin Valley and surrounding hills, including the Carrizo Plain. A plant that matched the current circumscription for Kern mallow was found in 2009 on the refuge in grassland vegetation in Unit 2. In 2009, a second collection of Kern mallow was found on a talus slope in Unit 11 at over 4,000 feet elevation. Subsequent surveys conducted during 2010 resulted in the documentation of extensive populations of this species throughout Unit 11 (De Vries 2010). Habitat for this species is present within all units of the refuge; therefore Kern mallow has the potential to occur elsewhere on the refuge. Both Jepson Manual treatments (Andreasen 2010; Bates 1992) and CNPS (2012) list agriculture, grazing, and energy development as threats. Taylor and Davilla (1986) also included trampling as a threat. USFWS (2010a) lists loss of habitat due to conversion to agriculture and other types of development, and competition from non-native plants as potential threats to the species.

Southern mountain buckwheat

Southern mountain buckwheat (*Eriogonum kennedyi* var. *austromontanum*) is federally-listed as threatened and ranked by CNPS as a California Rare Plant Rank 1B.2. Habitat for this perennial herb is lower montane coniferous forest (gravelly soil) and pebble plain, above 5,800 feet msl. The elevation range at Bitter Creek NWR is approximately 1,600 to 4,700 feet msl; below the range at which southern mountain buckwheat is known to occur; therefore, it is not likely to occur within the refuge.

Temblor buckwheat

Temblor buckwheat (*Eriogonum temblorense*) is ranked by CNPS as a California Rare Plant Rank 1B.2. Habitat for this annual herb is valley and foothill grassland (clay or sandstone) (CNPS 2012). Temblor buckwheat was reported on Bitter Creek NWR in 1983 (Lawrence 1983) and in 1997 (Werner 1997, Clendenen and Thomas undated), but it was not observed during the 2009 or 2010 surveys. Suitable habitat for this species is present in many areas of Bitter Creek NWR and it is considered to have potential to occur (De Vries 2010).

Tehachapi monardella

Tehachapi monardella (*Monardella linoides* subsp. *oblonga*) is ranked by CNPS as a California Rare Plant Rank 1B.3 (considered to be not very endangered in California). Habitat for this perennial rhizomatous herb is lower montane coniferous forest, pinyon and juniper woodland, upper montane coniferous forest (CNPS 2012). Tehachapi monardella was reported on Bitter Creek NWR in 1983 (Lawrence 1983) and in 1997 (Werner 1997); but it was not observed during the 2009 and 2010 surveys. Suitable habitat for this species is present within the refuge, and it is considered to have potential to occur (De Vries 2010).

San Joaquin woollythreads

San Joaquin woollythreads (*Monolopia congdonii*) is federally-listed as endangered and is ranked by CNPS as a California Rare Plant Rank 1B.2. Habitat for this annual herb is chenopod scrub, and valley and foothill grassland (CNPS 2012). San Joaquin woollythreads has been documented in the vicinity of Bitter Creek NWR. San Joaquin woollythreads was not observed during focused surveys of lower elevations of the western portion of the refuge (Units 9, 10B, and 12) in 2009 or 2010. Marginally suitable habitat is present within the refuge in grassland vegetation types at lower elevations in Bitter Creek Canyon in Unit 2; this

area was not included in the focused surveys in 2009. San Joaquin woollythreads has limited potential to occur within the refuge in these areas (De Vries 2010).

Special Status Wildlife
According to the Service's Sacramento Fish and Wildlife Office, the federally-listed as endangered or threatened wildlife species that may occur in the Bitter Creek area are: the federally-listed as endangered California condor, giant kangaroo rat (*Dipodomys ingens*), blunt-nosed leopard lizard (*Gambelia sila*), Buena Vista Lake shrew (*Sorex ornatus relictus*), and San Joaquin kit fox (*Vulpes macrotis mutica*); and the federally-listed as threatened vernal pool fairy shrimp (*Branchinecta lynchi*), valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), California red-legged frog (*Rana draytonii*; formerly *Rana aurora draytonii*), and Kern primrose sphinx moth (*Euproserpinus euterpe*).

Two of the federally-listed wildlife species are known to occur on Bitter Creek NWR: California condor and San Joaquin kit fox. Habitat for the endangered blunt-nosed leopard lizard and giant kangaroo rat, and threatened Kern primrose sphinx moth exists on the refuge. Surveys would be needed to determine if these species are present on the refuge.

Other federally-listed species for which there may be habitat, but the species have not been documented at the refuge are: the federally-listed as threatened valley elderberry longhorn beetle and vernal pool fairy shrimp. Based on their range and lack of habitat, the endangered Buena Vista Lake shrew and the threatened California red-legged frog are not expected to occur on the refuge.

The tricolored blackbird (*Agelaius tricolor*), golden eagle (*Aquila chrysaetos*), western burrowing owl (*Athene cunicularia hypugaea*), and Swainson's hawk (*Buteo swainsoni*) occur on Bitter Creek NWR. The following provides information about these special status wildlife that occur on the refuge. Appendix E includes a list of special status species known to occur at Bitter Creek NWR.

California condor
Bitter Creek NWR protects roosting and foraging habitat for the endangered California condor. The California condor is present on the refuge. The Bitter Creek NWR is located centrally in what was known as the Hudson-San Emigdio Foraging Zone for the historic (pre-1987) condor population. Specifically, the refuge was once the Hudson Ranch, where condors were known to forage on the cows and calves that died during calving on the ranch. Bitter Creek NWR was actively used by the historic condor population and was an important location during the supplemental feeding research and tagging efforts of the 1980s. Many of the last remaining wild condors were also trapped on the refuge. This trapping culminated in the spring of 1987 when the last wild condor was captured at a location on the refuge (Snyder and Schmitt 2002).

The Bitter Creek NWR was established as a California condor release site in 2006. Since the time of reintroduction, little condor activity occurred on the refuge as a result of bird relocations in 1996. However, on-refuge condor activity significantly increased once releases started on the refuge in the fall of 2006. Earlier that year, a number of young captive hatched condors were transferred to a flight pen located on the refuge, where they were held as a means to acclimate prior to their release into the wild. Concurrent with their time in the flight pen prior to their release, a supplemental feeding program was also reinitiated on the refuge. The combination of this supplemental food supply, the presence of an occupied flight pen, and relocating a number of

Condor flight pen, Bitter Creek NWR. Photo: USFWS

free flying individuals to Bitter Creek successfully encouraged the southern sub-population to expand their range to include the refuge. Once established as a release site, condor biologists have conducted annual releases of captive hatched birds on the refuge. With the preponderance of young newly released condors on Bitter Creek NWR, the supplemental feeding sites on the refuge are baited frequently as a means to assist the naive birds in lieu of not having the parental care that a newly fledged chick receives. These sites are also used by the established free flying population, which allows for a rapid integration of the released birds into the wild population.

The onset of intensive management strategies has meant condor activity on the refuge has increased annually. There are likely 3 factors that contribute to the increase of condor activities related to management activities. First, condor activity is increased by releasing young captive reared condors on the refuge. Newly released condors will remain on the refuge for 3 to 6 months, relying on the supplemental feeding that occurs there. The presence of these newly released birds means there are almost always condors on the refuge, even during periods when their presence might be considered less likely due to weather conditions. Condors are also highly social, so the presence of the young, newly released condors also increases the chance of other birds seeing them from afar and then being drawn to the refuge. Second, newly released condors are held in a flight pen for 3 to 6 months prior to their release. Condors, being highly social, are also attracted to the birds in the flight pen and will spend time loafing perched on the flight pen, interacting with the birds inside the pen. Finally, the continual supplemental feeding (due to the need to feed new releases and for trapping purposes) also attract any condors that visit the refuge.

Annual activity fluctuates seasonally over the course of the year in spite of a consistent amount of baiting throughout most of the year. Use of supplemental feeding sites on average has also declined annually from 2007–2008 (Brandt and Sandhaus 2008). The presence of food is only one factor that influences condor foraging behavior. The Service baits for trapping purposes and to assist newly released condors. This results in a steady food source always available to the entire population. In spite of that, the Service has observed an overall decrease in the use of supplemental feeding sites and an increase in non-proffered feeding events as more of the condor population has become older and more experienced (and presumably better at foraging on their own). Unlike the younger newly released condors, which rely on the supplemental feeding sites nearly year-round at Bitter Creek NWR, most of the older birds' activity at the supplemental feeding sites fluctuates, depending on the season. This is similar to what has been observed in the historic population's natural foraging patterns. Condors usually occur year-round across their range, but concentrations of activity will vary throughout the year. The change in concentrations is likely due to a combination of food availability, weather patterns, and air currents.

Supplemental feeding also acts as a tool for biologists to trap free flying condors so their tissue and blood may be monitored for lead and to fit each bird with a transmitter for tracking movements, activity, and mortalities throughout the range. The entire population is trapped twice per year: once in June following the peak season of molting tail feathers and then a second time in November, following the local big game rifle hunting seasons.

Given the recent range-wide regulation of lead ammunition in California, lead exposures and the resulting mortality is predicted to decline, and managers will be able to encourage natural foraging habits and decrease reliance on supplemental feeding (which is used to trap free flying condors to detect and treat lead exposures). As a result, foraging habitat availability will then become central to the successful recovery of the species. Steps continue to be taken to encourage the enhancement and re-establishment of a natural food source for the condors.

San Joaquin kit fox

Bitter Creek NWR includes habitat for the endangered San Joaquin kit fox. Surveys from 1982 to 1991 and an incidental sighting in March 2013 documented the San Joaquin kit fox presence at Bitter Creek NWR (see Appendix D).

The kit fox, of the Family Canidae, is the smallest canid species in North America (Ingles 1965). Prior to the 1930s, kit foxes were found throughout the

San Joaquin Valley, from southern Kern County to northern Tracy County, west through San Joaquin County and east to Stanislaus County near La Grange (Brown et al. 2005; Ralls et al. 2001). By the 1930s, their range had been reduced by half, mostly in the southern and western parts of the valley. Current distribution includes prior historic range in patchy populations.

Kit foxes inhabit dens with numerous entrances and frequently relocate, typically twice a month, especially during the summer months. They use the dens for shelter, reproduction, means to flee predators, and temperature regulation (Conover 2001; Ralls et al. 2001). Even though they are capable of digging their own dens, they are known to modify burrows from other animals, including coyote, American badger (*Taxidea taxus*), and California ground squirrel (*Otospermophilus beecheyi*) (Whitaker, Jr. 1996). Most hillsides where kit fox dens are found (95%) have a slope of less than 40 degrees (Reese et al. 1992). Natal and pupping dens are found on flatter ground with slopes of approximately 6 degrees (O'Farrell et al. 1980). The home range of a kit fox can be between approximately 1.6 and 19.3 square miles, depending on the abundance of prey (USFWS 1998).

Generally, kit foxes have a slim body, relatively large ears set close together, narrow nose, and a long, bushy tail, typically carried low and straight (Ingles 1965). They reach adulthood at one year old but typically do not breed their first year (USFWS 1998). Pairs remain together in the same home range. Mating and conception take place in late December through March, followed by a gestation period of approximately 50 days (Brown et al. 2005). Reproductive success is based largely on the availability of prey (Brown et al. 2005). Litters of 2 to 6 pups are born between February and May (Ingles 1965; Ralls and Eberhardt 1997). The females typically do not hunt while lactating and are dependent on the males for food (USFWS 1998). When the pups are approximately one month old, they emerge from their den (Brown et al. 2005). In August or September, when the pups are approximately 4 to 5 months old, they began to disperse (Koopman et al. 2000; Ralls et al. 2001). Healthy populations depend on immigration and dispersal of individuals in order to maintain reproductive opportunities, increase population size, and encourage genetic diversity (Koopman et al. 2000; Reed and Frankham 2003).

San Joaquin kit fox. Photo: Peterson

Kit foxes are primarily nocturnal. In turn, their diet consists of nocturnal rodents, such as kangaroo rats (*Dipodomys*) and pocket mice (*Perognathus*) (Whitaker, Jr. 1996). They also feed on California ground squirrels, leporids (black-tailed hares, jackrabbits (*Lepus californicus*), and desert cottontails (*Sylvilagus audubonii)*), grassy vegetation, and insects (Cypher and Spencer 1998; Ralls and Eberhardt 1997; Warrick and Cypher 1999). Kit fox diet is dependent on the seasonal, annual, and geographic variations of their prey species.

Historically, kit foxes inhabited native plant communities found throughout their range. Kit foxes prefer more open habitats with some percentage of bare ground available. Over time, as the native communities began to be altered by human activities, kit foxes began utilizing modified grasslands, scrublands, and agricultural fields (USFWS 1998).

The San Joaquin kit fox is federally- and state-listed as endangered. Natural mortality has been attributed to predation, starvation, flooding, disease, and drought (Cypher and Spencer 1998; USFWS 1998). Human caused mortality includes shooting, trapping, poisoning, and road kills. In addition, agriculture, industrialization, and development have contributed to the significant loss and fragmentation of their habitat (Boarman 2002; Conover 2001; Koopman et al. 2000; Ralls and Eberhardt 1997; Warrick and Cypher 1999).

Furthermore, the habitat requirements of the kit fox are also habitat characteristics that are beneficial to other species of concern (USFWS 1998). The kit fox acts as an umbrella species (Conover 2001). By preserving, protecting, and

when appropriate, enhancing habitat for the kit fox, the Service anticipates that habitat quality will be improved for other species as well, such as the giant kangaroo rat and blunt-nosed leopard lizard.

Blunt-nosed leopard lizard

Potential habitat for the endangered blunt-nosed leopard lizard exists on Bitter Creek NWR. The blunt-nosed leopard lizard belongs to the Family Iguanidae and was historically found in the San Joaquin Valley and the Sierra foothills, from Stanislaus County down to the Tehachapi Mountains, in addition to Kettleman, Carrizo Plain, and Cuyama Valley in San Luis Obispo, Santa Barbara, and Ventura counties. The blunt-nosed leopard lizard inhabits undeveloped arid areas with intermittent vegetation on the San Joaquin Valley floor typically associated with alkaline (having a pH greater than 7) and saline soils (Stebbins 1985). In the foothills, they inhabit chenopod shrub communities such as common saltbush (*Atriplex polycarpa*) and spiny saltbush (*Atriplex spinifera*) associated with non-alkaline and sandy soils. Vegetation is typically bunch and annual grasses and saltbush (USFWS 1998). The lizards are found between 98 to 2,600 feet msl in elevation. They are not known to occupy areas with seasonal flooding, steep slopes, or thick vegetation (Sandoval et al. 2005).

The lizards are 3 to 5 inches long with a blunt snout and long regenerating tail (USFWS 1998). Males tend to be larger than females. They are multicolored with striped patterns on their back, which divides into spots as they grow (Stebbins 1985). During the breeding season, females tend to exhibit a bright red-orange color on the sides of their head and body and the underside of their tail and thighs (Stebbins 1985; USFWS 1998). The males exhibit a salmon to rusty-red color beneath their entire body. Males heads tend to be broader compared to the females (Stebbins 1985).

In addition to creating their own tunnels, they seek shelter in abandoned burrows created by ground squirrels and kangaroo rats. They also create temporary shelters beneath rocks and berms (USFWS 1998). Females' ranges can extend out to 2.7 acres, whereas the males' ranges can be as much as 4.2 acres (USFWS 1998).

Their activity is limited by the climate, specifically the temperature. The most favorable temperature is 77 to 95 degrees F, with the soil temperature averaging 72 to 97 degrees F. As with other diurnal animals, during severely hot temperatures, the lizards are active only during dusk and dawn. During the colder months, they remain in a state of dormancy underground. The adults emerge in the spring, typically March and April, and remain active until July. The juveniles hatch in August and remain active until October (USFWS 1998).

Under favorable environmental conditions, the females typically reach sexual maturity following their second dormancy, while the males take longer. The lizards breed once they emerge in the spring and into June. The pair may remain together and typically use the same tunnel system. In areas where a male's territory overlaps more than one female, he may mate with multiple females. In June or July, the female lays 2–6 eggs, followed by a 2-month incubation period, after which the young hatch. During harsh conditions, the egg laying may be delayed by several months or not occur at all. However, if conditions are favorable, she may lay multiple clutches.

Both males and females are territorial and exhibit behaviors such as the head bob (one vertical head motion) and pushup (up and down motion involving the forearms and head). In addition, the adult male lizards exhibit may exhibit rocking (threatening) or fighting motions toward each other. It involves a simultaneous inflation of the body, expansion of the dewlap (loose skin fold attached to the neck) and hind limbs arching the back, and doing pushups in quick repetition (USFWS 1998).

Their diet mostly consists of insects like grasshoppers, crickets, and moths. In addition, they are opportunistic feeders and may consume animals, specifically lizards that they can capture and overcome (Sandoval et al. 2005). Natural predators include gophersnake, common kingsnake (*Lampropeltis getulus*), American kestrel, and American badger. The blunt-nosed leopard lizard is federally-listed as an endangered species and listed as fully protected by the state. Since the 1870s, approximately 95% of their former range has been destroyed. Their decline has been facilitated by cultivation, recreation, and extraction resulting in

habitat loss. Human activity has resulted in habitat fragmentation, creating small pockets of populations throughout its former range (USFWS 1998).

Giant kangaroo rat

Potential habitat for the endangered giant kangaroo rat exists on the Bitter Creek NWR in the lower elevations close to the valley floor. The giant kangaroo rats, of the Family Heteromyidae, are found in portions of the San Joaquin Valley and surrounding areas and in the plateaus of inner coastal ranges. Historically, they were found throughout the western San Joaquin Valley, Carrizo Plain, and Cuyama Valley. Currently, 6 clusters remain in their former range, divided into approximately 100 populations (Williams 2005). These clusters are separated by various obstacles such as steep terrain, unsuitable habitat, and development.

The kangaroo rats are considered keystone species (central supporting element) in grasslands and shrub communities. The Recovery Plan for Upland Species of the San Joaquin Valley, California, includes the following description of giant kangaroo rat habitat characteristics. Historically, giant kangaroo rats were believed to inhabit annual grassland communities with few or no shrubs, well drained, sandy-loam soils located on gentle slopes (less than 11%) in areas with approximately 16 centimeters (6.3 inches) or less of annual precipitation, and free from flooding in winter (Grinnell 1932; Shaw 1934; Hawbecker 1951). However, more recent studies in remaining fragments of historical habitat found that giant kangaroo rats inhabited both grassland and shrub communities on a variety of soil types and on slopes up to approximately 22% and 2,850 feet above sea level. This broader concept of habitat requirements probably reflects the fact that most remaining populations are on poorer and marginal habitats compared to the habitats of the large, historical populations in areas now cultivated. Yet these studies demonstrated that the preferred habitat of giant kangaroo rats still was annual grassland communities on gentle slopes of generally less than 10%, with friable, sandy loam soils. Few plots in flat areas were inhabited, probably because of periodic flooding during heavy rainfall (USFWS 1998).

The kangaroo rat is dependent on bipedal locomotion. It hops on its hind limbs. The front limbs are considerably smaller, the neck is very small, and their head is large and flattened. In addition, their tail is longer in length than the head and body combined and it ends in a large tuft. Furthermore, the kangaroo rat is larger than other coexisting species such as San Joaquin kangaroo rat (*D. nitratoides*) and Heermann's kangaroo rat (*D. heermanni*) (USFWS 1998).

Being nocturnal, the kangaroo rats forage above ground starting around sunset through the night, but are typically most active in the first 2 hours of the night (Williams 2005). Their activity tends to increase with the availability of their preferred food source. They are active throughout the year, regardless of the weather (USFWS 1998). Kangaroo rat reproduction is tied to population density and food availability. Typically, reproduction cycles range from December to April, but in colonies with fewer numbers, females reproduce into late summer (Whitaker 1996). Under the right conditions, they can produce more than 1 pup per litter. Generally, they have up to 3 pups per litter. If sufficient space and forage is available, juvenile females may reproduce their first year. The gestation period lasts 30 to 35 days. Dispersal generally occurs 11–12 weeks after birth (USFWS 1998). The majority of their diet consists of seeds, but they can also consume green vegetation and insects. Giant kangaroo rats place seedpods in shallow pits located above their burrowing systems and cover them (Ingles 1965; Whitaker 1996). Once the seeds are sun-dried to prevent molding during winter months, the seeds are moved into the burrow system (Shaw 1934). The kangaroo rats' natural predators include the San Joaquin kit fox, American badger, and burrowing owl.

Studies have suggested that certain kangaroo rat populations are genetically isolated, which can have devastating effects on the particular group (Storfer 1999). For a population to thrive, there must be diversity for the exchange of genetic material (Reed and Frankham 2003; Moritz 2002).

The giant kangaroo rat is federally- and state-listed as an endangered species. Since the 1970s, most of the historical range of the species has been lost to cultivation. In addition, up until the

1980s, rodenticides were used to control ground squirrel and kangaroo rat populations. Also, the infrastructure for petroleum exploration and extraction, mineral extraction, roads, communication, and energy have all contributed to fragmentation and habitat loss.

Kern primrose sphinx moth

The host plant for the threatened Kern primrose sphinx moth, contorted suncup (*Camissonia contorta*), has been reported on Bitter Creek NWR. Surveys would be needed to determine if this moth is present on the refuge. The contorted suncup (also known as plains evening primrose) is its primary food plant and essential to the survival of the Kern primrose sphinx moth. The Kern primrose sphinx moth is one of three species within the genus Euproserpinus, which are members of the family Sphingidae, commonly called hawk moths or sphinx moths. The adult Kern primrose sphinx moth is a moderate sized moth, distinctly marked by a broad and contrasting white band on the abdomen among other characteristics (Jump et al. 2006).

Since the Recovery Plan for the Kern primrose sphinx moth (Recovery Plan) was issued by the Service in 1984, the known distribution expanded as a result of the discovery of six confirmed populations of Kern primrose sphinx moth at the Carrizo Plain National Monument (Carrizo Plain) in San Luis Obispo County to the northwest of Bitter Creek NWR and of five populations in the Cuyama Valley in Santa Barbara and Ventura Counties (Jump et al. 2006, A. Kuritsubo in litt. 2006). These findings invalidate significant recovery criteria and actions in the Recovery Plan. More information about the population at the Carrizo Plain is described in the Service's Kern primrose sphinx moth 5-year review (USFWS 2007).

Flight periods for the adults range from late February to early April; however, pupae are known to diapause (delay metamorphosis to adult form) underground for multiple years during drought periods (Jump et al. 2006). Surveyed for the Kern primrose sphinx moth should coincide with the flight period to determine presence/absence (USFWS 2007).

Within the Carrizo Plain and in the Cuyama Valley there is a fairly wide distribution of potentially suitable habitat for the Kern primrose sphinx moth based on those habitat characteristics supporting known populations (Jump et al. 2006). Suitable habitat for the Kern primrose sphinx moth exists in and around the Carrizo Plain and the Cuyama Valley that has not yet been extensively surveyed for the presence of the Kern primrose sphinx moth (USFWS 2007).

Tricolored blackbird

The tricolored blackbird has been documented on Bitter Creek NWR (see Appendix D). In 1992, CDFG designated the tricolored blackbird as a state species of special concern. In 1995, the Service identified tricolored blackbirds as a non-game bird species of management concern. The tricolored blackbirds (tricolors) are a small passerine (birds from the Order Passeriformes) species of the Family Icteridae, which nests in very large colonies (over 50,000 birds). Although mostly found in the Central Valley, they are also known to inhabit the surrounding foothills, including Bitter Creek NWR and coastal California, Oregon, and Baja (DeHaven et al. 1975; National Geographic Society 1999; Sibley 2000). Population surveys have shown significant declines in population size in the past 2 decades. Declines in population have been attributed to widespread habitat loss throughout their historical range and failure of colonies that establish in

Kern primose sphinx moth. Photo: Paul Johnson

Tricolored blackbird. Photo: USFWS

agricultural fields when crops are harvested before birds fledge (Beedy and Hamilton 1997; Hamilton and Meese 2005).

Typically, tricolored blackbird colonies were found among cattails (*Typha* sp.) and bulrushes in freshwater marshes. Presently, colonies are found among blackberries (*Rubus* sp.), nettles (*Urtica* sp.), and among agricultural fields of silage and grain (Hamilton and Meese 2005).

During the winter months, the tricolors tend to congregate in the Sacramento-San Joaquin River Delta and along California's central coast (Hamilton 1998). During the breeding season, they flock to locations in Sacramento County and San Joaquin Valley (Beedy and Hamilton 1997). They tend to utilize the same breeding habitats year after year, if suitable resources are available (Hamilton and Meese 2005). Additionally, tricolors may re-nest in the same year but in a different location, a pattern known as itinerant breeding (Hamilton 1998). Tricolored blackbirds have 3 basic requirements for nesting habitat: 1) access to open water, 2) thorny or flooded substrate for nesting, and 3) an adequate insect population available within a mile or 2 ("a few kilometers") of the nesting colony as a food source (Hamilton and Meese 2005).

Females tend to breed their first year; however, males tend to wait until their second year. Females undertake the construction of the nest (Beedy and Hamilton 1997). If a female loses a nest, she may re-nest in the same season. Nests may fail due to inclement weather, predation, and agricultural activity (Hamilton and Meese 2005). Breeding starts toward the latter part of March into April (Hamilton 1998). Nests are suspended in dense vegetation, at least 0.8 inches above water or ground and up to 6.6 feet high, higher if constructed in the canopies of willows (Sibley 2001). The deep cup nest takes approximately 4 days to build and consists of 3 layers: the outer layer is created with long leaves from cattails or forbs formed tightly around the substrate, the middle layer is formatted with mud or algal fibers, and the inner layer part of the nest consists of plant down (fine soft plant material) (Hamilton and Meese 2005). Typically, 3–4 eggs are laid, one per day, approximately 4 days after arriving at a colony (Beedy and Hamilton 1997; Emlen 1985). The incubation period lasts 11–12 days. Once hatched, a nestling takes 9 days before it attempts to jump out of the nest and an additional 15 days before it is no longer dependent on parental care (Beedy and Hamilton 1997). Therefore, it takes one pair at least 45 days for a successful reproductive cycle.

Flocks of male tricolors flying above colonies during settlement indicate individuals that have not established nesting territories. Individual males that have established territories typically remain hidden within the substrate (Hamilton and Meese 2005). Usually, females outnumber males 2 to 1. While the females incubate the eggs, the males remain in groups within a approximately a mile from the colony. During incubation, the females remain inactive and the colony seems deserted (Beedy and Hamilton 1997).

Adult tricolored blackbirds' diet consists of plant matter and insects (Skorupa et al. 1980). Nestlings feed on various insects, including beetles, grasshoppers, and various larvae. They typically forage away from their nesting colony but usually within approximately 3 miles. Pastures, agricultural fields, and seasonally dry pools provide an excellent resource for insects (Skorupa et al. 1980). Large flocks of tricolors can be seen foraging in an area, with the continued exchange of individuals. During winter, tricolors congregate in large flocks and are mostly dependent on plant material as a food source (Hamilton and Meese 2005).

Their highly colonized nature leaves them susceptible to large nesting failures. The top 10 largest colonies account for 70% of the breeding population (Hamilton and Meese 2005). Natural predators include common ravens (*Corvus corax*), northern harriers (*Circus cyaneus*), and barn owls (*Tyto alba*). Human urbanization has systematically encroached on their historical habitat. Additionally, tricolor breeding colonies that utilize agricultural crops are destroyed during management operations, although partnerships have developed between private landowners to mitigate management timing to protect established colonies (Hamilton and Meese 2005). Furthermore, the greatest threats to tricolors are the direct loss and degradation of habitat from human activities (Beedy and Hamilton1997).

The tricolor habitat on the refuge is important because it can potentially help support a healthy, self-sustaining tricolor population within its existing range.

In 2011, researchers banded tricolors within a population of approximately 1,300 birds that nested in the stinging nettles (*Urtica dioica*) at Spanish Spring on Bitter Creek NWR, a location where tricolors had not previously been banded (Meese 2011).

During the 2011 surveying at Bitter Creek NWR, 2 birds were recaptured (that had previously been banded at Kern NWR), illustrating both the short- and long-distance movements exhibited by tricolored blackbirds. Previous banding results have confirmed that birds breed more than once in multiple locations, a phenomenon known as itinerant breeding (Hamilton 1998). Bitter Creek NWR is the fourth, and southern-most, NWR on which Meese (2011) had trapped and banded tricolors, the others being Kern, Merced, and Delevan NWRs. These refuges also illustrate the diversity of nesting substrates that are utilized by breeding tricolors, with the Bitter Creek colony utilizing stinging nettles in a drainage surrounded by a landscape of uplands dominated by annual and perennial grasses, the Kern and Delevan colonies utilizing cattails (*Typha latifolia*) and bulrush (*Schoenoplectus californicus*) in a largely agricultural landscape increasingly dominated by orchards (Kern) and rice (Delevan), and the Merced colony utilizing primarily introduced weeds (milk thistle, *Silybum marianum*, and mustard, *Brassica nigra*) in a landscape consisting of open pastureland to the north and an agricultural mosaic of mixed row crops and orchards, with a large dairy nearby. Thus, California's refuges are providing a diverse array of nesting substrates and permanent water sources that are attractive to breeding tricolors, but surrounded by foraging landscapes that are increasingly dominated by agriculture (Meese 2011).

Golden eagle

The golden eagle has been observed on Bitter Creek NWR (see Appendix D). The golden eagle is protected under the Federal Bald and Golden Eagle Protection Act (16 U.S.C. 668–668c). The Eagle Protection Act prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. More information on the act is in the Special Status Species section on Hopper Mountain NWR. The golden eagle uses rolling foothills and mountain terrain, wide arid plateaus deeply cut by streams and canyons, open mountain slopes, and cliffs and rock outcrops. It needs open terrain for hunting; grasslands, deserts, savannas, and early successional stages of forest and shrub habitats. It uses secluded cliffs with overhanging ledges and large trees for cover. The golden eagle nests on cliffs of all heights and in large trees in open areas. Alternative nest sites are maintained, and old nests are reused. Builds large platform nest, often 10 feet across and 3 feet high, of sticks, twigs, and greenery. Rugged, open habitats with canyons and escarpments are used most frequently for nesting. (CDFG 2011).

Western burrowing owl

The western burrowing owl occurs on Bitter Creek NWR. The western burrowing owl is not state-listed, but is designated by the CDFG as a California Species of Special Concern. The western burrowing owl of the Family Strigidae, is a small- to medium-sized raptor that inhabits open grassland habitat predominately in the western United States, Mexico, and Florida (Fisher et al. 2004; Orth and Kennedy 2001). This ground-dwelling species uses abandoned burrows for nesting and roosting (Fisher et al. 2004; King and Belthoff 2001; Sibley

2000). Burrowing owls have been documented using abandoned burrows of a variety of species, including California ground squirrels (Thomsen 1971), prairie dogs (*Cynomys ludovicianus*) (MacCracken et al. 1985; Orth and Kennedy 2001), rock squirrels (*Otospermophilus variegatus*) (Martin 1973), and badgers (Haug and Oliphant 1990). These natural burrows are renovated and maintained by using their feet, bill, and outstretched wings (Thomsen 1971). The burrowing owl also uses certain man-made structures, such as cement or metal culverts; cement, asphalt, or wood debris piles; openings beneath cement or asphalt pavement; and artificial burrows (Trulio 1997; Zambrano 1998).

Habitat requirements for burrowing owl include low-growing vegetation (less than 6 inches in height) and burrow availability (Orth and Kennedy 2001). Habitat is found in annual and perennial grasslands, deserts, and arid scrublands (Zarn 1974). Grasslands grazed by livestock are utilized because vegetation is relatively short (MacCracken et al. 1985; Haug and Oliphant 1990; Plumpton and Lutz 1993). The burrowing owl exhibits strong site-fidelity and, year after year, it may use the same site for migration stopovers, breeding, wintering, and/or foraging (Dechant et al. 2002).

Burrowing owls are sociable and often form loose colonies with several occupied burrows in relatively small areas, depending on burrow availability (Poulin et al. 2011). Unlike most strigiforms, burrowing owls are sexually dimorphic (male is larger). In general, males appear lighter due to greater plumage fading. Males call by the burrow and conduct bowing displays to attract females (Martin 1973). They are territorial when forming breeding pairs and remain until chicks fledge (Thomsen 1971). In California, the mean clutch size is 7.0 with a range of 1 to 11 (Landry 1979). The young are downy and defenseless at hatching, requiring parental care to mature through fledging.

Burrowing owls are active during the daytime rather than nighttime (Thomsen 1971). Their principle food source is insects, but they also feed on Norway rats, toads, birds, beetles, vegetation, small mammals, reptiles, and carrion (Brown 2005; Dechant et al. 2002; Robertson 1929). Four foraging methods are used: 1) ground foraging-main winter method observed, 2) observation foraging-perching, 3) hovering, and 4) flycatching (Thomsen 1971).

The western burrowing owl is federally designated as a Bird of Conservation Concern (USFWS 2008a) and in the state of California (Shuford and Gardali 2008). Habitat loss due to development and agriculture, and secondary poisoning to control ground squirrel populations, have caused declines in western burrowing owl populations throughout much of their range (Dechant et al. 2002; Gervais and Rosenberg 1999; Griebel and Savidge 2003; King and Belthoff 2001; Zambrano 1998).

Swainson's hawk

Swainson's hawk has been documented on Bitter Creek NWR (see Appendix D). It is listed as by the state of California as a threatened species. This listing was based on loss of habitat and decreased numbers across the state. The species is not federally listed.

In 2005, a state-wide survey was conducted in the known range. The results showed a state-wide

Western burrowing owl. Photo: USFWS

Bitter Creek NWR. Photo: K. Geurs

estimate for the number breeding pairs at 2,081. The most recognized threat to Swainson's hawks is the loss of their native foraging and breeding grounds. Typical habitat for Swainson's hawk is open desert, grassland, or cropland containing scattered, large trees or small groves. It breeds in the western United States and Canada and winters in South America. Swainson's hawks often nest peripheral to riparian systems. They will also use lone trees in agricultural fields or pastures and roadside trees when available and adjacent to suitable foraging habitat. The diet of the Swainson's hawk in California is varied, but mainly consists of small rodents called voles; however other small mammals, birds, and insects are also taken (CDFG 2011).

3.2.9 Contaminants

Known environmental contaminants associated with disturbed homestead sites located throughout the refuge include asbestos and lead paint. As funding permits, the sites have been cleaned and the debris properly disposed. At this time, the contaminants pose no known danger to the proposed management of wildlife or their habitats.

In 1997, the Service conducted a contaminant assessment process (CAP) on Bitter Creek NWR. The following includes highlights of that contaminants assessment. The known contaminant sites included: the main corral site and Percy's Place. Prior to becoming the refuge, the old corral site was part of former homestead operations and appears as if it may have been used as a staging location for refuse. Three to 4 unidentifiable 55-gallon drums were found at the corral site containing what was presumed to be petroleum products used in ranching operations. Thirty to 40 unidentifiable 55-gallon drums and barrels were found at Percy's Place. In about 1998, contaminant cleanup was safely completed. The drums and their contents were removed. The former locations of the drums and barrels pose no known threats to wildlife or the environment.

Lands surrounding the refuge are used for cattle grazing. Potential contaminant sources include biological material (such as feces, urine) that could impact water quality on the refuge and chemicals used in ranching activities (pesticides, insecticides, etc.). Also, lead bullets may be used to dispatch sick or injured cattle, which may then be ingested by scavengers such as the California condor.

Potential food items for the California condor (e.g., dead cattle, wildlife) may contain lead. Refuge management takes into consideration the possibility of condor exposure to lead. The levels of lead in the blood of condors can reach lethal levels if not treated. Lead exposure is believed to be occurring as a result of condors scavenging on carcasses that have lead in them. Spent ammunition is believed to be the primary source of lead in carcasses.

Raising public awareness about lead as one of the primary threats to the recovery of the California condor is a key factor in reducing lead exposure to condors. The Service's partners and stakeholders are aware of the risks of lead exposure to condors. The Service continues outreach to educate the neighboring communities about the risks of using lead ammunition.

Winds from the surrounding areas (north, south, east and west) could carry with them pesticides and other contaminants associated with regional agricultural fields. Agricultural and cattle grazing lands surround the refuge boundary. However, most of the agricultural lands are located at lower elevations than the refuge. The results of the CAP indicated that wind patterns could potentially carry contaminants from these lands up to the refuge, although this has not been analyzed.

The results of the CAP concluded that there are no indications at this time that contaminants on the refuge have adversely affected threatened or endangered species. However, it is essential that the refuge remain free of environmental contaminants that could adversely affect the recovery of endangered and threatened species. Long-term monitoring of potential contaminant sources are an important aspect of the management goals of the refuge. Because of the land use practices on the refuge and surrounding lands, contaminant threats are likely very low.

▼ Bitter Creek NWR Socioeconomic Environment

3.2.10 Local Population Base

Three small communities are located within a 25-mile radius of the refuge. The nearest town of Maricopa, located 15 miles to the northeast of the refuge, and the town of Taft, located 6 miles north of Maricopa, are both in Kern County. Cuyama and New Cuyama, located in the Cuyama Valley west of the refuge, are in Santa Barbara County, bordering San Luis Obispo County. Pine Mountain Club community, located 20 miles southeast of the refuge, is part of Ventura County. Although the majority of the individuals in Kern County are Caucasian, persons of Hispanic or Latino origin and non-Hispanic white persons are also represented in significant numbers, among other cultures and ethnicities (U.S. Census Bureau 2010). In 2011, the surrounding counties accounted for approximately 5% of the total population in California, with Kern and Ventura counties 2% each, and Santa Barbara 1% (California Department of Finance 2011). The California Department of Finance estimated that in January 2011, the population of Kern County was 846,883. The communities nearest Bitter Creek NWR have 19 public schools, accommodating students from kindergarten to twelfth grade (Taft City School District, Taft Union High School District, Maricopa Unified School District, Cuyama Joint Unified School District, and El Tejon Unified School District 2005). In addition, the surrounding counties, including Los Angeles County, are home to 34 higher education community or technical institutions and 54 private and 10 public colleges or universities.

3.2.11 Economy

Kern County is among the top five agricultural producing counties in the U.S., in addition to being one of the leading petroleum-producers (CEDD 2011). Also, some of the world's largest companies have built their distribution centers in the county due to the location and access to major highways in the Southwest. The economy associated with the local area consists of agriculture, petroleum, livestock, services, and recreation. Additional information regarding the surrounding work force is available in Table 3-1.

In addition to supporting an agricultural base, Kern County is a significant producer of oil, natural gas, hydro-electric power, wind-turbine power, and geothermal power. In 1894, the third largest oil field in the U.S. was discovered—the Midway-Sunset Oil Field, near the town of Maricopa, just north of the refuge. Additional huge oil fields were subsequently discovered in southwestern Kern County. In 2009, Kern County was California's top oil-producing county, with over 85% of the state's active oil wells; 3 of the 5 largest U.S. oil fields are in Kern County. In 2009, Occidental Petroleum announced it had discovered 150 to 250 million barrels of oil equivalent in Kern County. This discovery reportedly added approximately 10% to California's known reserves.

In the immediate vicinity of the refuge, most private properties of large acreage are associated with the livestock industry, agriculture, or oil excavation. Agricultural fields harvest alfalfa, grapes, and pistachios. The livestock industry includes both dairy and beef cattle and sheep. Private properties with beef cattle graze steers and/or cow/calf pairs seasonally and year-round. The Wind Wolves Preserve, a private wildlife preserve located east of the refuge, utilizes prescription grazing with steers, November through May, in elevations lower than 3,500 feet (Pers. comm. Clendenen, D. 2002–2005) and sheep. Carrizo Plain National Monument, managed by the Bureau of Land Management (BLM), located north of the refuge, utilizes prescription grazing as a management tool when needed on portions of the monument to reduce excessive non-native grass cover in blunt-nosed leopard lizard, giant kangaroo rat, and mountain plover core management areas. On other portions of the monument, livestock grazing is regularly authorized under the BLM Standards of Rangeland Health and may be used for vegetation management of other monument resources (USBLM 2010).

3.2.12 Land Use

The Service does not own the mineral (oil and gas) rights on Bitter Creek NWR lands. In addition to several privately owned parcels surrounded by refuge lands and generally used as ranchlands, a small in-holding owned by Pacific Gas and Electric near Pelato Peak contains several telecommunications towers (see Figure 3-7. Bitter Creek NWR, Facilities). Additionally, just southeast of the Pacific Gas and Electric in-holding, Chevron Corporation holds a 50-year easement on refuge lands for a microwave station, power line, and access road. This easement expires May 2, 2046.

3.2.13 Public Use

Aesthetics
Large portions of Bitter Creek NWR can be seen from Cerro Noroeste Road, which bisects the refuge. The refuge encompasses the rolling foothills between the San Joaquin Valley and the coastal mountain range. Approximately two-thirds of the refuge is open grassland, providing valuable foraging habitat for California condors. Refuge visitors along Cerro Noroeste Road can glimpse California condors soaring on warm thermal air currents or perched on steep hillsides, mule deer, tule elk, California quail, golden eagle, and occasionally greater roadrunner (*Geococcyx californianus*), and owls.

Management Considerations
The refuge is currently closed to the public and has been since its establishment in 1985 due to the sensitive nature of the California Condor Recovery Program activities and the sensitivity of its resources. The rugged terrain of the refuge also limits visitation opportunities, and the use of Service vehicles is usually required for clearance and four-wheel drive over the narrow dirt roads. The refuge is remote, and emergency services are not readily available. Unexpected weather or wildfires can cause evacuation of staff and volunteers from parts of the refuge. Refuge personnel are expected to uphold the highest caution while using all-terrain vehicles, especially during muddy, wet weather to avoid erosion of trails and accidents.

Despite boundary signs and perimeter fences around the property, unauthorized use of the refuge is an ongoing management problem. Trespassers have tampered with and cut locks, as well as broken fences to enter the refuge. The damage includes off-road vehicle use, poaching, and vandalism.

Recreation
Six wildlife-dependent recreation uses are identified in the Refuge Improvement Act as priority uses for refuges when they are compatible with refuge purposes: wildlife viewing and photography, fishing, hunting, and environmental education and interpretation.

Bitter Creek NWR is currently closed to public use due to the highly sensitive California Condor Recovery Program activities that take place there. There is no interpretive signage, and there are no visitor-oriented facilities on the refuge for the public. However, staff and partner-led guided interpretive tours allow for limited opportunities for the public to engage in wildlife viewing and photography. In addition, limited opportunities exist for wildlife viewing and photography at safe pullout locations along Cerro Noroeste Road, which bisects the refuge. Wildlife-dependent recreation is also available on adjacent public lands, including the Carrizo Plain National Monument, managed by the BLM, and the Los Padres National Forest, managed by the U.S. Forest Service.

Visitation
Since Bitter Creek NWR is closed to public access, the visits to the refuge each year are limited, and all have been guided by refuge employees or led by partner organizations educated in refuge rules and regulations, such as the Friends of California Condors Wild and Free. During hikes at Bitter Creek NWR (for events such as National Wildlife Refuge Week), the number of visitors have not exceeded 40 people per event, with approximately 200 visitors total per year. Most guided interpretive hikes have taken place on weekends to accommodate most visitors' availability. According to California State Parks' *Parks and Recreation Trends in California 2005*, citizens reported less involvement in recreation activities, with their work schedule becoming the most frequent barrier to their participation.

Bitter Creek NWR. Photo: USFWS

At Bitter Creek NWR, the part of the refuge used for guided hiking must remain a safe viewing distance away from California condors to reduce interaction and contact. The area used for guided hikes on Bitter Creek is located near the southernmost refuge sign on Cerro Noroeste Road and uses existing roads and trails. This area provides a good place for viewing condors, since condors can sometimes be seen soaring on the thermal air currents coming up out of Bitter Creek Canyon. A small pull-off along the road allows visitors to safely park along the side of the road near the refuge sign and engage in passive recreation such as bird watching. The refuge is marked as closed to entry here, and posted signs continue along the road passing through the refuge.

Environmental Education and Interpretation
Environmental Education and interpretation are identified in the Refuge Improvement Act as priority uses for refuges when they are compatible with refuge purposes. Because the Bitter Creek NWR is remote and not easily accessible from neighboring cities/towns, its existence and purposes are not well known in the region. However, the Hopper Mountain NWR Complex provides education to both local schools and inner-city schools in Ventura and Los Angeles counties regarding careers with the Service and the California Condor Recovery Program history and biology. By conducting community outreach, it is possible for members of the public to understand the Bitter Creek NWR's goals and purposes. There is not enough capacity or staffing, however, to conduct formal environmental education programs at this time. Interpretive guided hikes led by refuge employees or partner organizations educated in refuge rules and regulations take place a few times per year.

The future management of public use at the refuge is described in Chapter 4.

3.2.14 Structures and Facilities

The refuge headquarters is on the refuge, approximately 1 mile east of Cerro Noroeste Road. There is a bunkhouse for staff and volunteer housing, 3 barns, an office storage building, and 2 water tanks with a pressure system. Bitter Creek NWR has supplemental feeding stations, trap sites, and a flight pen that support the activities of the Recovery Program. The flight pen at Bitter Creek NWR was built in 2002. A residential subdivision is located just outside the southern boundary of the refuge. Residents of the subdivision use an easement road through the refuge for ingress and egress.

3.2.15 Archaeological and Historical Resources

The Service's Region 1/Region 8 Cultural Resources (CR) Team has compiled the following information regarding cultural resources on the refuge.

Previous Archaeological Research
In 2010, for a cultural resources review of Bitter Creek NWR, the Service conducted a search of records held in the California Historical Resources System within a 1-mile radius of the refuge. The search included a literature review of published articles, maps, and agency files. Since Bitter Creek NWR was established, the majority of the cultural resources investigations on the refuge have been carried out by or under the auspices of the Service's CR Team, and documents pertaining to these projects are archived at the CR Team office in Sherwood, Oregon. Historical land status maps, deed records, and general histories were reviewed for information about early settlers and development of the county. No field investigations were performed as part of the 2010 cultural resource review.

There are 7 recorded prehistoric sites and 3 recorded historic sites, one with 9 separate structures or features, within the refuge boundaries. Other historic sites and features are known to exist on the refuge but have not been recorded. Several prehistoric and historic sites and/or features have been recorded within 1 mile of the refuge. None of the prehistoric sites on the refuge have been evaluated for their eligibility for listing on the National Register of Historic Places (NRHP). Two of the historic features have been evaluated and determined ineligible. One structure, which is a component of one of the historic sites, is located on a private in-holding within the refuge boundaries and is not under the jurisdiction of

the Service. All sites are being treated as eligible for listing on the NRHP until listed or formally evaluated as ineligible in consultation with the State Historic Preservation Office (SHPO).

To date, approximately 7.5% (1,886 acres) of the 14,097-acre Bitter Creek NWR has been systematically surveyed as a result of 13 archaeological research projects conducted on the refuge. It is highly probable that additional archaeological sites will be exposed by human actions or natural causes in the future.

The following summarizes the highlights of the Cultural Resources Team's review of Bitter Creek NWR.

Paleontological Resources
There is no known information about paleontological resources occurring on Bitter Creek NWR. However, Quatal Canyon on the Los Padres National Forest, the refuge's neighboring landowner to the south, has been designated as a geologic special interest area, with "excellent examples of spectacular badlands topography, distinct scenery, geomorphic features; and unique fossils" (USFS 2005). The collection and curation of paleontological resources should be managed under the Department of the Interior's Museum Property program and the Paleontological Resources Preservation Act of 2009.

Prehistoric Resources

Prehistoric Setting of the Bitter Creek NWR Region
The Bitter Creek drainage was utilized by the Yokuts and coastal Chumash Indians on a seasonal basis. The Chumash spent much of their year in areas where water and plant resources were readily available and "used the eastern portion of their land, within Kern County, for gathering and hunting expeditions" (Uli and Schiffman 1983). Trade between the two groups commonly included pine nuts and tar from the western region of the southern San Joaquin Valley and dried fish from Santa Barbara coastal waters. The main travel routes were along the river valley floors, and use of the uplands is not well documented. Known archaeological remains of Native American usage within the Bitter Creek NWR are limited to 7 recorded sites, 5 of which are described as lithic scatters. Although based on results of a small number of archaeological investigations conducted on the Bitter Creek NWR, it appears likely that, at a minimum, the area was used for seasonal hunting trips and for seed and nut processing. However, the limited availability of surface water sources likely restricted the development of long-term camps or villages.

Known Prehistoric Sites
Seven prehistoric sites have been recorded on the refuge, all of which were identified during a 1,300-acre survey in 1983. Isolated prehistoric artifacts have also been reported during this and other surveys that have occurred within or adjacent to the refuge.

Ethnographic Setting and Background
The area was claimed ethnographically by the Chumash of the coast. While little is known about the area of the refuge specifically, the general ethnography of the coastal region has been discussed by several authors. The Chumash, initially known as the Santa Barbara Indians, occupied an area from San Luis Obispo to Malibu Canyon along the Pacific coast and inland to the western edge of the San Joaquin Valley, as well as the islands in the Santa Barbara channel. This large, important tribe was divided by territory and language dialect into eight separate groups (Kroeber 1925; Grant 1978a).

The Interior Chumash (Emigdiano, Cuyama, and Castac) were believed to have occupied the extreme southwest corner of Kern County. The Kitanemuk shared a vague eastern border with the Emigdiano (Grant 1978b). Little ethnological or archaeological information has been recorded on these groups, but a population of several hundred is believed to have lived in the region. The local inhabitants, at the time of European contact, spoke a dialect similar to that of the Santa Barbara area. Little knowledge of ancient life patterns was available by the time anthropologists became interested in the ethnological record (Grant 1978a).

Historic Setting and Background
The Spanish mission system did not infiltrate this part of the San Joaquin Valley, in part because of the rugged mountains between the coastal

Percy Hudson place, Bitter Creek NWR. Photo: K. Geurs

plain and the San Joaquin Valley and in part because of successful raids by the Yokuts on the missionaries' horses and cattle herds. Nor were Mexican land grants very successful in the southern San Joaquin Valley because of the frequent Yokuts raids. When the United States gained control of California in 1848, much of Kern County became public domain. The area of the refuge was also bypassed by the fur traders, explorers, and gold seekers that traveled through the San Joaquin Valley during the mid-1800s.

The Emerson and Hudson Families

It was not until the late 1880s that the population growth around Bakersfield pushed settlement into the surrounding foothills. In 1886, Edward Simpson Emerson settled his family, which included 7 sons, 12 miles south of Maricopa on 320 acres he purchased to establish a ranch. In the 1890s, he filed for a homestead claim of 160 acres and received the patent in 1899. To fulfill the terms of the Homestead Act, Emerson would have needed to make improvements such as building a house and fences, clearing fields, growing crops, and residing on the property for 3 to 5 years. At the time of his death in 1904, Emerson's family included 9 children. His son Charley inherited the ranch, making him one of the largest landowners in the area.

The Hudson family settled in the Bitter Creek area in 1899, raising sheep and cattle and growing barley and grain crops on some of the fairly level terrain. According to the General Land Office (GLO) records, Hudson family members, like the Emersons, were actively patenting land under the 1862 Homestead Entry Act and Cash Entry by the mid-1880s within the boundaries of what is today the Bitter Creek NWR. Charley, Elbert, Edward, Eunice, and Perry Emerson—along with Beattie, John B., John W., and Ruth Hudson—all are named in the land records (GLO patents). Structures related to the Emerson and Hudson families and their more recent history can still be found on the refuge.

3.3 Blue Ridge National Wildlife Refuge

Blue Ridge NWR is located in the foothills of the Sierra Nevada Mountains in central Tulare County, California. The nearest towns to the refuge include Springville, which is approximately 11 miles south of the refuge, and Porterville, which is approximately 18 miles southwest of the refuge. The refuge is closed to the public due to the sensitivity of its resources.

In 1967, before the 1973 Endangered Species Act, the California condor was federally-listed as "threatened with extinction" under the Endangered Species Preservation Act of 1966 (*ecos.fws.gov/docs/federal_register/fr18.pdf*). In 1976, the Service published a determination of critical habitat for the California condor (41 FR 187: 41914–41916). Blue Ridge was among 9 condor activity areas determined to be Critical Habitat for the condor

(USFWS 1976). Blue Ridge is a large ridge-shaped mountain approximately 4.5 miles long and 3,000 feet from base to top, with the peak elevation at 5,733 feet.

In 1982, the Service acquired 897 acres, securing most of the core roosting area and some of the ridgeline of Blue Ridge. This acquisition became the refuge, which is surrounded by properties owned by the BLM, U.S. Forest Service, CDFG, California Department of Forestry, and several private parties. Due to the varied interests involved in the management of the area, a Habitat Management Plan (USBLM 1985) was written to emphasize a cooperative effort, delineate responsibilities, and promote better communication between agencies and private parties.

The refuge is part of a cooperatively managed area designated as a Wildlife Habitat Area by the Habitat Management Plan, which is synonymous with the Blue Ridge Condor Critical Habitat Zone used in other documents.

Existing Plans and Management Constraints
Plans which direct conservation and management efforts at Blue Ridge include the California Condor Recovery Plan (USFWS 1984), Blue Ridge Habitat Management Plan (USBLM 1985), and the Draft Management Plan for the Blue Ridge Ecological Reserve (CDFG 1983), developed for CDFG's land acquisition.

▼ Blue Ridge NWR Physical Environment

3.3.1 Geology and Soils

The foothill belt of the Sierra Nevada Mountains is 5 to 12 miles wide, beginning at the San Joaquin Valley and merging with increasing relief into the higher elevations to the east. The Tulare County foothill region ranges from 600 feet in elevation at the edge of the valley to 6,840 feet at Case Mountain. Elevations on the Blue Ridge NWR range from approximately 3,860 to 5,600 feet above msl.

Locatable mineral development potential in the Blue Ridge area is expected to be low, based on the prevalence of plutonic rock and on the lack of past or present mining activity. Plutonic rock forms from magma that cools and is believed to have solidified deep beneath the earth's surface. Leasable minerals, although present, are too inaccessible to be marketable.

Soils
Soils in the Blue Ridge area have developed from granitic bedrock and generally have sandy loam or loamy textures. Typically, the soils are 10 to 80 inches deep. Many rock outcrops occur in the area, covering from 5%–75% of the surface. Slopes range from 15%–75%, with shallower, coarser-textured soils and rock outcrops generally more common on slopes of greater than 40% (see Figure 3-13. Blue Ridge NWR, Soils).

Blue Ridge NWR. Photo: USFWS

Figure 3-11. Blue Ridge NWR, Location

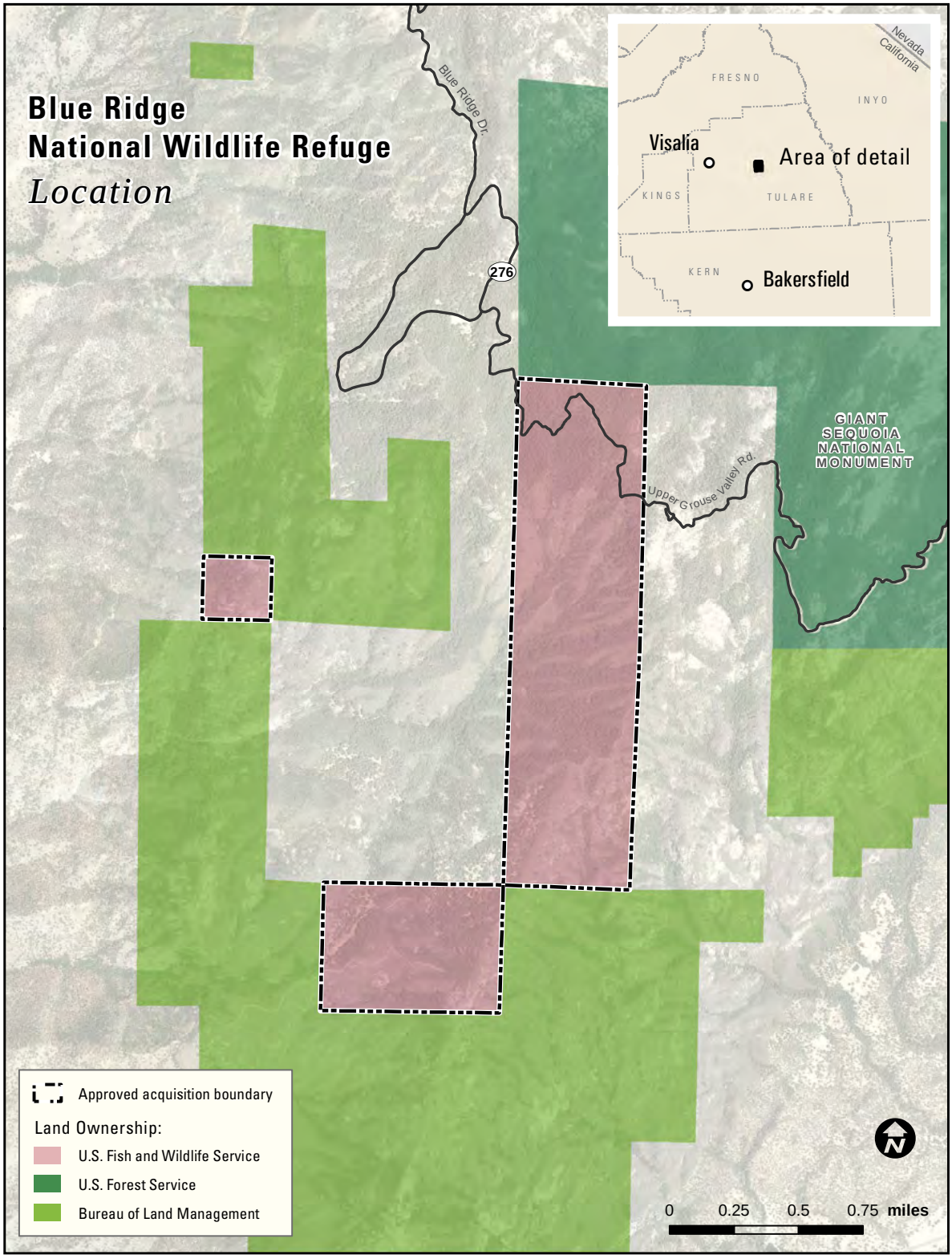


Figure 3-12. Blue Ridge NWR, Slope

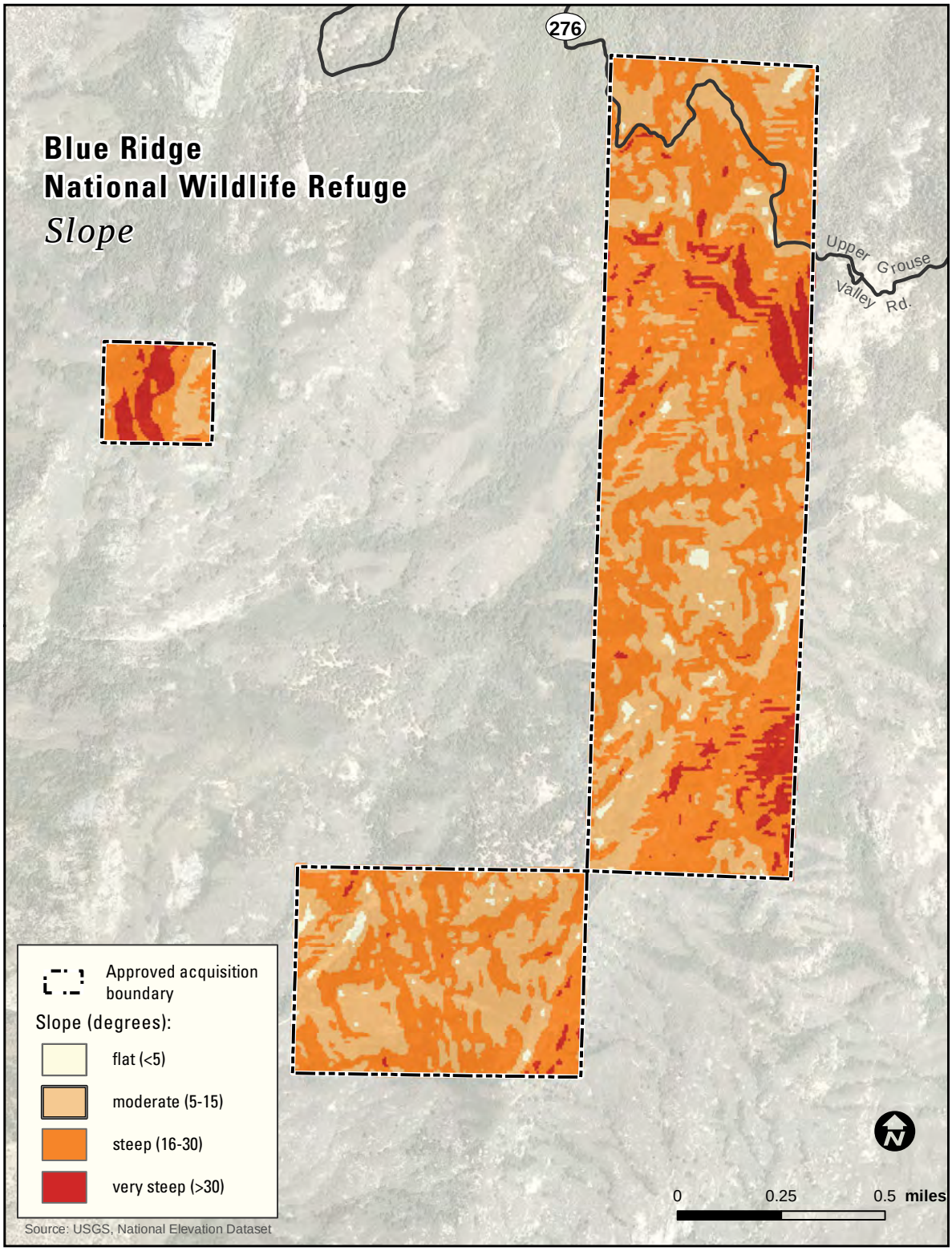


Figure 3-13. Blue Ridge NWR, Soils

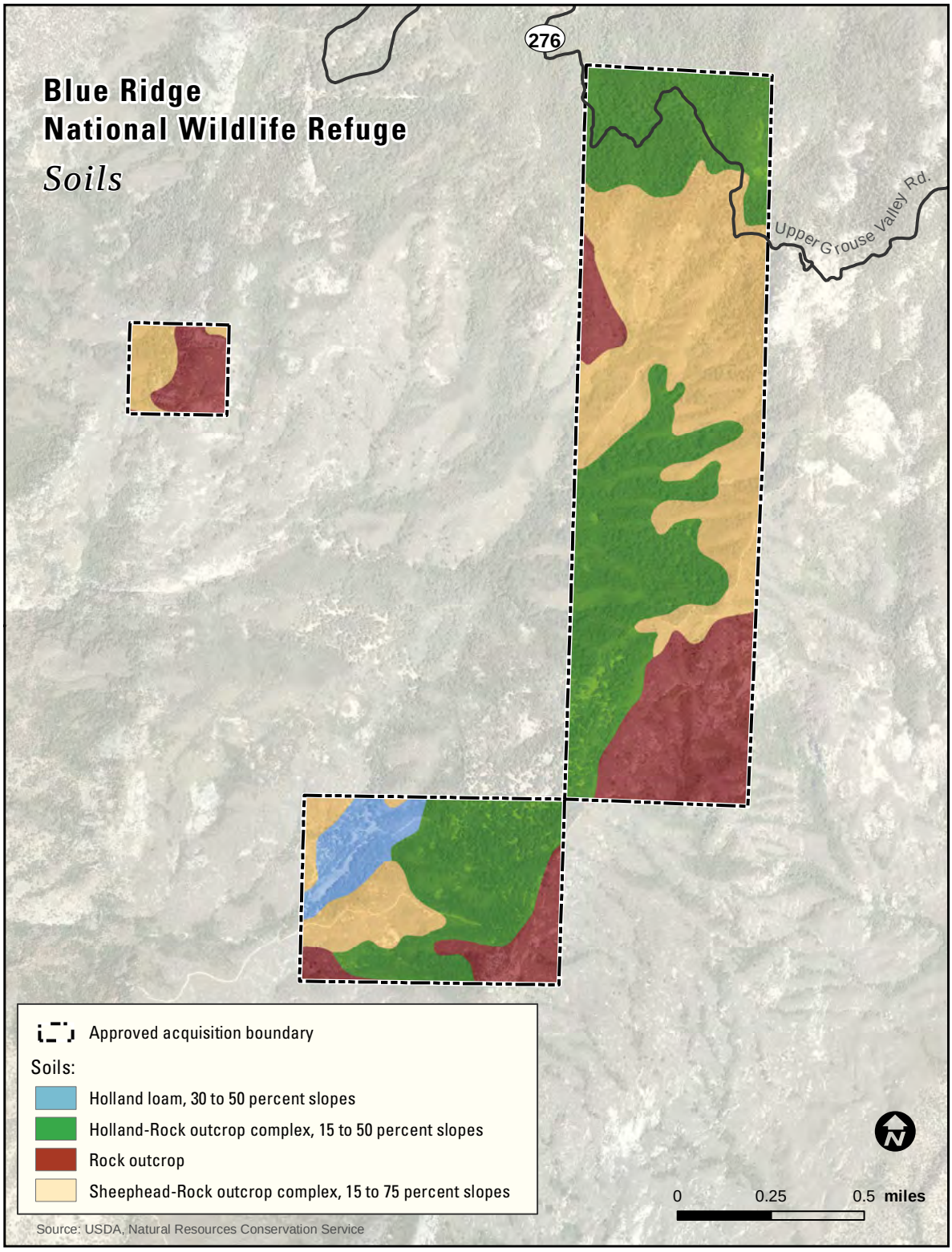
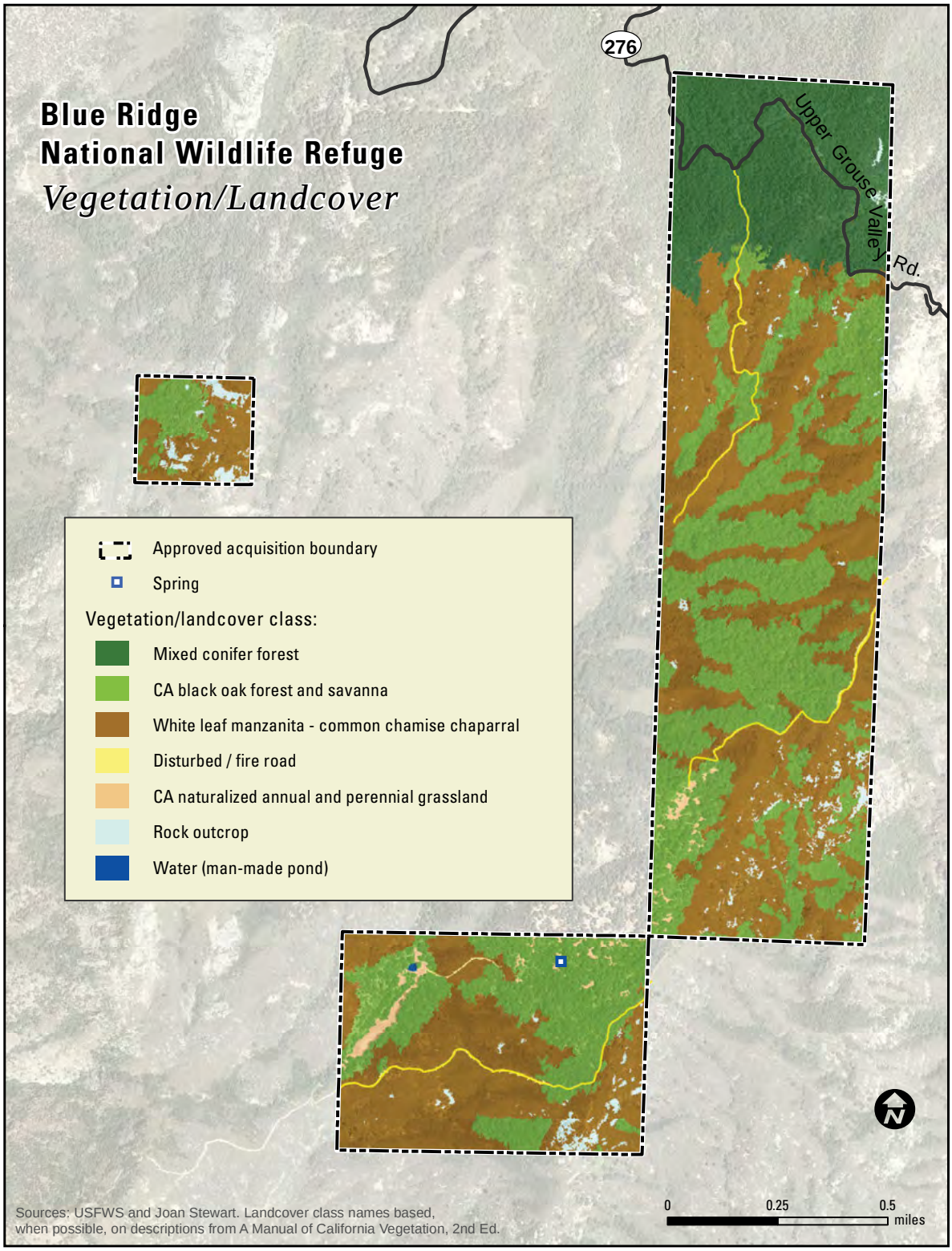


Figure 3-14. Blue Ridge NWR, Vegetation/Landcover



Manzanita, Blue Ridge NWR. Photo: USFWS

The soils are medium acid to slightly acid (pH 5.6–6.5) due to the acidic nature of the parent rock and moderately high rainfall (25–30 inches annually). The water holding capacity is quite variable due to the range in soil depth. There is a severe erosion hazard for these soils if they are exposed and unvegetated due to moderately steep slopes, moderately high rainfall, and loamy or moderately coarse textures. The organic matter content of the surface layer generally ranges from 1%–3% by weight.

Soil mapping was conducted in central Tulare County by the Soil Conservation Service from 1970 to 1977. The results of this project (Stevens 1982) include maps delineating the various soil types in the area and detailed descriptions of each type with their biotic and abiotic parameters.

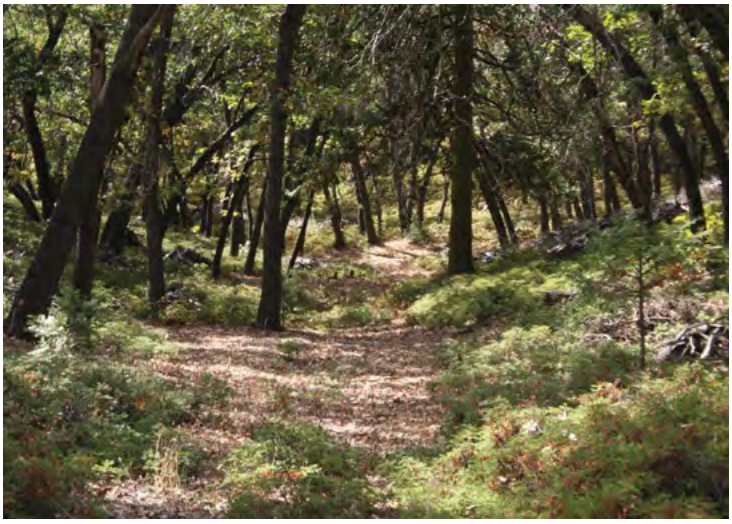
3.3.2 Climate and Climate Change

Climate

The climate of the area is generally one of hot, dry summers and cool, moist winters. During the summer months, a high pressure system off the west coast of California generally prevents precipitation in the foothill region. In winter, this high pressure system is intermittent, giving way to Pacific storms that bring rainfall to the lower foothills and snow to the higher elevations and the Sierras.

Annual precipitation near the refuge from lowest to highest elevations ranged from 36.5 to 38.5 inches per year based on average climate conditions from 1971–2000, with the lowest precipitation occurring in July (average of 0.13 inches) and the greatest precipitation occurring in March (7.3 inches) (PRISM 2011). Approximately 79% of annual precipitation generally occurs from November through March. No trends in seasonal or annual precipitation were observed.

Annual average temperature near the refuge from lowest to highest elevations ranged from a minimum of approximately 44 to 45 degrees F to a maximum of approximately 62 to 65 degrees F based on average climate conditions from 1971 to 2000. The lowest temperatures occur in January and February (ranging from a monthly



California black oak forest, Blue Ridge NWR. Photo: USFWS

minimum of approximately 33 to 36 degrees F and a monthly maximum of approximately 46 to 50 degrees F), and the highest temperatures occur in July (ranging from a monthly minimum of approximately 58 to 60 degrees F and a monthly maximum of approximately 81 to 85 degrees F).

While temperature patterns were mostly increasing or decreasing over time, sharp increasing trends in annual maximum and minimum temperature were observed since 1980, with similar patterns in monthly temperatures in all seasons. An abnormal hot period was observed late in the 20th century from about 1996 to 2005 for all months, followed by several colder years, which may have accentuated overall trends.

Climate Change

The Blue Ridge NWR is located in the southern Sierra Nevada Ecoregion (PRBO 2011). Climate change information for this ecoregion is presented in this section, with the focus on middle to lower elevations and southern areas of the Sierra Nevada Ecoregion. Unless otherwise specified, projections in percentage or magnitude are compared to normal current conditions for the area.

The projected impacts of climate change on temperature in the Sierra Nevada will be warmer winter temperatures, earlier warming in the spring, and increased summer temperatures (PRBO 2011). Topographic diversity in this ecoregion will likely result in high variability in the magnitude of temperature increases. Spring melt timing has in the past and will be likely in the future to advance more rapidly on the west slope than the east slope due to weakening westerly winds (Lundquist and Cayan 2007). Regional climate models project that by 2070, mean annual temperature will increase by approximately 3.2 to 4.0 degrees F from current normal temperatures, and that diurnal temperature (difference between maximum daily and minimum daily temperature) will increase by 0.2 to 0.4 degrees F (PRBO 2011). Other climate models indicate an average annual temperature increase ranging from 4.1 to 6.8 degrees F by the end of the 21st century, based on lower and higher emissions scenarios, respectively (IPCC 2007). The greatest warming will likely occur in July with increases ranging from 5.4 to 9.2 degrees F (PRBO 2011). Direct mortality of many wildlife species is unlikely due to moderate climates, but thermal stress may increase, especially at lower elevations and for species with narrow temperature ranges.

The projected effects of climate change on total precipitation in the Sierra Nevada remain highly uncertain, due to variability in results from climate models and emissions scenarios, and variability in topography and climate in this region. In the Sierra Nevada, regional climate models project a decrease in mean annual rainfall of 3.6 to 13.3 inches (-10% to -5%, respectively). Other sources predict that precipitation will increase on average by 2%–7% in the Sierra Nevada by 2070, with a sharp increase in winter precipitation of 6%–13% (Maurer and Duffy 2005). Other sources show that an increase may not be constant with time, however; Maurer et al. (2007) predicted a 5% increase in precipitation by 2040 and comparable decreases from 2040 to 2070 under the low emission scenario. Maurer et al. (2007) showed that with higher emissions scenarios, there is no statistically significant increase in annual precipitation in this region.

Although predicted total precipitation changes are uncertain or insignificant, climate models indicate significant decreases in end-of-year snowpack in the Sierra. Knowles and Cayan

(2002) project a decline of 5% by 2030, over 33% by 2060, and approximately 50% by 2090, with the largest decreases in lower elevations and 85% of the losses occurring between 6,000 and 11,000 feet in the southern Sierra (Blue Ridge NWR lands are located between approximately 4,000 and 6,000 feet in elevation). Hayhoe et al. (2004) report non-constant changes in snowpack with time, with predicted snowpack decreases in low elevations (3,300 feet to 6,600 feet) ranging from 58%–66% for the period 2020 to 2049 and decreases of 65%–97% for the period 2070 to 2099. Similarly, Cayan et al. (2008) predict non-constant losses in these elevations ranging from 13%–48%, 26%–68%, and 60%–93% for the periods 2005–2034, 2035–2064, and 2070–2099, respectively. Recent changes in the latter half of the 20th century (1950–2002), however, may not inform these dramatic increases projected by climate change models, with insignificant changes in overall snowpack volume (Howat and Tulaczyk 2005). Loss of snowpack may appear as early runoff, with higher runoff peaks prior to April and a reduction in snowmelt driven flows in subsequent months. Because snowpack volumes are highly based on precipitation projections, which have high uncertainty, snow water volume projections also carry high uncertainty.

As a result of warming temperatures, declining snowpack and changes in the timing of snowmelt will result in earlier runoff and reduced spring and summer streamflows in the Sierra Nevada region. For the southern Sierra, climate change simulations indicate decreases in annual streamflow of 14%–23% for the period 2020 to 2049 and decreases of 30%–43% for 2070 to 2099. Predicted deviations in annual streamflow are also highly variable, ranging from minus 33 to plus 17 over the period 2020 to 2070 dependent on emissions scenario used, with greater deviations later in the century (Hayhoe et al. 2004). From model projections of changes in

Communication towers at Blue Ridge NWR. Photo: USFWS

Sierra streamflow under higher and lower emission scenarios, Maurer et al. (2007) reported there is high confidence of increasing winter streamflow as a result of temperature-driven effects of an increased proportion of rain versus snow and increased snowmelt, and, secondarily, increasing winter precipitation. Also, there is a high confidence of decreasing streamflow in late spring and summer.

There is general consensus that increasing greenhouse gasses and climate change will result in larger and more intense fires in a number of vegetation types in the Sierra Nevada Ecoregion. However, these conditions may lead to vegetation shifts that support less severe wildfire regimes. Grasslands experienced more substantial increases in the projected frequency of fast-spreading fires compared to brush. Westerling and Bryant (2008) projected that the probability of large fires (greater than 494 acres) will increase under drier conditions projected by high emissions scenarios and particularly on the west slope and in the foothills.

Blue Ridge NWR. Photo: USFWS

Vegetation change. Decreases in Sierra mixed conifer/white fir/Jeffrey pine (12%–32%) were projected to 2070, whereas ponderosa pine/Klamath mixed conifer and blue oak/foothill pine were projected to increase by 55%–97% and 23%–97%, respectively. Lenihan et al. (2008) show general decreases in conifer and alpine/subalpine forest and increases in grassland and mixed evergreen by 2070 to 2099. This shift might be hastened by changes in fire severity and frequency (PRBO 2011).

Threats to wildlife. A predominant effect of climate change on wildlife populations in the Sierra Nevada region will likely result from changes in vegetation communities. These changes will include increases in the amount of grassland and oak/pine vegetation, and a loss of conifer dominated vegetation, especially at higher elevations (e.g., red fir/lodgepole pine/subalpine conifer). This shift may be hastened by changes in fire severity and frequency. While high temperature events will become more common, it seems unlikely that these temperatures will be high enough to cause direct mortality, as temperatures in much of this region are relatively moderate. However, thermal stress may be possible at the lowest elevations and/or for species with very narrow temperature tolerance levels. There will be severe changes in the timing of peak streamflows, with these flows occurring earlier in the spring. These changes may have important consequences for species sensitive to changes in seasonal phonologies and those dependent on a specific environmental trigger that is disrupted by changes in streamflow timing.

3.3.3 Historic Role of Fire

Fire has been an important ecological disturbance in all of the vegetation types found at Blue Ridge NWR. The majority of the species present have characteristics that promote resistance to fire (e.g., sprouting, thick bark, improved establishment on mineral soil, heat-stimulated seed germination), and most respond favorably to fire. Historically, fire was frequent in the refuge's habitat types, occurring on average every 2 to 20 years (Wagener 1961, Skinner and Chang 1996). Ignition sources were provided

by lightning and Native Americans, who used fire extensively for cultural purposes (Anderson 2006). In mixed conifer and black oak communities, fires were generally large surface fires with low to moderate intensity and severity (van Wagtendonk and Fites-Kaufman 2006, Sawyer et al. 2009). This fire regime maintained a relatively open forest structure with some areas of denser vegetation (Gruell 2001). High-severity fires likely occurred, but would have been infrequent and of much smaller size. Areas dominated by chaparral burned less frequently than those dominated by conifers, and with high intensity and severity (van Wagtendonk and Fites-Kaufman 2006).

Active fire suppression and displacement of Native Americans and their influences in the last 150 years have resulted in dramatic changes to fire regimes and forest structure. In the absence of fire, mixed conifer stands have become very dense with incense cedar (Calocedrus decurrens) and white fir (Abies concolor), and black oak stands are typically invaded by conifers. Surface and ladder fuels have accumulated substantially. Consequently, most fires in the vicinity currently burn as crown fires with high intensity and severity (Skinner and Chang 1996, van Wagtendonk and Fites-Kaufman 2006). No wildfires have been reported on Blue Ridge NWR since its establishment in1982; however, the potential exists for large, high-severity fires to start on the refuge or burn onto the refuge from surrounding lands.

3.3.4 Air Quality

The refuge is in California's San Joaquin Valley Air Basin (Valley). Air quality in the Valley is among the worst in the United States. The San Joaquin Valley Unified Air Pollution Control District is the agency responsible for ensuring compliance with federal and state air quality standards in the Valley. The federal and state governments have each established ambient air quality standards for several pollutants. Most standards have been set to protect public health. However, standards for some pollutants are based on other values such as protecting crops and materials and avoiding nuisance conditions. Currently, the Valley is federally classified as a nonattainment area for ground-level ozone and particulate matter less than 10 microns in diameter (PM10). In addition, the Valley is classified as a severe nonattainment area for the California ozone standard and nonattainment for the PM10 standard. The Valley is in attainment or has not been classified for all other criteria pollutants.

Background information about ozone, carbon monoxide, and particulate matter (PM10) is presented in the Air Quality section for Hopper Mountain NWR. On-road motor vehicles are the largest contributors to NOx emissions in the Valley. A significant portion of the stationary source ROG emissions are fugitive emissions from the extensive oil and gas production operations in the southern Valley. The majority of the CO emitted in the Valley comes from motor vehicles. The primary sources of PM10 in the Valley are fugitive dust from paved and unpaved roads and agricultural operations. Soil type and soil moisture content are important factors in PM10 emissions. Towns within the Basin, located in proximity to the refuge, Springville and Porterville are considered sensitive areas.

3.3.5 Water

Because of dry summers and topography, water is not abundant on Blue Ridge. Except for small tributaries, all major rivers and creeks in the area, such as Yokohl Creek, the south fork of the Kaweah River, and the north fork of the Tule River, occur at lower elevations outside the refuge.

There are no perennial streams located within the approved acquisition boundary. Winter and spring runoff drains into intermittent streams, which dry up in early summer. Ground water is found within the fracture systems and decomposed granitic bedrock areas (USFWS 1978). A stock pond impoundment of less than one-quarter acre exists in the southern part of the refuge that is difficult to access.

▼ Blue Ridge NWR Biological Environment

3.3.6 Vegetation

White Leaf Manzanita – Common Chamise Chaparral

White leaf manzanita - common chamise chaparral (*Arctostaphylos viscida-Adenostoma fasciculatum* Association) is the most predominant vegetation type on the refuge, covering nearly 400 acres,

or roughly 45% of the refuge lands. It dominates the hotter, drier slopes in the central portion of the refuge, as well as much of the southeastern portion of the refuge, which contains rocky soils and southerly-facing slopes. White leaf manzanita plants can grow to over 12 feet tall and form extremely dense thickets that are nearly impenetrable. Because the vegetation is also extremely flammable, it creates a considerable fire hazard in the dry summer months. Species commonly found in this plant community include white leaf manzanita (*Arctostaphylos viscida*), common chamise (*Adenostoma fasciculatum*), mountain mahogany (*Cercocarpus betuloides*), chaparral whitethorn (*Ceanothus leucodermis*), greenleaf manzanita (*Arctostaphylos patula*), and Sierra hoary coffeeberry (*Frangula californica* ssp. *cuspidata*).

California Black Oak Forest and Savanna
California black oak forest and woodland (*Quercus kelloggii* forest alliance) is the second-most abundant vegetation type on the refuge, covering nearly 325 acres or almost 37% of the refuge lands. This vegetation type is highly variable and includes several different plant associations within the refuge. In the northern part of the refuge, adjacent to the mixed conifer forest, California black oak forms nearly pure stands of closed-canopy forest with understory vegetation dominated by mountain misery (*Chamaebatia foliosa*). In the central part of the refuge, California black oaks form mixed stands with numerous other species, including ponderosa pine (*Pinus ponderosa*), California bay (*Umbellularia californica*), canyon live oak (*Quercus chrysolepis*), Oregon oak (*Quercus garryana*), interior live oak (*Quercus wislizeni*), and whitethorn manzanita (*Arctostaphylos viscida*). In the southern portion of the refuge, California black oak forms moderately open woodlands with an understory of mostly annual non-native grasses such as annual dogtail (*Cynosurus echinatus*), soft chess (*Bromus hordeaceus*), ripgut brome (*Bromus diandrus*), and cheatgrass (*Bromus tectorum*).

Mixed Conifer Forest
Mixed conifer forest (*Pinus ponderosa-Calocedrus decurrens* forest alliance) covers approximately 15% of the refuge, or roughly 135 acres. It is found exclusively in the northern portion of the refuge at elevations above 5,000 feet. The tree canopy is closed with common overstory species, including ponderosa pine (*Pinus ponderosa*), incense cedar (*Calocedrus decurrens*), black oak (*Quercus kelloggii*), and white fir (*Abies concolor*). Sugar pine (*Pinus lambertiana*) is less common and is found along the north-facing slope at the northern tip of the refuge. The understory varies from sparse to dense and is generally dominated by mountain misery (*Chamaebatia foliosa*), often as a monoculture.

Riparian/Wetland
Blue Ridge NWR contains several small riparian areas and wetlands. In the northern portion of the refuge, narrow drainages are likely to contain vegetation such as California bay laurel (*Umbellularia californica*), viscid monkey flower (*Mimulus viscidus*), rushes (*Juncus* spp.) and sedges (*Carex* spp.). In the southern portion of the refuge, at least one spring has been documented, which has created a small wetland area dominated by at least one species of rush (*Juncus* sp.). This wetland is a very narrow channel that stretches for a hundred yards or more, but is below tree cover and also too small to be identified in aerial photography. It therefore is not shown on the Blue Ridge NWR vegetation/landcover figure, although the spring that feeds this wetland is identified on that map. A small man-made pond also exists in the southern portion of the refuge. This pond also has an associated small wetland area.

3.3.7 Wildlife

Mammals of the area include mule deer, raccoon, western spotted and striped skunks, bobcat, mountain lion, gray fox (*Urocyon cinereoargenteus*), and black bear. Other mammals include the California myotis (*Myotis californicus*), plus many rodents such as the California mouse (*Peromyscus californicus*), deer mouse (*P. maniculatus*), pinyon mouse (*P. truei*), and the Merriam chipmunk (*Neotamias merriami*).

Some of the more common birds of the area include the wrentit (*Chamaea fasciata*), western scrub jay, and orange-crowned warbler (*Vermivora celata*). Aside from the California condor, common raptors include the great horned owl, golden eagle, red-tailed hawk, and Cooper's hawk.

Juvenile horned lizard. Photo: USFWS

One amphibian species has been observed on Blue Ridge NWR: the Sierran treefrog (*Pseudacris sierra*) (formerly recognized as *P. regilla*).

At least 10 reptile species have been described on BLM lands surrounding the refuge (USBLM 1985). Since the BLM lands and the refuge lands contain similar land elevations, contain similar habitats, and are adjacent to each other, we suspect the reptile species found on the BLM lands would also be found on refuge lands. These reptiles species include Sierra alligator lizard (*Elgaria coerulea palmeri*), western fence lizard, (*Sceloporus occidentalis*), Gilbert's skink (*Plestiodon gilberti*), Blainville's horned lizard (*Phrynosoma blainvillii*), western yellow-bellied racer (*Coluber constrictor mormon*), Pacific gopher snake (*Pituophis catenifer catenifer*), and northern Northern Pacific rattlesnake (*Crotalus oreganus oreganus*). A list of wildlife and plant species found on the refuge is included in Appendix E.

3.3.8 Special Status Species

According to the Service's Sacramento Fish and Wildlife Office, there are 1 plant and 6 wildlife species that are federally-listed as endangered or threatened and that may occur in the Blue Ridge area. The species are addressed in the following sections. Lists of special status plant and wildlife species are included in Appendix E.

Special Status Plants
This section includes special status plants that are: a) plants that are federally listed or proposed for listing as threatened or endangered, and species that are "candidates" for listing by the Service under the provisions of the Endangered Species Act; b) species listed by the state as threatened or endangered; and c) species that have been observed on Blue Ridge NWR and are ranked 1B in the California Native Plant Society's (CNPS) California Rare Plant Rank *(http://www.cnps.org/cnps/rareplants)*.

Plant communities are discussed in section 3.3.6 Vegetation, in this chapter.

Three special status plants occur in the Blue Ridge area. The Kaweah brodiaea (*Brodiaea insignis*), Springville clarkia (*Clarkia springvillensis*), and striped adobe-lily (*Fritillaria striata*). The first 2 species occur exclusively in the foothill woodland plant community (USBLM 1985). Surveys would be needed to determine if these plants are present at the refuge.

Kaweah brodiaea
The Kaweah brodiaea is listed by the state of California as endangered and is ranked by the CNPS a California Rare Plant Rank 1B.2 (fairly endangered in California). Habitat for this perennial herb is granitic or clay soils in cismontane oodland, meadows, seeps, and valley and foothill grasslands. It is known to grow along the South Fork of the Kaweah River (USBLM 1985).

Springville clarkia
Springville clarkia is federally-listed as threatened and state-listed as endangered. This plant is also ranked by the CNPS a California Rare Plant Rank 1B.2. It is endemic to Tulare County and is known from fewer than 20 occurrences around the Springville area (CNPS 2012). Habitat for this plant is chaparral, cismontane woodland, and grasslands up to approximately 4,000 feet msl. Springville clarkia grows in sandy gravelly loams; it is known to grow along the Balch Park and Bear Creek Roads in the Tule River Valley and elsewhere. At the time of the 1985 Blue Ridge Habitat Management Plan (USBLM 1985), neither the Springville clarkia or the Kaweah brodiaea had been recorded within the Blue Ridge Wildlife Habitat Area; however, the Kaweah brodiaea has been recorded on nearby state lands.

Striped adobe-lily
Striped adobe-lily is listed by the state as threatened, and is ranked by CNPS as a California Rare Plant Rank 1B.1 (considered to be seriously endangered in California). Habitat for this perennial herb is usually clay soils, cismontane woodland, and valley and foothill grassland (CNPS 2012). Habitat for this plant occurs on Blue Ridge NWR. Surveys would be needed to determine if striped adobe-lily grows on the refuge.

Special Status Wildlife

Blue Ridge NWR lands are within the Blue Ridge condor area in Tulare County and are designated as critical habitat for the California condor. The Service's Sacramento Fish and Wildlife office's database of Federal Endangered and Threatened Species includes the endangered California condor. The database includes federally-listed species for which there may be habitat, but the species are not known to occur at the refuge: the threatened California red-legged frog (*Rana draytonii*), the endangered southern California distinct population segment of the mountain yellow-legged frog (*Rana muscosa*), and the candidate species the fisher (*Martes pennanti*). The database also

Springfield clarkia © 2011 CNPS, San Luis Obispo Chapter

includes the threatened valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) and delta smelt (*Hypomesus transpacificus*). Based on the range of the species, the beetle is not expected to occur on the refuge. There is no habitat for the delta smelt at Blue Ridge NWR.

California condor

Currently, Blue Ridge receives very infrequent use by the California condor (estimated at one to two days a year, if any at all). The refuge was established because the historic population commonly used the area for a roost while they foraged in the foothill region of the Sierra Nevada on the eastern side of the San Joaquin Valley. While condor activity in this portion of the historic range is currently infrequent, the general trend is one of increasing activity. The Service anticipates that condor activity on Blue Ridge NWR and surrounding areas will continue to increase as their range continues to expand and the population recovers.

Like the Hopper Mountain and Bitter Creek refuges, Blue Ridge NWR alone does not possess nearly enough habitat or the resources capable for sustaining a population of condors. Rather it would serve as it did historically as a roost to the nearby foraging regions in the foothills of the Sierras. Local and regional conditions are therefore also very important factors when considering how the habitat on the refuge fits into the larger region. The availability of nearby nesting and foraging habitat is extremely important to the function that the refuge serves as a condor roost location. The absence of condors in the region due to their extirpation from the wild has meant the local region surrounding Blue Ridge has had little to no condor activity in many years. Still, the eventual recolonization means it is necessary to maintain appropriate habitat and ensure compatible land use for condor habitat in the Sierra Nevada foothill region.

California red-legged frog

Surveys would be needed to determine whether the California red-legged frog, or its habitat exists on Blue Ridge NWR. A species account for the California red-legged frog is provided under the Special Status Wildlife section for Hopper Mountain NWR.

Fisher

Surveys would be needed to determine whether the federal candidate to become a proposed species for listing, the fisher, occurs at the refuge. It is not a state-listed species. The fisher is a member of the order Carnivora, family Mustelidae. Fishers have a slender weasel-like body with relatively short legs and a long well-furred tail (Douglas and Strickland 1999). Fishers appear uniformly black from a distance, but in fact are dark brown over most of their bodies with white or cream patches distributed on their undersurfaces (Powell 1993).

In general, studies indicate fisher prefer late seral forest habitat and require some of the habitat attributes or elements of late seral forests such as high canopy cover, large diameter trees, large snags, and large down logs for denning and resting habitat. Individual fisher may occupy and use multiple of these elements within their large home ranges. Foraging habitats include the understory of late successional forests as well as openings/ patches that support understory vegetation and prey species in proximity to high canopy cover stands (CDFG 2010b).

The southern Sierra Nevada population is considered low and has been model estimated at fewer than 500 individuals, although it is unknown what the capacity for increase in fisher numbers is in the area; or what the population level should be to be considered high. What seems more relevant is that the population may be limited by space as its only route or link for expansion is north up along the central Sierra Nevada. Predictive models of extinction risk suggest the population is at risk, yet it has been a sustaining (or recovering) population compared to elsewhere in the Sierra Nevada since the intensive trapping era of the past (CDFG 2010b).

Mountain yellow-legged frog

Surveys would be needed to determine whether the endangered southern California distinct population segment (DPS) of the mountain yellow-legged frog (*Rana muscosa*) occurs on the refuge. Due to recent changes in scientific and common names associated with the populations, the scientific name will be used in this section. Elevation range in the Sierra extends from 4,500 feet to over 11,980 feet (Jennings and Hayes 1994).

In the Sierra, *R. muscosa* is associated with streams, lakes and ponds in montane riparian, lodgepole pine, subalpine conifer, and wet meadow habitats (CDFG 2008).

R. muscosa feeds primarily on aquatic and terrestrial invertebrates and favors terrestrial insects. Tadpoles graze on algae and diatoms along rocky bottoms in shallow water of streams, lakes, and ponds. During winter, adults apparently hibernate beneath ice-covered streams, lakes, and ponds. This aquatic species is always encountered within a few feet of water. Terrestrial hibernation has not been reported. Typical home ranges for this species are probably less than 33 feet in the longest dimension. Occasional movements up to 165 feet may be associated with habitat deterioration, especially drying. *R. muscosa* is one of the few high-elevation amphibians of the Sierra Nevada and southern California (CDFG 2008).

In 2004, when the north and south populations were considered to be one species, University of California Berkeley (2004) reported that *Rana muscosa* had declined dramatically despite the fact that it occurs almost entirely on protected public land. Several hypotheses have been proposed to explain the puzzling decline including introduced species, ultraviolet radiation, air pollution, climate change, and novel pathogens (UCB 2004).

3.3.9 Contaminants

In 2001, a Contaminant Assessment Process (CAP) was conducted for Blue Ridge NWR. Mill Creek, Outside Creek, and Sandy Creek are all at lower elevations than or outside the refuge and, therefore, contaminants are not likely to reach the refuge via surface water pathways. Winds from the east and northeast would come from the California desert region; the 2001 CAP report cited minimal concern for contaminants being carried from the east and northeast.

Winds from the south, west and southwest may carry contaminants originating from the Los Angeles basin. Metropolitan Los Angeles, an area of over 8 million people, is located southwest of the refuge. Contaminants include NO2, CO, CO2, and SO4, as well as particulate matter. More information is provided in the section on Air Quality for Blue Ridge NWR in this chapter. Airborne material associated with agricultural practices (pesticides/herbicides) may also be carried in a south wind. Because of the remoteness of the refuge, contaminant concerns for Blue Ridge NWR are low.

▼ Blue Ridge NWR Socioeconomic Environment

3.3.10 Local Population Base

The local area economy can be characterized as agricultural, with an emphasis on cattle ranching. There is some logging activity in the area, but this has been sporadic because of annual fluctuations in the allowable timber harvested by the adjacent Sequoia National Forest.

The closest community is the unincorporated town of Springville, approximately 12 miles south of the refuge. Springville, located on State Highway 190, is a major rural service center for the area and offers shopping facilities, a library, post office, fire protection, and an elementary school.

Recreation is an important industry, and demand is expected to increase. Springville is ideally located for providing recreation-oriented services because of its close proximity to the Giant Sequoia National Monument and Sequoia National Forest.

Area Growth
Tulare County is home to a growing population of 441,481 people. Forecasts provided by the California Department of Finance call for the population to nearly triple over the next 50 years. In fact, the county has grown by more than 122,000 people in just the past 20 years (1980–2000) and is expected to double in size by 2030.

A development proposal has been submitted to Tulare County for Yokohl Ranch, a 10,000-home planned community on 36,000 acres that borders the state's Blue Ridge Ecological Reserve, the BLM's Wildlife Habitat Area, and the refuge. This community is proposed to be built in phases and will have a lodge, trails, parks, and public and private golf courses.

3.3.11 Public Use

Aesthetics
Blue Ridge NWR is a prominent ridge overlooking the Central Valley approximately 11 miles north of Springville, California. The refuge includes a variety of vegetation and wildlife, as described in this chapter. A number of large tree snags rise above the chaparral and offer roost sites for California condors.

Recreation
Blue Ridge NWR is currently closed to public use due to the highly sensitive California Condor Recovery Program activities that take place there. However, wildlife-dependent recreation is available on adjacent public lands, including the Sequoia National Forest, managed by the U.S. Forest Service.

Visitation
Since the establishment of Blue Ridge NWR, public access has not been permitted due to the sensitivity of Recovery Program activities, limited staffing to conduct visitor services and interpretation, and public safety issues.

Visitor Facilities
Blue Ridge NWR has no visitor-oriented facilities or interpretive signage for the public.

Management Considerations
Public access is currently not allowed on Blue Ridge NWR to protect critical habitat for California condors and because of staffing limitations. The refuge is remote, and emergency services are not readily available. Refuge personnel are expected to uphold the highest caution while travelling on refuge roads, especially during muddy, wet weather to avoid erosion and accidents. In neighboring areas of the national forests, illegal marijuana plantations and associated risks with plantations such as wildfire starts, use of surface water, and employee safety have posed management concerns and are likewise potential management concerns to the Service on remote refuges such as Blue Ridge NWR.

The future management of public use at the refuge is described in Chapter 4.

3.3.12 Structures and Facilities

There are no structures located on Blue Ridge NWR. Bordering the northeast portion of the refuge, there are a number of private residences, several state-owned structures, and 4 large communications antennas along with a number of smaller ones. While the communications equipment and state-owned structures lie within one-quarter mile east of the refuge boundary, approximately 9 private residences lie within 1 mile east of the boundary. The communications towers and state-owned facilities are located on the summit of Blue Ridge, uphill from the refuge, while the private residences are located along the road that follows the ridgeline down from the summit on the opposite side of the refuge.

A microwave station is located approximately one-half mile north and east of the refuge.

3.3.13 Archaeological and Historical Resources

To date, only limited assessments have been conducted on cultural resources in the general Blue Ridge area. In 1984, a BLM archaeologist implemented a survey on a 1-acre project site in the Blue Ridge area, resulting in no recorded cultural resource (USBLM 1984). Whether this work was done on lands that later became the refuge in 1982 is unknown at the time of this writing. It appears that none of the 897-acre Blue Ridge NWR has been systematically surveyed.

Chapter 4. Management Direction; Refuge Complex Goals, Objectives and Strategies

Headwall, Bitter Creek NWR. Photo: USFWS

4.1 Introduction

The Service's priorities for refuge management derive from the individual refuge purpose(s), the National Wildlife Refuge System (Refuge System) mission, laws that specify Service trust resources, and the mandate to maintain the biological integrity, diversity, and environmental health of all refuges. Management on each refuge should, first and foremost, address the individual refuge purpose. Purposes are the essential objective of our refuge stewardship. They are the legislative, legal, and administrative foundations for administration and management of a unit of the Refuge System. This includes establishment of goals and objectives and authorization of public uses, which must be shown to be compatible with the refuge purpose(s) before they are allowed.

Service trust species are designated by various statutes governing the agency, as well as treaties the Service is charged with implementing. These trust species include migratory birds, inter-jurisdictional fish, marine mammals, and federally-listed threatened and endangered species. Although refuge purposes are the first and highest obligation, management for trust species, when appropriate, is a priority for management on a refuge (601 FW 1.9B). Furthermore, management for trust species directly supports the Refuge System mission.

An additional directive to be followed while achieving refuge purposes and the Refuge System mission relates to biological integrity, diversity, and environmental health. This requires that we consider and protect the broad spectrum of native fish, wildlife, plant, and habitat resources found on a refuge: "In administering the Refuge System, the Secretary shall…ensure that the biological integrity, diversity, and environmental health of the [Refuge System are maintained for the benefit of present and future generations of Americans…" (Refuge Improvement Act, Section 4(a)(4)(B). The Hopper Mountain, Bitter Creek, and Blue Ridge NWRs, in conjunction with other public lands and waters, provide a biological safety net for native species, trust resources, and state and federally-listed species that offset the historic and continued loss of habitats within the ecosystem.

Public uses are allowed on refuges only if they are determined to be appropriate and compatible with the purposes of a refuge. The Refuge Improvement Act identifies 6 priority wildlife-dependent public uses: hunting, fishing, wildlife observation and photography, and environmental education and interpretation. Four of the 6 priority wildlife-dependent public uses (wildlife observation and photography, and environmental education and interpretation) will be provided at a level that is feasible and compatible.

The sections that follow contain a summary of the proposed action (preferred alternative) and its associated goals, objectives, and strategies that will define the management direction of the Hopper Mountain, Bitter Creek, and Blue Ridge NWRs for the next 15 years.

4.2 Definitions of Key Terms

One of the most important parts of the Comprehensive Conservation Plan (CCP) process for all refuges in the Refuge System is the development and refinement of each refuge's vision and goals. See Chapter 1 for the vision statements developed for each refuge. In addition to developing management goals for each refuge, objectives and strategies were developed to help the refuges achieve these goals. These key terms are defined in the following text.

- *Goals:* Broad statements of the desired future conditions for refuge resources. Refuge goals may or may not be feasible within the 15-year time frame of the CCP.
- *Objectives:* Objectives are derived from goals and provide a foundation for determining strategies, monitoring refuge accomplishments, and evaluating success. The number of objectives per goal will vary, but should be those necessary to satisfy the goal. Where there are many objectives, an implementation schedule may be developed.
- *Rationale:* The rationale or basis for developing each objective is included after each objective. The degree of documentation will vary but typically includes logic, assumptions, and sources of information. This promotes informed debate on the objective's merits, provides continuity in management through staff turnover, and allows reevaluation of the objective as new information becomes available.
- *Strategy:* A specific action, tool, technique, or combination of actions, tools, and techniques used to meet an objective. Multiple strategies can be used to support an objective.

4.3 Organization

Under each goal, each objective and each strategy are given a unique numeric code for easy reference. Objectives have a 2-digit code (e.g., 1.1, 1.2, 2.1, 2.2). The first digit corresponds to the goal to which the objective applies. The second digit is sequential. Similarly, each strategy has a 3-digit code (e.g., 1.1.1, 1.1.2, 2.1.1, 2.1.2). The first and second digits refer to the appropriate goal and objective, respectively. The third digit is sequential.

4.4 Summary of the Preferred Plan

Implementing the proposed action would result in refuge lands being protected, maintained, restored, and enhanced for the California condor, migratory birds, resident wildlife, and threatened, endangered, and other special status species. Increased wildlife and plant census and inventory activities would be initiated to develop the baseline biological information needed to implement, monitor, and evaluate management programs on the refuges. All management actions would be directed toward achieving the purposes of the refuges, while contributing to other state, regional, and national goals. The impacts of climate change would be considered in making future management decisions. A narrative summary of the preferred actions for each refuge are presented in this section. Detailed descriptions of the goals, objectives, and strategies (actions) for each refuge are presented in the following section.

Hopper Mountain National Wildlife Refuge

Condor management activities at Hopper Mountain NWR include: all ongoing actions plus expand monitoring and maximize condor survivorship; evaluate the historic-era equipment barn near the house and build a new, earthquake-resistant pole barn; replace obsolete temporary quarters to increase the housing capacity by up to 8 employees to total up to 16 employees; expand coordination with neighboring land owners to enhance foraging habitat; survey, map, and monitor condor roosts; and enhance nest habitat quality by maintaining the refuge as closed to the public. Also, measure and reduce the carbon footprint for refuge operations.

Wildlife and habitat management activities at Hopper Mountain NWR include: gather baseline data and conduct surveys for special status species; develop partnerships for research supporting refuge goals; implement more actions to enhance quality of grassland, riparian, southern California black walnut, and oak woodland habitat for migratory and other birds and wildlife; more actions to prevent invasive plants and animals and develop an Integrated Pest Management (IPM) Plan for early detection/rapid response; and add a maintenance worker position to support all habitat management activities (shared with the other refuges in the Refuge Complex).

Grassland – Develop a grassland management program as part of a step-down Habitat Management Plan (HMP) that addresses climate change; develop best management practices for invasive plants; and evaluate the use of prescribed fire to reduce fuel loads and for habitat management.

Riparian – Develop riparian and wetland management programs as part of the HMP; develop an annual monitoring program; inventory springs; partner with oil and gas operators and develop riparian management practices to share with them to protect riparian resources; replace existing water control structure to improve adaptive management; and manage water to improve wildlife value for special status species.

Black walnut and oak woodland – Reduce fuel loads to sustain regeneration of woodlands; develop a walnut and oak woodland management program as part of the HMP; and promote sustainable age class distribution.

Visitor services at Hopper Mountain NWR include: all ongoing actions plus develop a Visitor Services Plan; increase outreach, volunteer opportunities, and interpretation by updating outreach materials, expanding the refuge website, and developing a refuge brochure and/or newsletter; coordinate with U.S. Forest Service on condor interpretation; offer at least 4 regular annual refuge tours; increase safety by adding a law enforcement officer for the refuge (shared with the other refuges in the Refuge Complex); and post the entire boundary.

Oil and gas extraction – Information about the 4 oil and gas pads at Hopper Mountain NWR are presented in Chapter 3. The locations of the pads are shown in the figure included with the Wilderness Review appendix to the CCP. Service Manual 612 FW 2, Oil and Gas, section 2.4, sets forth objectives of oil and gas management on Service lands: Protect wildlife populations, habitats, and other resources; and provide for the exercise of non-federal oil and gas rights while protecting Service resources to the maximum extent possible.

The Service seeks to improve the framework for managing and overseeing oil and gas activities on national wildlife refuges within existing policy. Additionally, refuge staff may seek training to oversee basic oil and gas activities with a focus on fully identifying potentially adverse effects and potential cleanup costs.

Bitter Creek National Wildlife Refuge

Condor management activities at Bitter Creek NWR supporting the California Condor Recovery Plan (CCRP) include: all ongoing actions in Alternative A plus construct a 1,000-square-foot basic veterinary care lab facility to maximize productivity and survivorship; expand temporary quarters for staff and volunteers by adding 2 RV hookups; expand condor monitoring; enhance condor foraging and roosting habitat; pursue possible land trades or cooperative agreement with Bureau of Land Management (BLM) in the Bitter Creek area to consolidate management of Headwall oaks roost area; remove unneeded internal fencing and replace some with wildlife-friendly fence to promote native ungulate movement to benefit condor foraging; and measure and reduce the carbon footprint (emissions) from refuge operations.

Wildlife and habitat management activities at Bitter Creek NWR include: all ongoing actions plus obtain baseline data on plants and animals with emphasis on special status species on grasslands, riparian and wetland communities, oak and other refuge woodlands; develop an IPM Plan with early detection/rapid response to reduce invasive plants and animals; analyze IPM techniques for invasive species control; reduce internal roads and improve degraded roads; coordinate with adjacent land managers to align management policies; reduce vehicle mortality strikes; reduce man-made barriers to wildlife movement; and add a maintenance worker position to support all habitat management activities (shared with the other refuges in the Refuge Complex).

Grassland – On up to 9,000 acres, use grazing and other methods to achieve a mosaic of short, medium, and tall grass to support San Joaquin Valley special status species (approximately 1,300 acres of short grass), and special status birds (up to 7,000 acres of mosaic of short to tall grass).

Riparian and wetland – Develop a riparian management plan as part of the HMP; restore and enhance riparian resources by modifying water control structures to restore natural flows and adding grazing exclusion fencing; remove invasive tamarisk and selectively replant with native riparian species; survey for vernal pools and unique grasses/forbs; develop an Avian Monitoring Plan; evaluate water rights; install a wind/rain gauge weather station; and conduct bi-annual tricolored blackbird surveys.

Oak woodland – Develop an oak HMP; promote sustainable age class distribution; and remove invasive tree of heaven and selectively replant with native trees.

Visitor services for Bitter Creek NWR include: all ongoing actions plus develop a Visitor Services Plan; open an interpretive walking trail approximately 1-mile-long; remove/restore structures at the former Cliff Hudson home site and install a refuge administrative office and visitor contact station; install a condor observation point on Cerro Noroeste Road; increase outreach, volunteer opportunities, and interpretation by updating outreach materials, expanding the refuge website, developing a refuge brochure and/or newsletter; and enhance safety and law enforcement by posting the refuge boundary, adding a law enforcement officer (shared with the other refuges in the Refuge Complex), and partnering with other agencies to provide refuge law enforcement.

A graphical representation of the proposed visitor services improvements are shown in Figure 4-1. Bitter Creek NWR, Visitor Services.

Blue Ridge National Wildlife Refuge

Condor management at Blue Ridge NWR includes: all ongoing actions plus expand remote condor monitoring; coordinate with partners and communication tower stakeholders to minimize potential adverse effects to condors; survey, map, and monitor refuge roost sites; coordinate with partners on effects of climate change on tree snags, wildfires, and water availability; and measure and reduce the carbon footprint (emissions) from refuge operations.

Wildlife and habitat management at Blue Ridge NWR includes: conduct special status species surveys; develop an IPM Plan for early detection/rapid response to invasive species; use appropriate thinning and prescribed fire to develop old-growth forests; support Fire Safe Councils; protect roost sites from fire; and add a maintenance worker position to support all habitat management activities (shared with the other refuges in the Refuge Complex).

Blue oak, Bitter Creek NWR. Photo: USFWS

Visitor services at Blue Ridge NWR include: develop a Visitor Services Plan; establish hiking trails; install boundary and interpretive signage; update outreach materials; expand the refuge website; develop a refuge brochure; provide at least 1 annual volunteer opportunity; add a law enforcement officer (shared with the other refuges in the Refuge Complex); and collaborate with partners to increase law enforcement.

4.5 Hopper Mountain NWR Goals, Objectives, and Strategies

GOAL 1: *Support the recovery strategies of the California Condor Recovery Program on Hopper Mountain NWR*

Objective 1.1:
Continue to provide on-refuge sites to support the California Condor Recovery Program's (Recovery Program) measures to maximize condor survivorship.

Rationale 1.1:
In 1980, an intensive monitoring and research program was conducted on California condors to investigate the causes of the species' decline. This monitoring of condors identified lead poisoning as a major mortality factor. By 1986, condor mortality in the wild was determined to be too high to promote a sustainable free flying population, and the remaining birds were brought into captivity.

The Recovery Program's California Condor Recovery Plan (CCRP) includes a recovery strategy with 5 key actions needed: 1) establish a captive breeding program, 2) reintroduce California condors into the wild, 3) minimize mortality factors, 4) maintain condor habitat, and 5) implement condor information and education programs (USFWS 1984). In accordance with CCRP section 234, "Released California condors should be closely monitored by visual observation and electronic telemetry." (USFWS 1984). To support the second key action in the CCRP, monitoring the free flying population of condors is conducted to identify threats and reduce adverse effects to condors, including minimizing mortality factors. The ability to monitor condor populations via remote telemetry and GPS provides data that informs wildlife management decisions to minimize condor mortality factors. Providing facilities designated for trapping and holding condors is necessary for attaching tags and transmitters to condors. Monitoring is also required to protect the California condors in accordance with CCRP 234, "Protection should be provided by management plans on public lands… patrolling wildlife authorities, and biologists tracking released birds" (USFWS 1984).

Another of the key actions in the CCRP's recovery strategy is to minimize mortality factors in the natural environment. In accordance with CCRP 45, "Condor blood, feathers, eggshells, and other tissues will be collected opportunistically and analyzed for heavy metals, pesticides, and other potential contaminants" (USFWS 1984). Providing facilities designated for trapping and holding condors is necessary for monitoring contaminant levels and minimizing mortality factors by treating sick or injured condors. The barn provides storage area for CCRP's refuge equipment.

Hopper Mountain NWR is located in a high fire risk area consisting of grasslands and chaparral plant communities. Due to this risk and the frequency at which wild fires occur near the refuge, it is necessary to reduce the fuel load near facilities to prevent their destruction in the event of a fire.

Hopper Mountain NWR Strategies:

1.1.1 Provide and maintain a flight pen and treatment facility to allow for temporary holding of wild condors for condor health assessment, treatment, and transmitter maintenance.

1.1.2 Evaluate the existing historic-era 1,600-square-foot (sf) equipment barn, which is part of the ranch complex to determine eligibility for the National Register of Historic Places. Consultation with the State Historic Preservation Office will be needed regarding planned changes to structures more than 50 years old listed on or determined eligible for the National Register of Historic Places.

1.1.3 Construct a similar, new, earthquake-resistant, 1,600-sf pole barn, and transfer the function and activities from the old barn to the new barn.

1.1.4 Maintain at least 2 condor trap sites (walk-in and double-door trap) to support Recovery Program activities.

1.1.5 Expand remote population monitoring capabilities by providing a site for remote telemetry stations located on-refuge.

Objective 1.2:
Maintain the refuge as a release site to support the California Condor Recovery Program's condor releases into the wild.

Rationale 1.2:
A significant component of the strategies for recovery in the CCRP is the reintroduction of condors in their habitat through the release of captive bred condors into the wild (section 232). From 1992 to the present, Service personnel have been releasing and monitoring California condors in southern California. The California condor population is currently exhibiting a positive growth rate, but this trend is predominately a result of releasing captive reared birds. To date, the annual production of wild-fledged birds has never exceeded the annual mortality of released individuals (USFWS, unpublished data). Therefore, until mortality rates are reduced, the continued release of captive reared condors into the wild is necessary to maintain population growth.

The CCRP mandates the release of California condors in accordance with release plans and established protocols to guarantee the health and safety of the birds being held for release. The CCRP requires monitoring the pre-release population in a flight pen prior to release (section 233) in accordance with the CCRP's annual release plan. Hopper Mountain NWR is surrounded by the Sespe Condor Sanctuary, pristine condor nesting habitat in the Los Padres National Forest, and was designated as a release site area in the CCRP. A newly renovated flight pen was completed on the refuge in the summer of 2010 and is capable of holding and releasing captive bred birds.

Newly released birds are dependent on supplemental food (carcasses) for up to a year as they integrate into the larger free flying population. Unlike newly fledged chicks, captive releases cannot rely on their parents for food for up to a year after they fledge. Supplemental feeding is used near release sites as a substitute for the parental care a young condor would receive prior to becoming independent. There are active baiting stations located on the refuge used for this purpose. Supplemental feeding provides newly released birds the opportunity to feed as they integrate into the wild population and begin finding other sources of carrion. Having multiple stations that can be baited randomly promotes more natural foraging behaviors and reduces the risk of the birds becoming conditioned to any single site. Newly released birds will often remain on the refuge for the first 4–6 months after release and are closely monitored, especially for the first month after release. The supplemental feeding stations that help sustain newly released condors are also used by the rest of the condor population, thus helping newly released condors to integrate into the free flying population.

Service wildlife biologists manage condor populations. Photo: USFWS

During a newly released bird's adjustment to the wild, it may display transitional behavior such as perching in unsuitable locations, going extended durations without eating or drinking, or not responding adequately to threats from predators. Condors need to be properly managed during this period to help maximize their survival and minimize disadvantageous behavior. For the long-term welfare of the birds, it is necessary that

a properly trained field crew closely monitor the newly released birds and the public not be allowed in areas where newly released birds will be present.

Hopper Mountain NWR is situated in a remote, mountainous, and fire-prone environment within southern California. Several times in the last few decades, fires have burned over much of the refuge, most recently in 2007. These fires are often allowed to burn naturally until they reach natural fire breaks or endanger buildings. For the safety of personnel, protection of resources, and safety of birds housed in the flight pen, an annual fuel reduction program is conducted by the refuge personnel and Los Padres National Forest fire crews. These efforts consist primarily of mowing the grass, cutting brush, and cutting small fire break lines around the defensible areas of the Hopper Mountain house and flight pen.

Hopper Mountain NWR Strategies:

1.2.1 Maintain condor flight pen for holding pre-release birds and for releases.

1.2.2 Maintain feeding sites for newly released condors.

1.2.3 Reduce fuels near facilities (mowing), and conduct fire suppression to protect facilities from wildland fires.

1.2.4 Maintain access trails to support condor management activities.

1.2.5 Maintain disturbance-free environment.

1.2.6 Coordinate with ranchers to allow condors to feed on natural livestock mortalities.

Objective 1.3:
By 2020, increase capacity of existing on-refuge temporary quarters to accommodate up to 16 residents to support California Condor Recovery Program activities and academic research.

Rationale 1.3:
Telemetry and GPS transmitter location data illustrate recent condor range expansion in southern California (Brandt and Massey 2009). Currently, there is little use of the southern Sierra Nevada range or the mountainous regions of Santa Barbara and San Luis Obispo counties. As the population recovers, it is expected that condors will reoccupy these once used areas for nesting and foraging.

As the population of California condors expands, a correlated increase of personnel to monitor the birds is necessary. The program also anticipates an increase in partnership involvement, volunteer interest, and education and outreach activity. Currently, Hopper Mountain NWR serves as a base of field operations for the day-to-day monitoring and management of condors by Service staff, partners, and volunteers. Maintaining existing housing, as well as replacing obsolete housing with Service-approved temporary living quarters to accommodate up to 16 people, would allow additional personnel to aid in the recovery of the species and minimize space use conflicts with personnel involved in non-condor related activities.

A group of structures located on the Hopper Mountain NWR serves as a base of operations for the Recovery Program. The Refuge Complex also manages an active release site and conducts monitoring activities for the Recovery Program at the refuge. Due to the remote location of the refuge, staff, volunteers, and partners involved in these activities need temporary quarters. Some of the existing quarters (old trailers) don't meet safety standards and need to be replaced to meet current and future demands for housing. This CCP objective supports some of the key actions in the CCRP (introduce condors into the wild; minimize mortality factors; and maintain condor habitat).

The Service will consider Leadership in Energy and Environmental Design (LEED) standards on new construction to replace unusable housing. LEED is an internationally recognized green building certification system. LEED provides strategies for energy savings, water efficiency, CO2 emissions reduction, improved indoor environmental quality, and stewardship of resources. Developed by the U.S. Green Building Council in March 2000, LEED provides building owners and operators with a framework for identifying and implementing practical and measurable green building design, construction, operations, and maintenance solutions. For more information on LEED, see *www.usgbc.org/DisplayPage.aspx?CMSPageID=1988*.

Hopper Mountain NWR Strategies:

1.3.1 Maintain existing housing and other facilities for use by Service staff, volunteers, and partners (up to 8 residents total).

1.3.2 Replace unusable, obsolete housing (old trailers) with Service-approved temporary living quarters to increase capacity by up to 8 additional residents (Service staff, volunteers, and partners) (up to 16 residents total).

1.3.3 Optimize energy efficiency of new facilities by following Green Building Council's LEED standards.

Objective 1.4:
Maintain existing quantity and quality of condor roosting habitat on-refuge.

Rationale 1.4:
California condors normally roost on large, open, horizontal limbs of tall trees; on steep cliff ledges; on rock outcroppings; or in cliff potholes (Snyder and Schmitt 2002). Often condor roosts are near their foraging grounds (USFWS 1984). While at a roost, condors devote considerable time to preening, sunning, and other maintenance activities. Roosts may also serve some social function, as it is common for 2 or more California condors to roost together and leave a roost together (USFWS 1984). Cliffs and tall trees, including snags, are utilized by breeding pairs as roost sites in nesting areas during the breeding season.

The CCRP establishes a mandate to protect and enhance habitat critical for California condor recovery. Section 3 of the CCRP states: "An important factor in the successful establishment of wild condor sub-populations is the existence of suitable habitat." CCRP section 32 recommends the continuation of management plans that protect suitable roosting sites on public lands. These policies prevent activities that may adversely modify or destroy roosting habitat and provide sufficient protection against human disturbance.

Most snags on the refuge are dead pine or oak trees that resulted from fire, especially the large, historically-used roost trees located on Snag Ridge. Often these trees are used by adults that spend the night in the Hopper Mountain NWR area and by juvenile birds that have recently fledged from the nests near the refuge. Management restricting disturbance to these areas will improve condor survival rates, strengthen pair bonds, and allow for behavioral development of juvenile condors. Biologists often survey these trees to monitor for condor dominance hierarchies, pair formation, and breeding displays, and this information allows for better management of the free-flying condor population.

Hopper Mountain NWR Strategies:

1.4.1 Minimize human disturbance near condor roosting areas.

1.4.2 Survey and map existing and historical roost sites on-refuge.

1.4.3 Evaluate and monitor threats to roost sites (e.g., fire, insect).

1.4.4 Within 10 years of CCP approval, coordinate with the U.S. Forest Service and other agencies that are conducting monitoring to identify climate change-related impacts and identify potential effects to refuge resources, including condor roosting habitat.

1.4.5 Support research and modeling of the future impacts of climate change on the refuge resources.

Objective 1.5:
Maintain existing quantity and quality of condor nesting habitat on-refuge.

Rationale 1.5:
Condors require habitat for nesting, roosting, and foraging. Condor nest sites are usually located in cavities in cliffs, on large outcroppings, or in large trees. There is currently sufficient nesting habitat to support the breeding population of California condors. An increase in human development and an increase in condor populations have the potential to reduce the number of available nesting sites. The effect of human activity on condor nesting has been difficult to determine. In 1969, a correlation between condor nest locations and proximity to human disturbance was identified: the greater

Condor pair perched, Hopper Mountain NWR. Photo: USFWS

the disturbance, the less likely condors were to nest nearby (Sibley 1969). Snyder et al. (1986) also recommend that human activity be restricted within 1.5 miles of condor nest sites.

Another key action in the CCRP's recovery strategy is to provide habitat for condor recovery in the wild. In accordance with CCRP 234, "Continue the enforcement of adopted [U.S. Forest Service] guidelines that protect known condor nest sites from activities that could adversely modify or destroy them and provide adequate protection against human disturbance."

Condor habitat has been identified on Hopper Mountain NWR; it is currently protected from human disturbance and will be protected in the future.

Hopper Mountain NWR Strategies:

1.5.1 Minimize disturbance to nesting condors by maintaining nesting area closures.

1.5.2 Provide support for the Recovery Program's nest management activities.

Objective 1.6:
Within 2 years of CCP approval, measure the carbon footprint (emissions) for the operation of Hopper Mountain NWR and, within 10 years of CCP approval, implement mitigation measures to offset the refuge's carbon footprint.

Rationale 1.6:
DOI secretarial orders issued in 2001 and 2009 (Orders 3289 and 3226) made clear that climate change impacts should be considered in refuge planning. In addition, the House of Representatives' resolution (H. CON. RES. 398), introduced in May 2006, proposed that the Service address in CCPs the effects of climate change on refuge resources. Further, the Service's 2011 Strategic Plan for Responding to Accelerating Climate Change commits us to achieving carbon neutrality by the year 2020. This will require that we reduce the energy use and carbon footprint of our buildings, facilities, vehicle fleet, workforce, and operations to the maximum extent possible. By implementing best practices such as those identified in Service policy, expanding these efforts, and embarking upon new and innovative efforts across the Service, we anticipate success in reducing our carbon footprint by 5%–10% annually between now and 2020. Example strategies are managing our fleet through life-cycle planning, including provisions in facility agreements and leases that promote conservation of energy and water, and ensuring energy-related deferred maintenance activities are identified in the Service Asset Maintenance Management System. We anticipate that the reductions achieved, combined with our carbon sequestration and, perhaps, offsets, will lead us to carbon neutrality by 2020 (USFWS 2011a).

This objective meets with the Service's Climate Change policy, which recommends reducing refuge staff carbon footprint to offset climate change impacts.

Hopper Mountain NWR Strategies:

1.6.1 Quantify the carbon footprint (emissions) from annual refuge operations. 1.6.2 Develop and implement measures to reduce the emissions resulting from refuge management operations.

1.6.3 Implement measures to improve efficiency where feasible at the refuge and the Refuge Complex headquarters (e.g., reduce vehicle trips, carpool to the refuge, reuse and recycle).

1.6.4 Educate and empower refuge staff and volunteers about "green" activities that offset or reduce carbon emission, climate change, and its effects on refuge resources.

GOAL 2: ***Protect and enhance refuge grasslands for healthy ecological conditions to support an abundance and diversity of migratory birds and special status species.***

Objective 2.1:
Within 10 years of CCP approval, manage the 420 acres of grassland to achieve a mosaic of habitat structure, including scattered shrubs, to support a diversity of grassland birds. Manage approximately one-third of the grassland area as short grassland (height less than 12 inches) to provide foraging habitat for grassland obligate birds such as prairie falcon (*Falco mexicanus*). Manage another third as medium grassland (heights 12 to 20 inches) to provide habitat for grassland-nesting birds such as short-eared owl (*Asio flammeus*) and another third as tall grasslands (heights 20 to 40 inches) to provide habitat for birds such as northern harrier (*Circus cyaneus*).

Rationale 2.1:
Grasslands on Hopper Mountain NWR support a number of priority migratory bird species, including prairie falcon, grasshopper sparrow (*Ammodramus savannarum*), short-eared owl, and northern harrier. As shown in subsequent text, the preferred grassland habitat structure for these species varies widely. A mosaic of grassland types provides more variable habitat, which attracts a greater variety of bird species (Fuhlendorf et al. 2006).

Prairie falcons inhabit grasslands, shrubsteppe, and agricultural habitats in mostly arid landscapes (Skinner 1961; Steenhof 1998). Prairie falcon foraging habitat includes a mosaic of grass heights including less than 12 inches in height and bare ground covering more than 50% of the area.

Nesting short-eared owls require open country that supports concentrations of microtine rodents and herbaceous cover sufficient to conceal their ground nests from predators (Wiggins et al. 2006). A mosaic of suitable habitats may include salt- and fresh-water marshes, ungrazed grasslands, and old pastures. Tule marsh or tall grasslands with cover 12–20 inches in height can support nesting pairs (Wiggins et al. 2006). During winter months, short-eared owls may roost in large concentrations on the ground or in willow, cottonwood, or oak thickets in riparian areas. Short-eared owls were documented at Hopper Mountain NWR in the 2002 Annual Narrative Report (see CCP Appendix E).

Northern harriers breed and forage in a variety of open (treeless) habitats that provide adequate vegetation for cover; an abundance of suitable prey; and scattered hunting, plucking, and lookout perches such as shrubs or fence posts. In California, such habitats include freshwater marshes; brackish and saltwater marshes; wet meadows; weedy borders of lakes, rivers, and streams; annual and perennial grasslands (including those with vernal pools); weed fields and ungrazed or lightly grazed pastures; some croplands, sagebrush flats, and desert sinks (MacWhirter and Bildstein 1996). Harriers nest on the ground, mostly within patches of dense, often tall, vegetation in undisturbed areas (MacWhirter and Bildstein 1996). Plant species composition varies by site, and the average height of vegetation surrounding nests varies regionally and annually. Average live height was greatest in the San Joaquin Valley at 23.3 to 37.8 inches (Loughman and McLandress 1994).

In addition to providing important habitat for birds, refuge grasslands are a fuel source for wildfires. Excessive amounts of fuel (tall grass) could increase risks of wildfire to humans and wildlife, neighboring and refuge structures, and habitat diversity. After a high intensity fire burns through an area, the result can be a monoculture rather than a mosaic of grassland types. Reducing the potential fuel in

grasslands is expected to reduce the adverse effects of wildfire. The protection of life and structures from wildfires will take precedence over the use of prescribed fire for habitat management.

This objective will help achieve the statewide conservation actions f, h, and m in the California Wildlife Action Plan (CDFG 2005), as follows:

f. Federal, state, and local agencies should provide greater resources and coordinate efforts to eradicate or control existing occurrences of invasive species and to prevent new introductions.

h. Federal, state, tribal, and local agencies and nongovernmental organizations (NGOs), working with private landowners, should expand efforts to implement agricultural and rangeland management practices that are compatible with wildlife and habitat conservation.

m. Permitting agencies, county and local planners, and land management agencies should work to ensure that infrastructure development projects are designed and sited to avoid harmful effects on sensitive species and habitats.

Several invasive non-native plants have been documented in refuge grasslands. Invasive, introduced plants can negatively affect native birds by:

- Competing with native vegetation, thereby eliminating useful foraging and nesting habitat.
- Providing a sub-optimal nesting substrate, in which nest success is reduced.
- Reducing several orders of native insects (NPS 1998).
- Enhancing non-native animal populations (Riparian Bird Conservation Plan 2004).

A maintenance worker position (shared with all of the refuges in the Refuge Complex) would be needed to implement the habitat management actions described in the majority of the strategies within the habitat goals for Hopper Mountain NWR.

Hopper Mountain NWR Strategies:

2.1.1 Develop and implement a step-down grassland HMP to maintain a mosaic of grassland types suitable for special status species. Consider using prescribed grazing (e.g., sheep, cattle), prescribed burning, mowing, and other management tools.

2.1.2 Develop a long-term restoration strategy for grassland plant communities on the refuge that addresses climate change adaptation as part of the grassland HMP.

2.1.3 Develop and implement standardized survey protocols to document grass heights, densities, and species composition.

2.1.4 Develop an IPM Plan for Hopper Mountain NWR.

2.1.5 Reduce non-native and invasive species composition in existing grasslands using IPM techniques, including biological, chemical, and mechanical techniques (e.g., prescribed grazing, prescribed fire).

2.1.6 Coordinate with neighboring landowners and county governments on weed management best practices.

2.1.7 Implement early detection/rapid response plan as part of the IPM Plan to minimize invasive plants.

Objective 2.2:
Within 5 years of CCP approval, obtain baseline information on the presence and distribution of grassland plants and special status animal species, including prairie falcon, short-eared owl, northern harrier, coast patch-nosed snake, American badger, and grasshopper sparrow.

Rationale 2.2:
In the past, inventory and monitoring efforts have focused almost exclusively on the California condor. Other limited bird surveys have been periodically conducted, and limited vegetation sampling was completed in 2011. However, there is no documentation of grassland-focused surveys of plants and wildlife being conducted. These surveys

Vegetation mapping, Hopper Mountain NWR. Photo: USFWS

are critical to meeting the Refuge Improvement Act's mandate to "monitor the status and trends of fish, wildlife, and plants in each refuge" (PL 105–57).

Hopper Mountain NWR Strategies:

2.2.1 Map the current approximate distribution of native grasses and forbs at Hopper Mountain NWR.

2.2.2 Conduct presence/absence surveys for select special status plant and wildlife species.

2.2.3 Establish and develop partnerships with other agencies, NGOs, and universities to pursue research supporting refuge goals.

Objective 2.3:
Within 12 years, identify and prioritize non-native invasive species for management action. Reduce by 50% or extirpate targeted non-native invasive species to minimize impacts on refuge resources.

Rationale 2.3:
Certain plant and animal species have undesirable effects on wildlife, plants, and their habitats or may pose a health risk. Invasive plant species compete with more desirable plants for water, soil nutrients, sunlight, and space. Invasive plants can have detrimental effects on the distribution and abundance of more desirable plants, which are those that are beneficial to wildlife as food, shelter, and nesting habitat. While there may be few invasive plants on the refuge currently, the Service strives to prevent invasion with early detection/rapid response techniques that would be described in an IPM Plan for the refuge.

This objective will help achieve the statewide conservation action (f) in the California Wildlife Action Plan (CDFG 2005), which states: federal, state, and local agencies should provide greater resources and coordinate efforts to eradicate or control existing occurrences of invasive species and to prevent new introductions.

Hopper Mountain NWR Strategies:

2.3.1 Develop a step-down IPM Plan, including an emphasis on early detection/rapid response, to prevent and limit adverse effects of invasive wildlife (including feral swine) on wildlife habitat.

2.3.2 Within 5 years, identify and map existing and potential invasive wildlife and plants.

2.3.3 Limit invasion and spread of colonizing non-native plants using IPM techniques.

2.3.4 Support management-oriented research, such as research that analyzes the effects of various vegetation management techniques for the control of invasive plant species.

GOAL 3: ***Enhance and maintain optimum health and function of the riparian and wetland areas to support a diversity of Neotropical migratory birds and special status species.***

Objective 3.1:
Within 5 years of CCP approval, obtain baseline information on the presence and distribution of select riparian plant and animal communities.

Rationale 3.1:
In the past, inventory and monitoring efforts on the refuge have focused almost exclusively on the California condor. Other limited bird surveys have been conducted, including Monitoring Avian Productivity and Survivorship surveys from 1993 through 1997 (see Appendix D). However, riparian and wetland-focused surveys of wildlife and plants have never been conducted. These surveys are critical to meeting the Refuge Improvement Act's mandate to "monitor the

status and trends of fish, wildlife, and plants in each refuge" (PL 105–57).

Hopper Mountain NWR Strategies:

3.1.1 Conduct targeted wetland/riparian plant and animal surveys for special status species such as the California red-legged frog (*Rana draytonii*).

3.1.2 Conduct regularly scheduled point count surveys for birds in wetland/riparian areas.

3.1.3 Develop partnerships with other agencies, NGOs, and universities to pursue research pertaining to riparian and wetland communities, species, and water sources that support the refuge goals.

3.1.4 Develop and implement survey protocols for riparian and wetland resources.

Objective 3.2:
Within 7 years, reduce by 80% invasive non-native species, including reed canary grass (*Phalaris arundinacea*), black locust tree (*Robinia pseudoacacia*), rabbit-foot grass (*Polypogon monspeliensis*), and vinca (*Vinca major*), in all riparian and wetland habitat.

Rationale 3.2:
Several invasive non-native plants have been documented in refuge riparian and wetland habitats, primarily in and around the man-made wetland. Invasive, introduced plants can adversely affect native birds. See Hopper Mountain NWR Rationale 2.1.

Further, this objective addresses and helps implement recommended actions for a conservation issue identified in the 2004 North American Landbird Conservation Plan. Recommended actions in the Landbird Conservation Plan include: restore with native plant species following disturbance; maintain water quality and quantity and vegetation in embedded springs, seeps, and riparian areas; restore degraded habitats and habitats that have been converted to non-native grasslands; and control or reduce the extent of invasive Russian olive and tamarisk, as appropriate.

Hopper Mountain NWR Strategies:

3.2.1 Develop IPM Plan for management of invasive non-native wildlife and plant species.

3.2.2 Implement early-detection/rapid response to protect habitat quality from degradation due to invasive species.

3.2.3 As part of IPM, restore the riparian areas by planting native trees and understory plants using local ecotypes.

Objective 3.3:
Within 5 years, obtain baseline information on springs, wetlands, water rights, and the potential impacts of erosion and contaminants on water resources. Based on findings, develop and implement strategies to improve water quality and address water rights.

Rationale 3.3:
Water resources on Hopper Mountain NWR are critical to supporting refuge biodiversity, yet little is known about them. The 2004 North American Landbird Conservation Plan identified loss and contamination of freshwater wetlands as a conservation issue. This CCP objective and accompanying strategies address this conservation issue by implementing actions to gather baseline data on water resources on the refuge and protect water quality (Riparian Bird Conservation Plan 2004).

Oil and gas extraction activities take place both on and adjacent to Hopper Mountain NWR. Having readily available information on habitat characteristics is important in the event of accidental releases of oil or other hazardous substances. Habitat information and the characteristic wildlife species that particular habitats support is important in determining what species may be most susceptible to environmental contaminants. It also provides information on rare habitats that may need special protection measures in the event of spills.

Sensitive habitats and/or sensitive species are important "biomarkers" for changes in environmental conditions. Reduction in sensitive

species may be indications that environmental contaminants are having adverse effects on or adjacent to the refuge.

Although no documented contaminant problems have been reported for the refuge, monitoring of aquatic habitats will be important. It is important to monitor the health of the aquatic habitats in the event an oil spill occurs. Monitoring of aquatic plants after exposure to oil will be important in determining recovery. Preventing or minimizing exposure of condors and other wildlife to environmental contaminants is important for the success of the condor and the refuge. Amphibians are highly sensitive to environmental contaminants. The respiratory function of their skin makes contaminant transfer from water column to tissue rapid and causes contaminant sensitivity.

Hopper Mountain NWR Strategies:

3.3.1 Conduct comprehensive inventory of existing water rights and springs.

3.3.2 Conduct scheduled water quality testing for contaminants during regular flows and after storm events.

3.3.3 Coordinate with upstream oil and gas operators to inform them of the potentially adverse effects to riparian resources and water supplies related to contaminants and run-off and encourage oil and gas operators to voluntarily use management practices to protect refuge resources.

3.3.4 Coordinate with BLM for assistance and training to refuge staff regarding oil and gas facilities inspections, surface management of operations, and best management practices.

3.3.5 Monitor annually and protect riparian and wetland areas from degradation from runoff erosion and channel head-cutting by installing water-bars and/or culverts as needed.

3.3.6 Maintain refuge roads to decrease associated erosion.

Objective 3.4:
Within 10 years, improve wildlife value of wetland near refuge office by maintaining 50% of the area in open water with a depth of greater than 3 feet and 50% of the area in native emergent vegetation.

Rationale 3.4:
The Service has not completed surveys for the threatened California red-legged frog at Hopper Mountain NWR; however, the potential for habitat exists at the man-made wetland (marsh).

The California red-legged frog inhabits quiet pools of streams, marshes, and occasionally ponds. For cover, the frog prefers shorelines with extensive vegetation and usually escapes to water 3 feet deep or more at the bottom of pools (CDFG species accounts at dfg.ca.gov/wildlife/nongame). Adaptive management at the man-made wetland to increase open water greater than 3 feet deep and emergent marsh vegetation could provide cover and breeding habitat, respectively, for the California red-legged frog.

Bird species that could benefit from managing the wetland include warbling vireo (*Vireo gilvus*), Swainson's thrush (*Catharus ustulatus*), yellow warbler (*Setophaga petechia*), common yellowthroat (*Geothlypis trichas*), Wilson's warbler (*Cardellina pusilla*), song sparrow (*Melospiza melodia*), black-headed grosbeak (*Pheucticus melanocephalus*), Sora (*Porzana carolina*), and Virginia rail (*Rallus limicola*) (RHJV 2000).

Hemp dogbane (*Apocynum cannabinum*) is currently found on the refuge at the edges of the freshwater marsh south of the house. Hemp dogbane is used by Native Americans for artistic and ceremonial purposes. The plant is not protected by the state or federal government. Because plants spread by way of creeping horizontal roots, it can be harvested and grow back the next season. According to a local Chumash Indian tribe, this plant is difficult to find in the Ventura and Santa Barbara area. Some hemp dogbane is harvested yearly by Chumash Indian tribal members and used for cultural purposes. The marsh area on the refuge could be managed to encourage growth of this plant.

Hopper Mountain NWR Strategies:

3.4.1 Within 5 years, develop a riparian and wetland HMP that considers climate change adaptation.

3.4.2 Replace existing culvert with new water control structure (i.e., weir and weir boards) and manipulate water levels to reach wetland objectives, guided by adaptive management.

3.4.3 Mechanically modify wetland substrate to achieve the objective ratio of open water and emergent marsh vegetation.

3.4.4 Manage vegetation using adaptive management principles to provide habitat for riparian-associated birds and California red-legged frogs.

3.4.5 Manage the man-made wetland to sustain and enhance the growth of hemp dogbane, as consistent with the other wetland objectives and refuge goals.

GOAL 4*: Restore and perpetuate native black walnut (Juglans californica var. californica) and oak woodlands to support Neotropical migratory birds and special status species.*

Objective 4.1:
Maintain and monitor 2 stands of regenerating black walnut and oak woodlands, 1 stand of 86 acres and the other 103 acres, to provide snags and other features to benefit woodland birds, including Nuttall's (*Picoides nuttallii*) and acorn woodpeckers (*Melanerpes formicivorus*), oak titmouse (*Baeolophus inornatus*), Hutton's vireo (*Vireo huttoni*), and ash-throated flycatcher (*Myiarchus cinerascens*).

Rationale 4.1:
Hopper Mountain NWR supports stands of the southern California black walnut. California black walnut is nearly restricted to the southwest region of California and covers less than 1% of the vegetation in this region (Davis et al. 1995). The current distribution of California black walnut is highly fragmented and almost entirely (89%) on private land. Southern California black walnut is listed by the state of California as vulnerable.

Southern California black walnut. Photo: USFWS

California black walnut woodlands have been greatly reduced by urbanization and impacted by the over-grazing of cattle and the introduction of non-native plant species that compete with understory vegetation. The greatest current threat to the few remaining stands is urbanization.

At the refuge, the California black walnut grows with other species, including coast live oak (*Quercus agrifolia*) and canyon oak (*Quercus chrysolepis*). The native California black walnut and oak woodlands support many wildlife species at Hopper Mountain NWR, including woodland birds such as Nuttall's and acorn woodpeckers, oak titmouse, Hutton's vireo, and ash-throated flycatcher. Trees with natural cavities (older, larger trees) are especially important for oak titmouse (Wilson et al. 1990). The oak titmouse requires oak and pine-oak woodlands with adequate natural or excavated cavities for nesting and sufficient canopy cover for foraging and roosting. Habitat is a major concern in the conservation of the oak titmouse. The loss of dead standing trees, live trees with dead limbs, or diseased trees reduces the

number of cavities available for nesting (CalPIF 2002). Nuttall's woodpeckers forage mostly in oak and riparian deciduous habitats and require snags and dead limbs for nest excavation (CDFG 2011). Nuttall's woodpeckers frequent a mix of deciduous riparian and adjacent oak habitats, occurring in oak woodlands, live oak forests, and chaparral, and found in canyons with sycamores, alders, cottonwoods, and bay trees growing along streams lined with live oaks (Audubon WatchList 2011). By protecting young trees and regularly assessing oak regeneration, the Service could help ensure trees mature sufficiently to provide habitat for woodpecker, oak titmouse, and other woodland obligate birds.

Regeneration may not be a problem if the overstory is at its desired level and if all overstory trees appear healthy and not in danger of being lost to mortality in the next 5 to 10 years. Regeneration is considered a problem requiring management action only if there is a large amount of mortality or anticipated mortality with insufficient seedling and sapling reproduction to replace trees being lost. In areas where regeneration is determined to be a problem, it may be necessary to take actions to ensure that seedlings survive in the stand. This may involve protecting naturally occurring young seedlings in the stand from browsing and grass competition (UCIHRMP et al. 1996).

Prior to initiating any management activity, University of California Integrated Hardwood Range Management Program recommends that acorn production in the stand is evaluated using the system described in the Guidelines for Managing California's Hardwood Rangelands. One study estimates that 5% of the trees provided 95% of the acorn production in the stand. For this reason, the best acorn producers should be identified and every effort should be made to maintain the health and vigor of these trees (UCIHRMP et al. 1996).

Hopper Mountain NWR Strategies:

4.1.1 Within 10 years, develop a step-down HMP for black walnut and oak woodlands that includes climate change adaptation and surveys for special status plants and wildlife.

4.1.2 Maintain existing fire breaks near the black walnut and oak woodlands (three-fourths of the woodlands are surrounded by roads).

4.1.3 Maintain coordination with other agencies for fire protection.

4.1.4 If needed to protect walnut and oak woodlands from wildfire, reduce fuel loads in grasslands near woodlands using various targeted grassland management tools (e.g., grazing, mowing, prescribed burns).

4.1.5 Every 5 years, work with a qualified subject expert to evaluate health, vigor, and recruitment of black walnut and oak woodland stands.

4.1.6 If necessary to promote sustainable age-class distribution and regeneration of walnuts and oaks, consider using plant browse protection (e.g., exclusionary fencing, temporary growth tubes) as prescribed in the black walnut and oak woodlands management practices in the HMP.

4.1.7 Within 2 years of CCP approval, work with others to gain a more comprehensive understanding of animal species that use the black walnut and oak woodlands on the refuge and compile species list.

GOAL 5: *Maintain and restore coastal sage scrub to support coastal sage scrub-associated special status and priority species.*

Objective 5.1:
Monitor and conserve stands of coastal sage scrub to benefit special status species that depend on this habitat type including the coast patch-nosed snake (*Salvadora hexalepis virgultea*), and San Diego desert woodrat (*Neotoma lepida intermedia*).

Rationale 5.1:
Coastal sage scrub is a threatened vegetation community in the southwest region of California, and the type that occurs on Hopper Mountain NWR is the least protected type of coastal sage scrub (Davis et al. 1994; Davis et al. 1995). A large proportion (87%) of landscapes dominated by purple

Coastal sage scrub, Hopper Mountain NWR. Photo: USFWS

sage is in private land ownership within the western Transverse Ranges. The greatest threats to coastal sage scrub are habitat loss, habitat fragmentation, and habitat degradation such as sometimes occurs with increasing fire frequencies, invasion of non-native plant species, and livestock grazing (CalPIF 2004).

California Species of Special Concern coastal sage scrub-associated species potentially found at Hopper Mountain NWR include coast patch-nosed snake (*Salvadora hexalepis virgultea*) and San Diego desert woodrat (*Neotoma lepida intermedia*). It is unknown whether these subspecies occur on the refuge. California Partners in Flight coastal sage scrub-associated priority species potentially found at Hopper Mountain NWR include: loggerhead shrike (also a California Species of Special Concern), greater roadrunner (*Geococcyx californianus*), Costa's hummingbird (*Calypte costae*), cactus wren (*Campylorhynchus brunneicapillus*), wrentit (*Chamaea fasciata*), black-chinned sparrow (*Spizella atrogularis*), sage sparrow (*Amphispiza belli*), and rufous-crowned sparrow (*Aimophila ruficeps*).

The western patch-nosed snake (*Salvadora hexalepis*) and desert woodrat (*Neotoma lepida*) have been documented at Hopper Mountain NWR in the 2002 Annual Narrative Report. Because the special status subspecies of snake (*S.h. virgultea*) and woodrat (*N.l. intermedia*) also use the coastal sage scrub habitat on the refuge, these subspecies may be present. Surveys would be needed to determine if the snake and woodrat at the refuge are the special status subspecies.

Within the United States, the Coastal California gnatcatcher (*Polioptila californica californica*) (federally-listed as threatened) is restricted to coastal southern California from Ventura and San Bernardino counties to the Mexican border (72 Federal Register 72010; December 19, 2007). While Hopper Mountain is not in designated critical habitat, the refuge is located approximately 10 miles north of critical habitat, and gnatcatchers are currently being found outside of their historic range. Therefore, there is potential for the Coastal California gnatcatcher to occur in the coastal sage scrub habitat on Hopper Mountain NWR. To inform management decisions about actions that could affect coastal sage scrub, surveys would be needed to determine if the Coastal California gnatcatcher is present on the refuge.

Hopper Mountain NWR Strategies:

5.1.1 Conduct surveys to determine if the coastal California gnatcatchers occur and breed on the refuge.

5.1.2 Conduct surveys to determine if coastal sage scrub-associated California Species of Special Concern and California Partners in Flight priority species occur at the refuge.

5.1.3 Conduct surveys to determine if special status plants occur in the coastal sage scrub on the refuge.

Objective 5.2:
Within 2 years of CCP approval, partner with the Division of Migratory Birds, Ecological Services, and other experts to determine how management of coastal sage scrub habitat at Hopper Mountain NWR contributes to maintaining the health of these Species of Special Concern and California Partners in Flight species' populations.

Rationale 5.2:
Coastal sage scrub covers 686 acres (29% of the refuge) and is dominated by purple sage (*Salvia leucophylla*). Coastal sage scrub is found primarily on the Calleguas shaly loam and Castaic-Balcom complex soil types at the refuge, often on very steep slopes. The coastal sage scrub habitat on the refuge has not been managed in the past. Coastal sage scrub is a threatened vegetation community in the southwest region of California, and the type that occurs on Hopper Mountain NWR is the least protected type of coastal sage scrub (Davis et al. 1994; Davis et al. 1995). A large proportion (87%) of landscapes dominated by purple sage are in private land ownership within the western Transverse Ranges. The greatest threats to coastal sage scrub are habitat loss, habitat fragmentation, and habitat degradation such as sometimes occurs with increasing fire frequencies, invasion of non-native plant species, and livestock grazing (CalPIF 2004).

California Species of Special Concern coastal sage scrub-associated species potentially found at Hopper Mountain NWR include coast patch-nosed snake and San Diego desert woodrat. California Partners in Flight coastal sage scrub-associated priority species potentially found at Hopper Mountain NWR include loggerhead shrike (also a California Species of Special Concern), greater roadrunner (*Geococcyx californianus*), Costa's hummingbird (*Calypte costae*), cactus wren (*Carnpylorhynchus brunneicapillus*), wrentit (*Chamaea fasciata*), black-chinned sparrow (*Spizella atrogularis*), sage sparrow (*Amphispiza belli*), and rufous-crowned sparrow (*Aimophila ruficeps*). The California Partners in Flight conservation plans are found online at *www.prbo.org/calpif.*

Hopper Mountain NWR Strategies:

5.2.1 Use recommendations from California Partners in Flight Bird Conservation Plans for developing coastal sage scrub habitat management ideas to benefit the California Partners in Flight priority bird species.

GOAL 6: *Provide quality information and education to increase the public's appreciation and understanding of the California Condor Recovery Program, as well as Hopper Mountain NWR and its wildlife, habitats, and cultural resources.*

Objective 6.1:
Within 5 years of CCP approval, 500 residents of Ventura and surrounding counties will learn about and gain appreciation for the Hopper Mountain National Wildlife Refuge and the California Condor Recovery Program.

Rationale 6.1:
The Hopper Mountain NWR is tucked in the mountains just north of Fillmore. Because the refuge is only accessible by private roads, there is no public access. The lack of public access and its closure to public visitation since its establishment has resulted in a low awareness of the refuge within the surrounding region. Although the Recovery Program is a bi-national program often cited as one of the most successful endangered species recovery programs in the world, it is not well known and understood in the area. Therefore, education and outreach about Hopper Mountain NWR and the Recovery Program is needed to raise knowledge and awareness within the region. Further, "implementing condor information and education programs" is identified as 1 of the 5 key actions identified in the Strategy for Recovery in the CCRP. Some of the primary threats to the recovery of condors, such as lead poisoning and the ingestion of microtrash, depend on educating the public and raising awareness in the community for overcoming and minimizing these dangers to the long-term survival of the species.

Hopper Mountain NWR Strategies:

6.1.1 Conduct presentations to community groups and schools.

6.1.2 Attend outreach events and staff booths to provide refuge and Recovery Program information.

6.1.3 Coordinate with partners on lead and microtrash awareness on and near the refuge.

6.1.4 Develop updated outreach materials on the refuge and coordinate with materials for the Recovery Program.

6.1.5 Expand and improve the Hopper Mountain NWR website.

6.1.6 Develop refuge-specific brochure and/or newsletter.

6.1.7 Record the number of contacts made at each condor outreach program or event and on the website.

Objective 6.2:
Annually provide at least 4 opportunities for interpretation, wildlife observation, and wildlife photography on the refuge.

Rationale 6.2:
Hopper Mountain NWR is closed to public use. All vehicles driving to or from the refuge must use private roads with locking gates. Because of this, the Service cannot open the refuge to public use. However, since the Service places a high priority on wildlife-dependent recreation on national wildlife refuges, guided tours provide a venue to educate people about Hopper Mountain NWR and opportunities to experience the refuge through interpretation, wildlife observation, and photography.

Condor monitoring blind built by volunteers from Friends of California Condors Wild and Free, Hopper Mountain NWR. Photo: USFWS

Hopper Mountain NWR Strategies:

6.2.1 Develop a Visitor Services Plan for Hopper Mountain NWR.

6.2.2 Work with Friends of California Condors Wild and Free to offer joint walks and talks.

6.2.3 Conduct regularly scheduled seasonal refuge tours.

6.2.4 Coordinate with U.S. Forest Service to provide interpretation on California condors.

Objective 6.3:
Starting 2 years after CCP approval, provide at least 2 volunteer opportunities per year to promote stewardship and appreciation of the refuge and California Condor Recovery Program.

Rationale 6.3:
Volunteers, Friends, and partners are valuable allies of the U.S. Fish and Wildlife Service. These individuals and groups are vital to fulfilling the Service's mission and goals (USFWS 2010b). Volunteers and intern biologists provide thousands of hours of service to the Hopper Mountain NWR Complex and Recovery Program. During 2009, volunteers and interns donated approximately 8,464 hours. These activities included plant inventories, maintenance, condor monitoring, and other Recovery Program activities.

With Hopper Mountain NWR closed to public use, volunteering on the refuge builds awareness of the refuge and the wildlife management that takes place there. For example, the Friends of California Condors Wild and Free group provided volunteers who assisted refuge staff with building a blind for the Recovery Program.

Hopper Mountain NWR Strategies:

6.3.1 Partner with the Friends of California Condors Wild and Free to offer at least 2 volunteer opportunities each year.

6.3.2 Provide volunteer opportunities, such as plant propagation, planting, invasive plant removal, and plant and wildlife surveys.

Objective 6.4:
Provide a safe environment for visitors, protect refuge resources, and ensure compliance with regulations through effective law enforcement.

Rationale 6.4:
Safety is a top priority for the Service. That means providing a safe place for refuge staff and volunteers to work and a safe place for visitors to experience wildlife-dependent recreation. While illegal activities on the refuge are rare, they do exist. Poaching has been documented on the refuge. Also, illegal marijuana cultivation has been discovered in the surrounding area, although none has been found on the Hopper Mountain NWR. Wildfires are a real threat to people and property at Hopper Mountain NWR. In the last few decades, the area has seen higher than normal wildfire frequencies.

Hopper Mountain NWR Strategies:
6.4.1 Periodic patrols by law enforcement.

6.4.2 Periodic coordination with neighboring agencies on law enforcement.

6.4.3 Complete posting of entire boundary.

6.4.4 Add safety and rules/regulations information to refuge brochure.

6.4.5 Maintain fuel breaks (mowing existing roads, which serve as fuel breaks).

6.4.6 Maintain Fire Management Plan and coordination with other agencies.

6.4.7 Maintain radio contact among refuge staff whenever available.

Objective 6.5:
Within 5 years of CCP approval, professionally assess all known refuge cultural resources through coordination with the Service's Cultural Resources staff.

Rationale 6.5:
Little archaeological research has been conducted within the boundaries of Hopper Mountain NWR. Since its establishment in 1972, fieldwork on the refuge has fallen into these categories: 1) third parties fulfilling requirements to obtain conditional use permits for oil exploration, 2) compliance with Section 106 of the NHPA for refuge management and Recovery Program activities, and 3) post-wildfire damage assessment. The total acreage surveyed is unknown. However, to date the Service's Cultural Resources Team estimates that less than 1% (less than 20 acres) of the 2,471-acre refuge has been systematically surveyed. It is highly probable that additional archaeological sites will be exposed by human actions or natural causes in the future. All sites should be treated as eligible for listing on the National Register of Historic Places (NRHP) until listed or formally evaluated as ineligible in consultation with the State Historic Preservation Office (SHPO).

A systematic baseline inventory and evaluation of cultural resources would assist the Service in developing a better understanding of which areas of the refuge may be sensitive for the presence of cultural resources.

Hopper Mountain NWR Strategies:
6.5.1 Inventory and evaluate cultural resources on the refuge, including evaluation of sites and structures for eligibility to the National Register of Historic Places.

6.5.2 Develop GIS database for cultural resources.

6.5.3 If eligible properties are present, develop preservation plans to ensure protection of the resource and possibly for interpretation.

4.6 Bitter Creek NWR Goals, Objectives and Strategies

GOAL 1: ***Support the recovery strategies of the California Condor Recovery Program on Bitter Creek NWR.***

Objective 1.1:
Continue to provide on-refuge sites to support the Recovery Program's measures to maximize condor survivorship.

Rationale 1.1:
See Rationale for Objective 1.1 for Hopper Mountain NWR.

Bitter Creek NWR has been in use as a condor trap site since 2007. The majority of trapping activity for the program occurs on the refuge. Bitter Creek NWR is used as a release site because it provides ideal foraging habitat for condors and excellent roost trees, and the terrain is accessible for managing newly released birds. Releasing condors requires utilizing an outdoor flight pen and providing supplemental food; because of this, it is also an ideal location for monitoring and trapping the wild population.

Condors are trapped to monitor for the threat of lead exposure, administer West Nile Virus vaccination, and treat other identified and unidentified threats. Each wild condor is trapped twice yearly and given blood lead tests and health examinations. Wild condors are monitored in the field by attaching wing tags, very high frequency (VHF) radio transmitters, and/or GPS transmitters. Currently, any condor requiring medical treatment is driven to Los Angeles Zoo. Upon their return to Bitter Creek NWR, treated condors are released into a larger flight pen with other condors. A new treatment facility would provide smaller, isolated pens and a larger enclosure for multiple condors, with the capability of separating birds to reduce injury. A treatment facility would also provide a location for processing and treating condors, a portable digital radiograph machine for evaluating level of lead exposure, and storage for condor processing equipment.

As with the addition of a biologist and a law enforcement officer, a maintenance worker position (shared with all of the refuges in the Refuge Complex) would be needed to implement the habitat management actions described in the majority of the strategies within the habitat Goals for Bitter Creek NWR.

Bitter Creek NWR Strategies:

1.1.1 Provide and maintain a flight pen and treatment facility to allow for temporary holding of wild condors for condor health assessment, treatment, and transmitter maintenance.

1.1.2 Maintain at least 2 trap sites (walk-in and double-door trap).

1.1.3 Reduce fuels near facilities (mowing) and conduct fire suppression to protect facilities from wildland fires.

1.1.4 Expand remote population monitoring capabilities by providing a site for remote telemetry stations located on-refuge.

1.1.5 Construct an approximately 1,000-square-foot condor treatment facility for the on-site care of sick or injured condors.

Objective 1.2:
Maintain the refuge as a release site to support the California Condor Recovery Program's condor releases into the wild.

Rationale 1.2:
A significant component of the CCRP's recovery strategy is the reintroduction of condors in their habitat through the release of captive bred condors into the wild (section 232). From 1992 to the present, Service personnel have been releasing and monitoring California condors in southern California. The California condor population is currently exhibiting a positive growth rate, but this trend is predominately a result of releasing captive reared birds. To date, the annual production of wild-fledged birds has never exceeded the annual mortality of released individuals (USFWS, unpublished data). Therefore, until mortality rates are reduced, the continued release of captive reared condors into the wild is necessary to maintain population growth.

The CCRP mandates the release of California condors in accordance with release plans and established protocols to guarantee the health and safety of the birds being held for release. The CCRP requires monitoring the pre-release population in a flight pen prior to release (section 233) in accordance with the CCRP's annual release plan. Bitter Creek NWR was originally acquired by the Service because of its important foraging habitat and was designated as a release site area in the CCRP, and currently, the refuge is a base of field operations for the day-to-day monitoring and management of condors. In 2006, Bitter Creek

NWR was established by the Recovery Program as the primary release site for California condors in the southern California region. Since then, condor releases have taken place each fall. As of 2009, 23 captive bred condors and 1 original wild condor have been released. See also Rationale 1.2 for Hopper Mountain NWR for more about newly released condors.

In 1992, the CCRP documented concerns over the tendency of the captive bred condors to frequent zones of heavy human activity, and 3 birds died from collisions with power lines. Captive bred condors have shown a tendency to be attracted to the vicinity of human activity and man-made obstacles, especially power lines (USFWS 1996).

Bitter Creek NWR is located in the foothills of the Transverse Ranges on the south end of the San Joaquin Valley. The habitat is fire prone and consists primarily of annual-dominated grassland with areas of oak woodland, juniper woodland, and scrub. It is surrounded by private lands used primarily for grazing operations, BLM holdings, and Los Padres National Forest. Fires have burned on several parts of the refuge, and there is a concerted, multi-agency effort to prevent wildfires from damaging human and natural resources. The fires are often caused by human activities near roads and are controlled by fire crews and fire breaks. For the safety of personnel, protection of resources, and safety of captive birds housed in the flight pen, annual fire break maintenance and fire fuel reduction efforts are conducted by refuge personnel and partners. These efforts consist primarily of disking fire breaks, mowing grass, cutting brush, and cutting small fire break lines around the defensible areas of the Bitter Creek buildings and the Bitter Creek NWR flight pen.

Bitter Creek NWR Strategies:

1.2.1 Maintain condor flight pen to hold pre-release birds and for releases.

1.2.2 Maintain feeding sites for newly released condors.

1.2.3 Reduce fuels near facilities (mowing) and conduct fire suppression to protect facilities from wildland fires.

1.2.4 Maintain access trails to support condor management activities.

1.2.5 Minimize human disturbance to condors and other focal species and minimize structures that could pose potential risks to condors, especially power lines.

Objective 1.3:
By 2020, increase capacity of on-refuge temporary quarters to accommodate up to 9 residents to support refuge and Recovery Program activities.

Rationale 1.3:
Telemetry and GPS transmitter location data illustrate recent condor range expansion in southern California (Brandt and Massey 2009). Currently, there is little use of the southern Sierra Nevada range or the mountainous regions of Santa Barbara and San Luis Obispo counties. As the population recovers, it is expected that condors will reoccupy these once used areas for both nesting and foraging. Additionally, the southern and central California condor populations are anticipated to show increased interaction and population exchange.

As the population of California condors expands, a correlated increase of personnel to monitor the birds is necessary. The program also anticipates an increase in partnership involvement, volunteer interest, and education and outreach activity. Currently, Bitter Creek NWR is a base of field operations for the day-to-day monitoring and management of condors by Service staff, partners, and volunteers.

Bitter Creek NWR Strategies:

1.3.1 Maintain existing housing and other facilities for use by Service staff, volunteers, and partners (up to 5 residents total).

1.3.2 Construct 2 RV hookups (concrete pads with water, electricity, and sewer) to increase housing capacity by 4 additional residents (up to 9 residents total).

Objective 1.4:
Maintain existing species composition and structure of the pinyon/juniper/oak woodland in the Headwall area (also known as Unit 3 East) to provide a condor roost area.

Rationale 1.4:
The CCRP establishes a mandate to protect and enhance habitat critical for California condor recovery. See Rationale for Objective 1.4 for Hopper Mountain NWR.

Management of the roost habitat to restrict disturbance to these areas will improve condor survival rates, strengthen pair bonds, and allow for proper behavioral development of juvenile condors. Biologists often survey these trees to monitor for condor dominance hierarchies, pair formation, and breeding displays, and this information allows for better management of the free flying population.

In 2010, 3 condor mortalities were discovered at a nearby roost site just off the refuge on BLM property. These deaths were all attributed to mountain lion depredation and occurred within 32 days of one another. The first mortality occurred on November 28, 2010, and the third on December 30, 2010. While mountain lions are considered a natural predator to condors and have preyed upon them in the past, the rate at which condors were being taken was unprecedented and considered a result of the lion exploiting a situation where newly released and therefore naive condors were concentrated. The Service seeks to investigate alternatives to reduce potential conflicts between mountain lions and condors on the refuge.

The Service plans to pursue cooperative agreements or land transactions with BLM on their lands that are located within the refuge's approved acquisition boundary (see Figure 3-7. Bitter Creek NWR, Facilities). Consistent management of the Headwall oaks roosting area is expected to improve the efficiency of protecting and enhancing habitat important for California condor recovery.

In the context of providing condor roost habitat, the Service considered strategies to protect the condor roosting area at the Headwall oaks from wildfire, such as creating firebreaks around the Headwall area. Even if wildfire burns through the Headwall area, trees and snags would likely remain as roosting structure for condors. The Service will continue to maintain fuel breaks on Bitter Creek NWR to protect property and reduce the size of wildfires that occur. The Service has decided additional fuel breaks to protect condor roosting habitat is not necessary in the Headwall area because there are adequate roosting locations else where on the refuge should those at the Headwall be lost to a wildfire. All wildfires on Bitter Creek NWR will be fought aggressively while providing for firefighter and public safety. Protection of life and property is the Service's first priority when fighting wildfires.

Bitter Creek NWR Strategies:

1.4.1 Pursue management agreements with BLM on their lands within the approved acquisition boundary of the refuge to consolidate management of the Headwall oaks condor roosting area by the Service.

1.4.2 Survey and map existing and historical roost sites on-refuge.

1.4.3 Evaluate, monitor, and mitigate threats to roost sites (i.e., fire, insects).

1.4.4 Develop predator management measures for the refuge (as part of the IPM Plan).

1.4.5 Within 10 years of CCP approval, coordinate with U.S. Forest Service and other agencies leading efforts to assess the effects of climate change to identify potential effects to refuge resources, including condor roosting habitat. Support research and modeling of the future impacts of climate change on refuge resources.

Objective 1.5:
Maintain Service-owned lands as high quality condor foraging habitat, mitigating potential hazards to California condors.

Rationale 1.5:
The fourth key action identified in the CCRP is to maintain habitat for condor recovery. The CCRP states: "An important factor in the successful establishment of wild condor sub-populations is the existence of suitable habitat..." (USFWS 1984).

Maintaining condor foraging habitat on the refuge helps preserve habitat for condor recovery. CCRP section 33 calls for the continued implementation of management plans to protect foraging habitat: "The management of existing foraging habitat should include the support of established wild condor subpopulations." And further, CCRP section 331 states: "Implement strategies for managing condor foraging habitat."

In southern California, some historic foraging habitat is no longer suitable, but historic grassland foraging habitat around the base of the San Joaquin Valley remains viable, and since about 1984, large swaths have been protected, including the Bitter Creek NWR, the private Wind Wolves Preserve (about 96,371 acres), and the Carrizo Plain National Monument (nearly 300,000 acres) (AOU 2008). These 3 large properties provide protected habitat for ungulates and other wildlife, as well as corridors for range expansion. The Tejon Ranch conservation agreement protects large swaths of foraging and roosting habitat in an area that is a critical gateway to historic foraging areas in the Sierras (Ricklefs et al. 1978; Mee and Snyder 2007; AOU 2008). Grassland and oak-savanna remain critical foraging habitat for condors, as little foraging takes place in densely forested or chaparral habitat (AOU 2008).

Bitter Creek NWR, formerly the Hudson Ranch, was purchased by the Service and designated a national wildlife refuge due to its proximity to ranchlands and historic condor foraging habitat, as well as for direct use as condor foraging habitat. The Service will continue to maintain foraging habitat to promote natural feeding opportunities.

Through the strategies, the Service strives to determine if any areas that are not currently used as foraging sites can be improved, through management actions, to become foraging habitat.

Currently, Bitter Creek NWR is a base of field operations for the day-to-day monitoring and management of condors. Supplemental feeding of released condors is a primary management tool, and there are 6 active feeding stations located on the refuge. One purpose of supplemental feeding is to provide newly released birds the opportunity to feed as they integrate into the larger wild population. Unlike newly fledged chicks, captive releases cannot rely on their parents for food for up to a year after they fledge. Supplemental feeding is used near release sites as a substitute for the parental care a young condor would receive prior to becoming independent. Supplemental feeding provides newly released birds the opportunity to feed as they integrate into the wild population and begin to feed on other sources of carrion. Having multiple stations that can be baited randomly promotes more natural foraging behaviors, as the birds do not become conditioned to any single site. Newly released birds will often remain on the refuge for the first 4 to 6 months after release and are closely monitored, especially for the first month after release. The supplemental feeding stations that aid in their survival are also utilized by the rest of the population, making the refuge an ideal trapping site.

Bitter Creek NWR Strategies:

1.5.1 Coordinate with ranchers to allow condors to feed on natural livestock mortalities and with hunters about leaving non-lead carcasses in the field (off refuge).

1.5.2 Continue to participate in annual ungulate survey with Wind Wolves Preserve to determine population and trends.

1.5.3 Define and map the habitat characteristics of condor foraging areas on the refuge.

1.5.4 Remove unnecessary refuge fencing; ensure all necessary fencing is wildlife-friendly.

Tricolored blackbird. Photo: USFWS

Objective 1.6:
Within 2 years of CCP approval, measure the carbon footprint (emissions) for the operation of Bitter Creek NWR and, within 10 years of CCP approval, implement mitigation measures to offset the refuge's carbon footprint.

Rationale 1.6:
This objective meets with the Service's Climate Change policy, which recommends reducing refuge staff carbon footprint to offset climate change impacts. See Rationale 1.6 for Hopper Mountain NWR.

Bitter Creek NWR Strategies:

1.6.1 Quantify the carbon footprint (emissions) from annual operations of the refuge.

1.6.2 Develop measures to reduce the emissions resulting from refuge management operations.

1.6.3 Improve efficiency where feasible at the refuge and the Refuge Complex headquarters (e.g., reduce vehicle trips, carpool to the refuge, reuse and recycle).

1.6.4 Educate and empower refuge staff and volunteers about "green" activities that offset carbon emission and climate change and climate change effects on refuge resources.

Western burrowing owl. Photo: USFWS

GOAL 2: ***Protect and enhance Bitter Creek NWR grasslands to promote ecologically sound conditions to support a diversity of migratory birds and special status plant and animal species.***

Objective 2.1:
Within 5 years, obtain baseline information on the distribution and relative abundance of grassland-dependent and other special status species and migratory birds.

Rationale 2.1:
Although various surveys have been conducted in the past, comprehensive baseline data about focal wildlife does not exist for the refuge. This information is needed to better inform land management decisions. The California condor (federally-listed as endangered) and the San Joaquin kit fox (*Vulpes macrotis mutica*, federally-listed as endangered, state-listed as threatened), and the western burrowing owl (*Athene cunicularia hypugaea*, California Species of Special Concern), occur on the refuge.

The Service seeks distribution and relative abundance data on the following additional focal species: federally-listed or special status species that use grasslands and are informally documented or have the potential to be on the refuge, including

- giant kangaroo rat (*Dipodomys ingens*; federally-listed as endangered; state-listed as endangered),
- short-nosed kangaroo rat (*Dipodomys nitratoides brevinasus*, California Species of Special Concern),
- western mastiff bat (*Eumops perotis*, California Species of Special Concern),
- blunt-nosed leopard lizard (federally-listed as endangered; state listed as endangered),
- Nelson's antelope squirrel (*Ammospermophilus nelsoni*, state-listed as threatened),
- ferruginous hawk (*Buteo regalis*, California watch list),
- loggerhead shrike (*Lanius ludovicianus*, California Species of Special Concern),
- short-eared owl (*Asio flammeus*, California Species of Special Concern),

California jewelflower. Photo: B. Moose Peterson, WRP

- grasshopper sparrow (*Ammodramus savannarum*) California Species of Special Concern),
- tricolored blackbird (*Agelaius tricolor*, California bird Species of Special Concern), and
- Kern primrose sphinx moth (*Euproserpinus euterpe*, federally-listed as threatened).

Special status grassland plants that are known to occur in the vicinity of Bitter Creek NWR, but have not been documented on the refuge include California jewelflower (*Caulanthus californicus*) and San Joaquin woollythreads (*Monolopia congdonii*), both federally-listed as endangered plants. Both of these plants occur in saltbush scrub, and the jewelflower also occurs in juniper woodlands. Other special status plants that may be considered important in future management decisions are listed in De Vries (2009). Kern mallow (*Eremalche parryi* subsp. *kernensis*) may also occur in saltbush scrub.

When prioritizing which focal species to inventory and monitor, the refuge manager will consider if the species has been detected or would likely be detected on the refuge. Many of these species are included in the recovery plan for the upland species of the San Joaquin Valley, California (USFWS 1998).

The Kern primrose sphinx moth may occur on Bitter Creek, especially on the lower drainages flowing north toward the central valley Pers. comm. Jump, P.). However, since there has been no flight in the last two years (Pers. comm. Jump, P.), this moth may not be seen in surveys in any given year. The Service's 5-year review recommends conducting surveys of suitable habitat for the Kern primrose sphinx moth in and around the Carrizo Plain and the Cuyama Valley that has not yet been extensively surveyed for the presence of the Kern primrose sphinx moth. These areas should be surveyed coinciding with the Kern primrose sphinx moth flight period to determine presence/absence as a minimum (USFWS 2007).

Bitter Creek NWR Strategies:

2.1.1 Develop and implement survey protocols to standardize data collection for focal plant and animal species with emphasis on endangered species, threatened species, and special status species.

2.1.2 Survey and map current distribution of select grassland and saltbush scrub special status species, including migratory birds. Special status plant and wildlife lists are provided in Rationale 2.1 and Appendix E. (See also the strategy for surveys for Kern mallow under Bitter Creek NWR Goal 3.)

2.1.3 Survey and map the current distribution of unique native grasses and forbs on the refuge.

2.1.4 Evaluate potential for establishing endangered California jewelflower (*Caulanthus californicus*) by seed or plants (using local ecotypes) into suitable juniper woodland or grassland sites to establish additional populations for recovery of the species.

2.1.5 Survey for the presence of the threatened Kern primrose sphinx moth (*Euproserpinus euterpe*) in the saltbush scrub plant community.

Objective 2.2:
Within 10 years, provide suitable grassland habitat with vegetation height between approximately 1 to 4 inches, shrub cover less than 20%, and residual dry matter between 300 and 600 pounds/acre to benefit San Joaquin Valley special status species (such as San Joaquin kit fox, giant kangaroo rat, blunt-nosed leopard lizard, Nelson's antelope squirrel) on approximately 1,300 acres in the northwest portion of the refuge.

Rationale 2.2:
The Service has considered all aspects of grassland management and chose not to implement prescribed fire for habitat management at this time. Strategies to develop a Habitat Management Plan (HMP) and Integrated Pest Management (IPM) Plan to address invasive plants and other management activities are included within the objectives that follow.

In the past, San Joaquin kit fox has been documented in lower elevation areas of the refuge. Other special status species with potential to occur there include blunt-nosed leopard lizard, giant kangaroo rat, and Nelson's antelope squirrel. Adaptively managing suitable areas of Bitter Creek NWR to provide short grass vegetation with low RDM could improve habitat for these species. Management practices similar to and compatible with those used by BLM on the Carrizo Plain National Monument (NM) (neighboring the refuge to the northwest) will be implemented at Bitter Creek NWR to support San Joaquin Valley special status species. As at Carrizo Plain NM, to achieve a desired resource objective, it may be necessary to modify vegetation abundance, distribution, composition, and/or structure. The choice of whether to apply a vegetation management tool, or which tool to use, is based on existing conditions, the physical and biological processes at the site, the species targeted, the desired outcome, the type and influence of impacts, and the funding available. Following adaptive management practices such as these, efforts will be made so that the tool employed achieves the desired objective, with a minimum of adverse effects to other resources (USBLM 2010). Germano et al. (2012) found that populations of blunt-nosed leopard lizard and giant kangaroo rat increased significantly faster in grazed plots than in ungrazed plots; and of the eight species studied, only Heermann's kangaroo rat were more abundant on the ungrazed plots. The abundance of rare plants in this vegetation type varies considerably from year-to-year, which makes annual monitoring important. Fewer monitoring points measured annually would be more effective than many plots measured more irregularly or less often.

Secretary of the Interior Order Number 3270 calls for the Service, BLM, and other Department of the Interior agencies to incorporate adaptive management principles into management plans and programs. The Secretarial Order also directs that Adaptive Management: The U.S. Department of the Interior Technical Guide (USDI 2007) be used as the technical basis for implementing adaptive management programs. Adaptive management recognizes that ecosystems are very complex and understanding of their processes and responses to management actions is limited. Thus, the greatest hurdle to overcome in implementing effective restoration and other management actions is uncertainty regarding their effectiveness. Adaptive management acknowledges that there are incomplete data when dealing with natural resources, and that through continued research and monitoring of management practices, new information will be collected. This new information is evaluated, and a determination is made whether to adjust the strategy accordingly to improve success in meeting plan objectives.

In summary, the term "vegetation management" as used here denotes any manipulation of vegetation to meet a specific plan objective for either wildlife or botanical resource management. In many cases, tradeoffs would be involved, and a specific tool that benefits one resource may negatively affect another. The Service acknowledges these undesirable consequences/tradeoffs and includes protective and mitigating measures to maximize the beneficial effects to Service resources while minimizing the negative effects. For example, fencing may be constructed to exclude livestock from a grazing prescription area to minimize or prevent adverse impacts to specific habitats or species (e.g., wetlands, rare plants). However, this may not completely eliminate negative effects. As stated, the strategies would be implemented using an adaptive management approach to further refine use of management tools to increase beneficial results while minimizing undesired effects.

Bitter Creek NWR Strategies:

2.2.1 Identify and map refuge grasslands with potential to support San Joaquin Valley special status plant and animal species including San Joaquin kit fox (*Vulpes microtis mutica*), giant kangaroo rat (*Dipodomys nitratoides exilis*), blunt-nosed leopard lizard (*Gambelia sila*), Kern mallow (*Eremalche parryi* subsp. *kernensis* [*Eremalche kernensis*]), California jewelflower (*Caulanthus californicus*), and San Joaquin woollythreads (*Monolopia congdonii* [*Lembertia congdonii*]).

Bitter Creek NWR. Photo: K. Geurs

2.2.2 Evaluate and implement various grassland management tools to achieve habitat objectives (e.g., grazing, over-seeding with native perennial grasses and forbs requiring the use of local ecotypes [from seeds collected on-site], mowing, herbicide).

2.2.3 Implement prescribed grazing through annual permits and agreements if appropriate to meet habitat objectives.

2.2.4 Monitor plant and wildlife community responses to management actions and evaluate data to inform adaptive management. (See also strategy 2.2.6.)

2.2.5 Coordinate with neighboring land management agencies and organizations to share best practices for achieving management objectives.

2.2.6 Conduct special status plant surveys annually during spring and into fall to track selected plant populations throughout the refuge and particularly in the units where prescribed grazing occurs. Qualified subject expert and refuge staff shall assess grazing effects on plant populations. The Region 8 Inventory and Monitoring Program may also facilitate a special status plant inventory. (See also strategy 2.2.4, and Appendices E and H for special status plants on the refuge.)

Objective 2.3:
Within 10 years of CCP approval, manage up to 7,000 acres of the refuge's grasslands to achieve a mosaic of habitat structure and floristic diversity, including scattered shrubs, to support a diversity of grassland birds. Manage approximately one-third as short grassland (height 3 to 8 inches), another third as medium grassland (height 6 to 12 inches), and another third as tall grasslands (height 12 to 25 inches), and monitor for native plants.

Rationale 2.3:
Bitter Creek grasslands currently support or have the potential to support several birds of conservation concern, including prairie falcon, grasshopper sparrow, burrowing owl, and wintering Oregon vesper sparrow (*Pooecetes gramineus affinis*). We are managing for these resource targets because either they are a high priority for the Service; they are know to occur on Bitter Creek or, based on their habitat needs and distribution, are likely to occur there. The target habitat structure is based on published literature on the habitat needs of these species.

Some of the birds of conservation concern prefer short grassland. For example, for burrowing owl, the over-riding characteristics of habitat appear to be burrows for roosting and nesting and relatively

short vegetation with only sparse shrubs and taller vegetation (Green and Anthony 1989; Haug et al. 1993). Other birds, such as northern harrier and other raptors, use medium to tall grass, scattered shrubs, and trees for perches.

By following the recommendations in Shuford and Gardali (2008) and the California Partners in Flight Bird Conservation Plans, the Service can provide or improve foraging habitat for grassland obligate birds such as prairie falcon, grasshopper sparrow, and nesting burrowing owl; and foraging and nesting for tricolored blackbird, prairie falcon, and wintering Oregon vesper sparrow. Burrowing owls prefer well-drained level to gently sloping areas characterized by sparse vegetation and bare ground such as moderately or heavily grazed pasture, grass heights less than 3.1 inches; 25%–60% bare ground; and fresh manure for lining nests (Dechant et al. 2002). Prairie falcons inhabit grasslands, shrubsteppe, and agricultural habitats in mostly arid landscapes (Skinner 1961; Steenhof 1998). A mosaic of grassland types attracts a greater variety of bird species (Fuhlendorf et al. 2006). Monitoring studies over a 7-year period by Germano (Germano et al. 2012) found that if cattle grazing is closely monitored in space and time to minimize adverse effects on the habitat, grazing could be an effective tool to control dense stands of non-native grasses and benefit native wildlife. Prescribed grazing may be used as a tool to reach the grassland mosaic habitat objectives.

The mosaic of habitat structures is described in more detail in the Bitter Creek NWR Prescribed Grazing Plan (see appendices). The Prescribed Grazing Plan includes prescriptions for approximately 14 management units comprised of refuge lands dominated by annual grasses. Several of the existing grazing units will likely be combined or split to accommodate reasonable grazing cell sizes.

See Rationale for Objective 2.2 for information about the Secretary of the Interior Order Number 3270, which calls for the Service, BLM, and other Department of the Interior agencies to incorporate adaptive management principles into management plans and programs.

Bitter Creek NWR Strategies:

2.3.1 Develop a long-term restoration strategy for grassland communities to benefit migratory birds on the refuge as part of the step-down HMP that also addresses climate change adaptation.

2.3.2 Evaluate and implement various grassland management tools (e.g., grazing, over-seeding with native perennial grasses and forbs requiring the use of local ecotypes [from seeds collected on-site], mowing, herbicide) to achieve habitat objectives.

2.3.3 Consider implementing prescribed grazing through permits and agreements when appropriate to meet habitat objectives.

2.3.4 Develop and implement protocols to monitor plant and animal community responses to management actions and evaluate data to inform adaptive management.

2.3.5 Coordinate with neighboring land management agencies and organizations to share best practices for achieving management objectives.

2.3.6 Use prescribed livestock grazing to manage grass height and cover density for target species' habitat conditions, reduce competition from non-native annual grasses and forbs, improve available soil moisture, manage for grassland mosaics, encourage germination of native species, and allow oak recruitment in grassland savannas, as applicable.

2.3.7 Monitor native plant composition and frequency over time to track succession and density.

Objective 2.4:

Prevent the infestation of new invasive plant species and reduce the range and coverage of existing invasive species by 25%, including yellow star thistle (*Centaurea solstitialis L.*), and invasive non-native mustards (*Brassicaceae* spp.).

Rationale 2.4:
Certain plant and animal species have undesirable effects on wildlife, plants, and their habitats or may pose a health risk. Invasive plant species compete with more desirable plants for space, sunlight, nutrients, and water. Invasive plants can have detrimental effects on the distribution and abundance of more desirable plants, which are those important to wildlife as food, shelter, and nesting areas. In some cases, certain plants may be desirable in modest proportions but can be detrimental to diversity and productivity if they become dominant. In addition to yellow star thistle and invasive mustards, Russian thistle grows at the edges of the refuge and is creeping into the disked fire breaks; early detection/rapid eradication of Russian thistle could help avoid infestations on the refuge. See also Rationale 2.3 for Hopper Mountain NWR for managing invasive species.

Bitter Creek NWR Strategies:

2.4.1 Develop and implement a step-down IPM Plan, including management prioritization and early detection/rapid response to prevent and limit adverse effects of invasive plants on wildlife and grassland habitat.

2.4.2 Inventory and map invasive plants and their management treatments. Invasive non-native mustards documented or reported on the refuge include *Capsella bursa-pastoris*, *Chorispora tenella*, *Descurainia sophia*, *Hirschfeldia incana*, *Sisymbrium altissimum*, and *Sisymbrium orientale.*

2.4.3 Use appropriate cost-effective IPM techniques to prevent infestation and reduce cover area of invasive plants.

2.4.4 Evaluate the use of prescribed livestock grazing to reduce invasive plants as part of the IPM Plan.

2.4.5 Conduct, facilitate, and/or support research to evaluate techniques for controlling invasive plant species.

Objective 2.5:
Prevent the infestation of new invasive animal species (e.g., feral swine) and reduce the number of existing non-native animals.

Rationale 2.5:
Invasive species are one of the leading threats to U.S. ecosystems and may cause devastating economic, environmental, and human impacts. Invasive animals include introduced and native animals that have or may become overabundant and pose threats to agriculture, the environment, and/or human health and safety.

Certain animal species have undesirable effects on wildlife, plants, and their habitats or may pose a health risk. Feral swine are secretive, highly adaptive opportunists that seek out and destroy native plant communities without regard for rare or endangered status. By rooting the soil and wallowing in wetland areas, they raze the vegetation that both prevents erosion and provides food and habitat for native wildlife. Their ravenous consumption of food, upon which other forest species depend, can have a direct negative effect on native animals. Wild boars are vectors of several serious diseases, including pseudorabies, which is fatal in mountain lions; swine brucellosis, which can be fatal in people; and trichinosis, a food borne disease caused by a parasitic worm that lodges in the animal's muscle tissue. The disease may be passed to humans who consume infected, undercooked meat and can be fatal if not treated (USDA 2011).

The Service anticipates that the early prevention of new invasions of pest mammals would reduce overall costs and help protect habitat for target species for which the refuge was established.

Bitter Creek NWR Strategies:

2.5.1 Develop and implement feral and non-native animal management practices and early detection/rapid response as part of the IPM Plan.

2.5.2 Proactively obtain necessary permits and authorizations to facilitate rapid response to target non-native and feral animals so they may be removed quickly.

2.5.3 Partner with adjacent landowners, such as Wind Wolves Preserve, to effectively share information about and management actions for target species such as feral swine.

Juniper woodland, Bitter Creek NWR. Photo: USFWS

GOAL 3: ***Protect and enhance oak and other refuge woodlands for healthy ecological conditions to support special status species and an abundance and diversity of migratory birds.***

Objective 3.1:
Within 5 years of CCP approval, obtain baseline data (relative abundance) on special status animal species and plant community composition and structure in woodland and savanna habitats, including focal bird species such as Nuttall's woodpecker, oak titmouse, loggerhead shrike, and western bluebird (*Sialia mexicana*).

Rationale 3.1:
Juniper and oak woodlands on Bitter Creek NWR support several birds of conservation concern and California Partners in Flight focal species, including grasshopper sparrow, northern harrier, olive-sided flycatcher, tricolored blackbird, Vaux's swift, vesper sparrow, loggerhead shrike, Bewick's wren, black-headed grosbeak, Bullock's oriole, California thrasher, greater roadrunner, Lawrence's goldfinch, Nuttall's woodpecker, oak titmouse, and spotted towhee. The olive-sided flycatcher (*Contopus cooperi)* (California Species of Special Concern) is known to breed at the Headwall oaks area. From 2009 through 2011, De Vries and others conducted plant surveys on the refuge (De Vries 2009; De Vries 2010). However, more detailed information is needed about the juniper woodland and oak woodland plant communities' composition on the refuge, and there is no information on plant community structure. This baseline information is needed to track long-term trends and monitor effectiveness of management actions in refuge woodlands. A summary of the plant and wildlife surveys is provided in the appendices.

Alvord oaks, Bitter Creek NWR. Photo: USFWS

Bitter Creek NWR supports a variety of woodland types. Alvord oak woodlands include Alvord oak and other oak species, and California juniper woodlands also mix with oak woodlands on the refuge. Because Nuttall's woodpecker and oak titmouse are oak woodland-associated species, protecting older, larger trees used for nesting, encouraging regeneration of oaks, and protecting oak stands from wildfire are management priorities at Bitter Creek NWR.

Efforts to protect California juniper woodlands on the refuge should focus on reducing fine fuels, especially from non-native annual grasses. Mowing or grazing can be effective, but can inhibit juniper recruitment. Prescribed burning is not recommended as a protection strategy [and prescribed fire is not being proposed at Bitter Creek NWR], as it can result in nearly complete loss of California juniper where fine fuels are intermittent to continuous (Sawyer et al. 2009). However, mechanical treatments would be effective in limiting encroachment of California juniper into grasslands.

Bitter Creek. Photo: K. Geurs

Mixed scrub oak/pinyon woodlands are found on the steep slopes of the Bitter Creek Canyon Headwall. This cover type is similar to Alvord oak woodlands with the addition of pinyon pine. The presence of pinyon pine likely increases overall flammability, and the steep slopes almost certainly increase fire size and severity. A fire starting at the bottom of the Headwall would likely make sustained long runs as a crown fire, but also create a mosaic of low and high severity patches. In exceptionally dry years, or years in which the production of non-native annual grasses is high, the proportion of high severity to low severity areas can be expected to significantly increase. Complete stand replacement is a possibility.

Bitter Creek NWR Strategies:

3.1.1 Conduct surveys for focal bird species.

3.1.2 Inventory woodland plant species, and investigate age structure of trees.

3.1.3 Develop step-down HMP for refuge woodlands, and develop and implement survey protocols to monitor woodland plant and wildlife species.

3.1.4 Survey for Kern mallow (*Eremalche parryi* subsp. *kernensis*) and other special status plants in woodlands and saltbush scrub and document results and areas surveyed in the refuge GIS database. (See also the strategy for special status species surveys in grasslands under Bitter Creek NWR Goal 2.)

3.1.5 Determine if there are woodland-associated mammals, reptiles, or amphibians that should be considered as focal species.

Objective 3.2:
Within 12 years, develop and implement management prescriptions to protect and maintain oak regeneration and diversity to benefit woodland birds, including Nuttall's woodpecker, oak titmouse, and western bluebird.

Rationale 3.2:
Threats to Nuttall's woodpecker include loss of habitat, human encroachment, and pesticides. A permanent resident of oak woodlands, the range of the Nuttall's woodpecker range barely extends outside of California. Its limited range, low density, and close association with oak woodlands and riparian zones make it vulnerable to development that encroaches on its habitat. Much of this species' biology has received only superficial or incidental attention (CalPIF 2002). The Nuttall's woodpecker appears within forested areas and subtropical regions; it resides in urban environments as well. The global population of this bird is estimated to be 100,000–200,000 birds. Human activities such as urban, suburban, or agricultural development that result in reducing extent or quality of oak woodlands and riparian habitats would impact total numbers of the Nuttall's woodpecker (Lowther 2000).

See Rationale for Hopper Mountain NWR Objectives 4.1 for information on UC Davis' Integrated Hardwood Range Management Program (UCIHRMP).

Bitter Creek NWR Strategies:

3.2.1 Follow California Partners in Flight management recommendations until step-down HMP is developed.

3.2.2 Every 5 years, evaluate whether natural oak regeneration is adequate using the UCIHRMP decision key (UCIHRMP et al. 1996).

Orchard Spring, Bitter Creek NWS. Photo: USFWS

3.2.3 Prior to initiating restoration (planting) activities, evaluate acorn production using the UCIHRMP method (UCIHRMP et al. 1996).

3.2.4 If restoration (planting) is needed because natural regeneration is not sustainable, develop a restoration program for mixed woodlands as part of the HMP, requiring the use of local ecotypes (seedlings grown from acorns collected on-site). To protect seedlings from animal browsing, consider use of protective tubes/exclosures and, exclude livestock from these restored/planted areas.

Objective 3.3:
Within 10 years, eliminate all tree of heaven (*Ailanthus altissima*) and prevent the establishment of new non-native invasive species.

Rationale 3.3:
See Hopper Mountain NWR Rationale 2.3 for managing invasive species.

Bitter Creek NWR Strategies:

3.3.1 Use appropriate cost-effective IPM techniques to manage invasive species on the refuge.

3.3.2 Selectively replace trees of heaven with the local ecotypes of native trees specified in the HMP (approximately 1 acre).

GOAL 4: *Restore and maintain riparian and wetland communities to support native plants and wildlife.*

Objective 4.1:
Within 5 years of CCP approval, obtain baseline information on the presence and distribution of riparian and wetland-associated plants, animals, and habitat conditions.

Rationale 4.1:
Little information exists about the riparian and wetland plant community composition and structure and wildlife on the refuge. Baseline information is needed to track long-term trends and monitor effectiveness of management actions. See Rationale for Bitter Creek NWR Rationale 3.1.

Bitter Creek NWR Strategies:

4.1.1 Develop and implement an Avian Monitoring Plan for riparian areas and wetlands.

4.1.2 Conduct aquatic/riparian habitat assessment (including presence/absence of special status species, such as California red-legged frog (*Rana draytonii*) and foothill yellow-legged frog (*Rana boylii*)).

4.1.3 Install wind/rain gauge weather station.

4.1.4 Survey for vernal pools during spring.

4.1.5 If listed species are found in vernal pools, ensure those pools and alteration of their hydrological patterns are avoided (e.g., roads will not be constructed through vernal pool complexes).

Objective 4.2:

Within 5 years, obtain baseline information on springs, wetlands, water rights, and the potential impacts of erosion and contaminants on water resources. Based on findings, develop and implement strategies to improve water quality and address water rights.

Rationale 4.2:
The 2004 North American Landbird Conservation Plan identified loss and contamination of freshwater wetlands as a conservation issue. This CCP objective addresses this conservation issue by implementing strategies to gather baseline data on water resources on the refuge and protect water quality (Riparian Bird Conservation Plan 2004).

Bitter Creek NWR Strategies:

4.2.1 Conduct comprehensive inventory of springs and wetlands, including water quality.

4.2.2 Research, document, and evaluate water rights on the refuge.

Objective 4.3:
Within 5 years of CCP approval, restore natural spring flow in 3 subwatersheds within the 6 watersheds on Bitter Creek NWR to support native plants and wildlife.

Rationale 4.3:
Since European settlement (approximately 200 years ago), humans have dramatically altered ecological and hydrological functioning of Bitter Creek NWR and neighboring lands. Landscape modifications include the introduction of large numbers of livestock (e.g., cattle, horses, sheep). Springs provide much of the water to riparian habitats on the refuge. In general, 2 types of springs occur: (1) springs with their water source from the precipitation within the watershed, and (2) springs with their water source derived from deep within the earth and make their way to the surface, which may be associated with the fault line. Currently, almost all of the springs on the refuge have been diverted or otherwise tapped to provide water for troughs and tanks throughout the refuge (Pers. comm. Heitmeyer, M. 2011). Originally used for cattle, they are now used as wildlife guzzlers and for fire protection (Pers. comm. Heitmeyer, M. 2011). Bitter Creek NWR has an intricate and expansive water system of 22 water tanks and nearly 10.5 miles of pipes.

Changes to flow patterns, including altered flow regimes and impoundment of water, can affect riparian and wetland communities, alter distribution of populations of special status species, and affect the distribution of non-native invasive species. The springs and outflow channels provide habitat for resident birds, reptiles, amphibians, mammals, and migratory bird species. Many factors have historically affected water levels and water quality, including on- and off- refuge human impacts from resource developments, as well as natural climatic conditions. Water resource impacts will be ongoing considerations during planning and management of finite water resources. Preventing deleterious changes in the condition of water resources is critical to fulfilling the refuge purposes, thus they require constant and increasing monitoring efforts.

In 2011, the Service's Inventory and Monitoring (I&M) Program began a hydro-geomorphologic (HGM) analysis of the refuge. The study was not completed. By using the results of the HGM analysis and by working with the Recovery Program team, fire management staff, and other riparian restoration biologists, the Service will determine which drainages to initially restore. By using adaptive management principles to determine the effects on riparian systems (water timing and quantity, animal and plant species responses), the objective is to restore the integrity and environmental health of Bitter Creek NWR watersheds to improve water quality and quantity for native wildlife and plant communities. The water management infrastructure will be left in place during this experiment.

Bitter Creek NWR Strategies:

4.3.1 Based on information in the HGM study results, develop and implement an HMP that addresses riparian restoration needs.

4.3.2 Reduce and modify water control structures to restore natural flows and eliminate diversion of water except as needed for fire suppression, bunkhouse use, and prescribed livestock grazing needs.

4.3.3 Require exclusionary fencing to protect riparian areas and wetlands prior to implementation of prescribed grazing in adjacent grasslands.

4.3.4 Based on 2011 evaluation, install approximately 20 miles of fencing to define management units based upon biological and logistical considerations.

4.3.5 Implement early detection/rapid response to remove invasive plants to avoid colonization in response to changes in water availability (see also IPM Plan in strategy 4.5.1).

Objective 4.4:
Maintain and improve existing tricolored blackbird breeding habitat, and improve habitat by providing open accessible water (within 950 feet of the colony) suitable nesting substrate (cattail, nettles, bulrush, and willows), and foraging habitat (within about 9,800 feet) of the colony.

Rationale 4.4:
Although originally protected to provide a secure site to conserve the California condor, Bitter Creek NWR is also providing essential conservation services for another member of California's unique and increasingly threatened avifauna: the tricolored blackbird (Meese 2011). Tricolored blackbird breeding habitat includes open accessible water (within "a few hundred meters"); suitable nesting substrate, such as cattails (*Typha* sp.), thistle, nettle (*Urtica* sp.), willows, or Himalayan blackberries; and suitable foraging areas that provide adequate insect prey within "a few kilometers" (Beedy and Hamilton 1997).

California's national wildlife refuges are providing a diverse array of nesting substrates and permanent water sources that are attractive to breeding tricolors but that are surrounded by foraging landscapes that are increasingly dominated by agriculture.

Bitter Creek NWR is unique in that it provides native nesting substrates surrounded by foraging substrates that remain relatively free from agricultural influences, which provides an opportunity for tricolors to breed and for us to view breeding tricolors in as natural a setting as likely currently exists in California. Approximately 250 breeding pairs were noted in the Annual Narrative during the 1992 season. Of concern is the reduction in the number of colony nesting sites on the refuge from a high of 6 in 2005 to a single colony site (Spanish Spring) in 2011 (Stockton, M, Pers. comm. 2011).

Spanish Spring area is the largest known area on the refuge where tricolored blackbird colonies are undisturbed by people and cattle. In the last few years, red-winged blackbirds have inhabited areas that were previously tricolored blackbird nesting sites; however, there is a lack of historic survey data to support this. Overflow from some existing water tanks have supported small riparian areas that may provide nesting substrate for tricolored blackbirds.

From 2006 through 2011, tricolored blackbird surveys were conducted on the refuge. In 2011, Robert Meese, PhD, conducted trapping and surveying work at only the Spanish Spring location. During these surveys, Meese noted that several other locations on the refuge (e.g., the west side of Unit 1, also known as "Aunt Ruth's"), although small in area, could provide potential habitat for tricolored blackbird. Although willow (one type of nest substrate used by tricolored blackbirds) grows at this location, emergent marsh vegetation such as cattails is limited there at this time (Stockton, M. Pers. comm. 2011). During his 2011 research, Meese discovered 2 banded tricolored blackbirds at Bitter Creek NWR that were also captured at Kern NWR, north of Bitter Creek NWR. These type of data both confirm the multiple-broodedness of the species as well as the itinerant nature of the breeding, where birds that breed early in the year (March–April)

in the southern San Joaquin Valley breed again at locations further north in the Central Valley during summer (May–June). These recapture data also illustrate the importance of California's national wildlife refuges to tricolored blackbird conservation (Meese 2011).

Bitter Creek NWR Strategies:

4.4.1 Coordinate with partners to conduct bi-annual tricolored blackbird surveys on the refuge.

4.4.2 Encourage growth of nettles and willows near historic tricolored blackbird habitat.

4.4.3 Fence out livestock and native grazers from historic tricolored blackbird nesting and breeding habitat to maintain vegetation cover.

4.4.4 Consider and evaluate the use of livestock grazing in areas adjacent to tricolored blackbird breeding colonies to optimize grassland foraging areas for blackbirds.

Objective 4.5:
Within 5 years, eliminate salt cedar (*Tamarix* sp.) on the refuge and prevent the infestation of other non-native invasive species.

Rationale 4.5:
The suitability of salt cedar (also known as tamarisk) as wildlife habitat has been a subject of considerable debate. It generally does not provide habitat for most wildlife because neither its foliage nor its flowers (including seeds) have any significant forage value in contrast to native species (Lovich et al. 1994). From a structural standpoint, tamarisk does provide cover for some species, particularly birds. The value of tamarisk to wildlife appears to vary geographically. Utilization of tamarisk by birds was high to low in some areas of the Rio Grande River and low on the Colorado River. Published studies of the value of tamarisk as wildlife habitat have focused on birds. Purported benefits to selected birds do not necessarily extend to other animals. In spite of the value that tamarisk may have for wildlife cover, most authors have concluded that tamarisk has little to no value to wildlife (Kerpez and Smith 1987; Anderson and Miller 1990; Rosenberg et al. 1991). Tamarisk invasion has serious adverse consequences on the structure and stability of native plant communities (Lovich et al. 1994).

Riparian ecosystems have been so detrimentally affected by tamarisk and other factors that they may possibly be the rarest ecosystem in North America (Barranco 2001). The monotypic stands of tamarisk aggressively replace willows, cottonwoods, seepwillow/baccharis, and other native riparian vegetation. Tamarisk is a very great consumer of water: a single large plant can absorb 200 gallons of water a day. This can result in the lowering of ground water, drying up of springs and marshy areas, as well as reduction in water yield of riparian areas. The dense roots of tamarisk can slow down river flow, increasing deposition and increasing sediments along the riverbank. Although it can provide nesting area for some species, avian density and diversity decreases dramatically when tamarisk is present. It has been found that tamarisk stands supported only 4 species per hundred acres, in comparison to 154 species per hundred acres of native vegetation. Tamarisk communities also tend to have smaller numbers of insects (Barranco 2001).

Bitter Creek NWR Strategies:

4.5.1 Develop and implement a step-down IPM Plan, including management prioritization and early detection/rapid response to prevent new infestations and limit adverse effects of invasive plants on wildlife and riparian and wetland habitats.

4.5.2 Partner with others to remove tamarisk on the refuge using IPM techniques.

4.5.3 Survey for new occurrences of non-native invasive species seasonally and treat all new occurrences within 30 days of discovery.

4.5.4 Revegetate treated areas with native species propagated from locally collected cuttings as specified in HMP (approximately 2 acres).

GOAL 5: ***Promote ecosystem function by enhancing landscape-level connectivity within the Transverse Ranges through coordinated management.***

Objective 5.1:
Within 12 years, reduce adverse effects of roads on refuge resources (for example, erosion).

Rationale 5.1:
Areas where vegetation cover has been removed and mineral soil is exposed are susceptible to erosion and runoff during rain events. Watershed rehabilitation measures help stabilize the soil; control water movement and sediment and debris transport; prevent permanent impairment of ecosystem structure and function; and mitigate significant threats to human health, safety, life, property, or downstream habitat quality. Although not caused by wildfire, erosive conditions on the refuge (specifically in Bitter Creek Canyon) can be rehabilitated with similar measures to mitigate the aforementioned threats to human health and safety and to biological integrity diversity and environmental health. The Service's Roadway Design Guidelines are available at: *http://www.fws.gov/pacific/planning/main/docs/Transportation/LRTPAppendixFinal.pdf*

Bitter Creek NWR Strategies:

5.1.1 Evaluate internal road system to determine which roads support the refuge purposes and the Recovery Program.

5.1.2 Reduce and avoid habitat degradation by closing/removing unneeded roads and annually maintaining selected roads.

5.1.3 Within 10 years, restore selected, erosion-prone roadbeds to natural conditions as specified in HMP.

Objective 5.2:
Within 5 years of CCP approval, identify primary wildlife movement corridors for larger mammals across Cerro Noroeste Road and State Highway 166/33, and work with neighboring landowners and transportation agencies to address wildlife mortalities on these corridors; and reduce barriers to wildlife movement within the refuge.

Rationale 5.2:
Road ecology is an emerging science. With roots in ecosystem and environmental fields, it is a multidisciplinary science that blends the disciplines of ecology and transportation studies, particularly vehicular and pedestrian traffic studies. A wildlife movement corridor is a linear habitat whose primary wildlife function is to connect at least 2 significant habitat areas (Harris and Gallagher 1989). Beier and Loe (1992) provide a checklist for evaluating impacts to wildlife movement corridors. One of the steps in the evaluation process is to map the corridor(s). The Service seeks to learn more about the existing wildlife movement corridors on the refuge and management practices used to improve connectivity across boundaries.

Bitter Creek NWR Strategies:

5.2.1 Monitor wildlife activity to identify high-use wildlife crossings on the refuge.

5.2.2 Partner with Caltrans to install wildlife crossing (and/or reduce-speed) signs at documented locations on highway and adjacent paved roads where wildlife is most likely to be present (based on monitoring in 5.2.1).

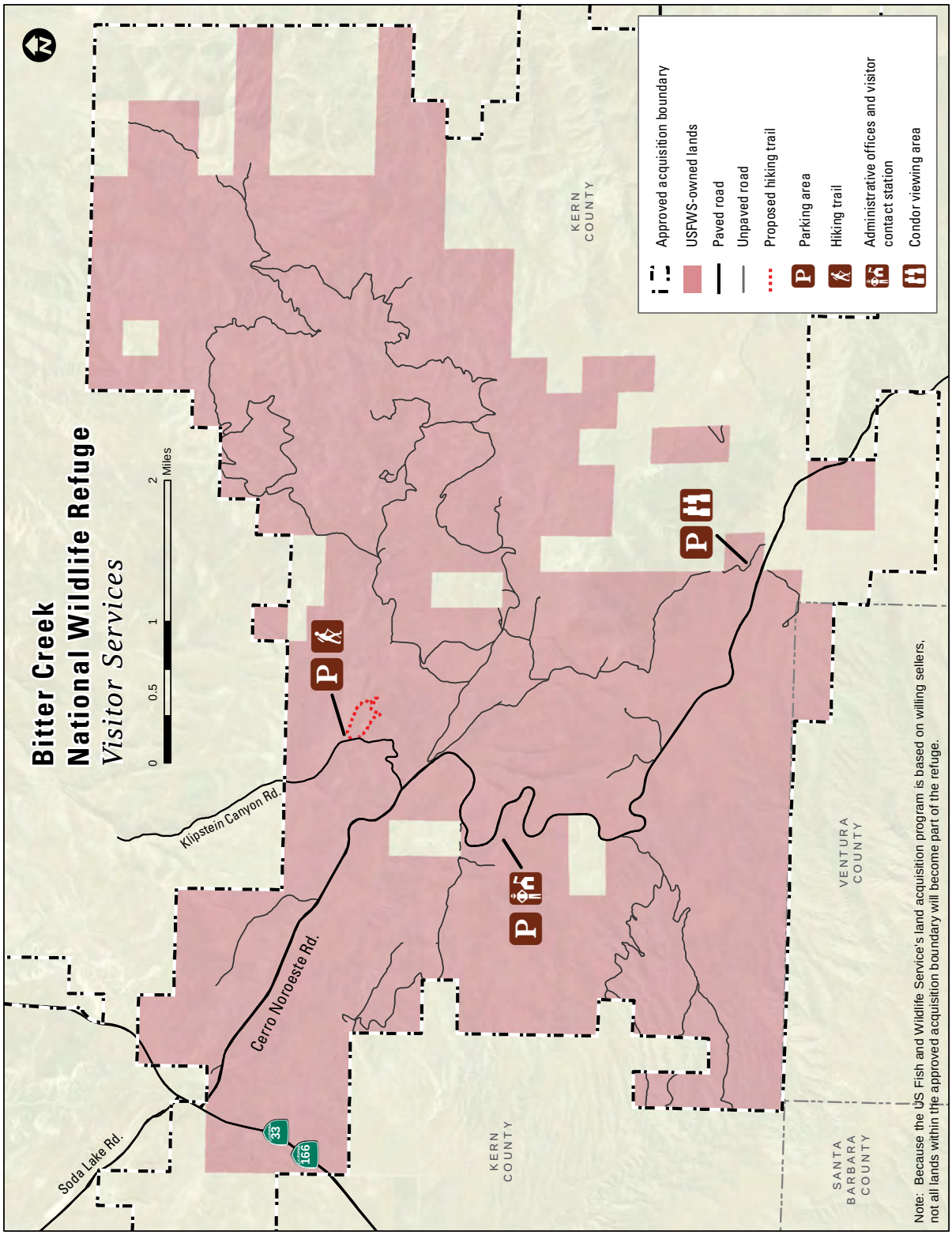
5.2.3 Within 5 years of CCP approval, remove old and unnecessary internal fencing.

5.2.4 Within 10 years of CCP approval, replace non-wildlife-friendly fences with wildlife-friendly fences.

5.2.5 Coordinate with neighboring land management agencies and organizations to establish a commonly recognized landscape management area with partnerships or agreements to reach common management goals.

5.2.6 Within 2 years of CCP approval, coordinate with neighboring land management agencies and organizations to develop best practices for improving connectivity across boundaries.

Figure 4-1. Bitter Creek NWR, Visitor Services



Refuge-guided hike, Bitter Creek NWR. Photo: USFWS

GOAL 6: ***Provide quality information and education to increase the public's appreciation and understanding of the refuge and its wildlife, habitats, and cultural resources.***

Objective 6.1:
Within 5 years of CCP approval, 500 residents of Kern, Ventura, Santa Barbara, and San Luis Obispo counties will learn and gain appreciation for the Bitter Creek National Wildlife Refuge and the California Condor Recovery Program.

Rationale 6.1:
The Bitter Creek NWR is located in a remote, sparsely inhabited area where Kern, Ventura, San Luis Obispo, and Santa Barbara counties meet. Its distance from population centers and its closure to public visitation since its establishment has resulted in a low awareness of the refuge within the surrounding region. Also, although the California Condor Recovery Program is a bi-national program often cited as one of the most successful endangered species recovery programs in the world, it is not well known and understood in the area. Therefore, education and outreach about Bitter Creek NWR and the Recovery Program is needed to raise knowledge and awareness within the region.

Further, "implementing condor information and education programs" is identified in the CCRP as 1 of the 5 key actions identified in the Strategy for Recovery (USFWS 1984). (For a list of the 5 key actions, refer to Hopper Mountain NWR Rationale 1.1.) Addressing some of the primary threats to the recovery of condors, such as lead poisoning and the ingestion of microtrash, depends on educating the public and raising awareness in the community about ways to overcome and/or minimize these dangers to the long-term survival of the species.

The Service recognizes that all wildlife, plants, and habitats on the refuge are part of an interdependent ecosystem that extends beyond the refuge boundaries. Providing outreach and education to the public is the best way to further management actions on the Bitter Creek National Wildlife Refuge. When the public and partners are not aware of the refuge and its role in local, regional, and national conservation, they are less likely to value, appreciate, or advocate for the resources on the refuge.

A graphical representation of the proposed visitor services improvements are shown in Figure 4-1. Bitter Creek NWR, Visitor Services.

Refuge-guided condor viewing hike. Photo: USFWS

Bitter Creek NWR Strategies:

6.1.1 Prepare a Visitor Services Plan for Bitter Creek NWR.

6.1.2 Conduct presentations to community groups, schools, and the public.

6.1.3 Attend events and staff booths to provide information on the refuge and the Recovery Program.

6.1.4 Conduct 5 regularly scheduled refuge tours each year.

6.1.5 Develop new and update existing outreach materials.

6.1.6 Expand/improve Bitter Creek NWR website.

6.1.7 Develop a refuge-specific brochure.

Objective 6.2:
Offer at least 5 volunteer opportunities per year to promote stewardship and appreciation of the refuge and California Condor Recovery Program.

Rationale 6.2:
Due to staff size, the refuge relies heavily on volunteer staff to conduct biological and maintenance work, as well as to conduct tours and special projects. The National Wildlife Refuge System Volunteer and Partnership Enhancement Act of 1998 (PL 105–242) identifies the importance of volunteers and strengthens the Refuge System's role in developing relationships with volunteers. Volunteers possess knowledge, skills, and abilities that can enhance the scope of refuge operations. Volunteers and Friends groups may have a good understanding of community needs and how the refuge may conduct outreach to the community.

Bitter Creek NWR Strategies:

6.2.1 Coordinate refuge volunteer opportunities with Recovery Program.

6.2.2 Provide volunteer opportunities such as plant propagation, planting, invasive plant removal, plant surveys, and wildlife surveys.

6.2.3 Work with Friends of California Condors Wild and Free and other organizations to offer joint walks, talks, tours, and volunteer opportunities.

Objective 6.3:
Within 10 years of CCP approval, provide quality interpretation, wildlife observation, and wildlife photography opportunities at the refuge.

Rationale 6.3:
The Bitter Creek NWR has been closed to public use due to the sensitivity of California Condor Recovery Program activities occurring on the refuge. To provide opportunities for the public to experience the refuge, staff and volunteers have led limited guided tours. Interpretation and wildlife observation and photography are 3 of the 6 priority public uses identified in the Refuge Improvement Act. As such, the Service is creating wildlife-dependent recreation on the refuge in a way that doesn't hinder refuge management activities. We assume that hiking through Bitter Creek NWR's oak savanna and observing condors from the refuge observation point will promote an appreciation for the biological diversity and wildlife value of the refuge and ultimately promote support among the community for refuge efforts to restore and manage this ecosystem. The public will be encouraged to participate in self-guided wildlife viewing on an established trail off Klipstein Canyon Road. Accessibility Guidelines for Outdoor Developed Areas, which apply to

federal land management agencies can be found at: *http://www.access-board.gov/outdoor/draft-final.htm*.

Bitter Creek NWR Strategies:

6.3.1 Establish refuge interpretive walking trail, approximately 1-mile-long loop, off Klipstein Canyon Road that provides for wildlife viewing and photography opportunities including a 2-panel visitor kiosk, interpretive trail signage, and interim auto parking for up to 5 cars (while frequency of use is determined).

6.3.2 Install a lockable gate at the trailhead.

6.3.3 At former Cliff Hudson house site, remove unsafe structures, restore some historic/cultural structures for interpretation, and establish refuge administrative office with visitor area and parking.

6.3.4 Establish automobile pull-off with low panels and overhead shade structure at a condor observation point near the upper refuge sign, off Cerro Noroeste Road with low interpretive panels and a shade structure.

Objective 6.4:
Within 5 years of CCP approval, assess all known refuge cultural resources.

Rationale 6.4:
Cultural resources are not renewable. The Bitter Creek NWR has experienced very little archaeological survey, so the potential for significant cultural resource sites is not clearly understood. A program for systematic archaeological survey and site inventory will assist the Service in developing a better understanding of which areas of the refuge may be sensitive for the presence of cultural resources.

The Service's Region 1 and Region 8 Cultural Resources Team compiled the following information regarding the structure on the refuge known as "Percy's Place." The structure is also known as the Percy F. Hudson House. In 1907, Percy Hudson brought up from Hazelton 2 sections of a Sunset Railroad line depot building that had been abandoned. He also brought sections of a house from Maricopa. The result is a 1-story building in a "T" formation. It is wood frame and an adobe brick root cellar under the main section. In 2010, protective wrapping was installed on the house. The protective wrapping installed on Percy's Place is estimated to last approximately 5 years from installation. The Service seeks to determine the disposition and future plans for the house within the life of the protective wrapping.

Bitter Creek NWR Strategies:

6.4.1 Identify archeological sites that coincide with existing and planned roads, facilities, public use areas, and habitat projects.

6.4.2 Develop GIS database for cultural resources.

6.4.3 Evaluate threatened and impacted sites and structures for eligibility to the National Register of Historic Places.

6.4.4 Prepare and implement Cultural Resources Management Plan for Bitter Creek NWR, including measures to avoid and mitigate impacts to sites and structures as necessary.

6.4.5 Within 5 years, develop a rehabilitation/reuse plan for Percy's Place house and begin implementation of the plan.

6.4.6 Prepare plans to ensure protection, preservation, and interpretation of NRHP eligible cultural resources.

Objective 6.5:
Within 2 years of hiring a Refuge Complex law enforcement officer, obtain 50% reduction in theft and vandalism on the refuge.

Rationale 6.5:
Safety is our number one concern for refuge staff and visitors. Effective law enforcement is essential to ensuring a safe environment in which refuge staff can work and refuge visitors can recreate. Because Service law enforcement personnel alone cannot adequately patrol Bitter Creek NWR, partnerships with law enforcement organizations are needed to provide adequate coverage. Posting

Blunt-nosed leopard lizard. Photo: 2008 William Flaxington

the boundaries of the refuge is expected to provide a clear designation of public lands, help protect sensitive refuge resources, and reduce trespass.

Bitter Creek NWR Strategies:

6.5.1 Periodic patrols by law enforcement.

6.5.2 Maintain existing boundary signs.

6.5.3 Maintain periodic coordination with neighboring agencies on law enforcement.

6.5.4 Maintain roads for safe access by staff, volunteers, guided tours, and law enforcement.

6.5.5 Post boundary, ensuring signs are visible and boundary lines are easily determined to support law enforcement.

6.5.6 Partner with neighboring land management agencies to provide law enforcement on the refuge.

Objective 6.6:
Prevent fire-related injury and property loss.

Rationale 6.6:
Safety is our number one concern for refuge staff and visitors. Wildfires can endanger people and property both on and around the refuge. Fire prevention and suppression activities on the refuge can help to ensure a safe place to work and recreate.

Bitter Creek NWR Strategies:

6.6.1 Maintain needed fuel breaks (existing roads also serve as fuel breaks) as indicated in the approved Fire Management Plan and annual agreements among agencies.

6.6.2 Suppress wildfires to protect life, structures, and natural and cultural resources in accordance with the approved Fire Management Plan.

4.7 Blue Ridge NWR Goals, Objectives and Strategies

GOAL 1: ***Support the recovery strategies of the California Condor Recovery Program on Blue Ridge NWR.***

Objective 1.1:
Within 5 years of CCP approval, work with neighboring communication station stakeholders and Recovery Program coordinators to implement strategies to prevent injury or mortality of California condors.

Rationale 1.1:
A CCRP recovery strategy focuses on minimizing condor mortality factors. In accordance with CCRP section 235, "Protection should be provided by management plans on public lands…patrolling wildlife authorities, and biologists tracking released birds." Because Blue Ridge NWR was established to benefit the condor, all refuge management activities are implemented to reduce the risk of condor injury and mortality.

As with the addition of a biologist and a law enforcement officer, a maintenance worker position (shared with all of the refuges in the Refuge Complex) would be needed to implement the habitat management actions described in the majority of the strategies within the habitat goals for Blue Ridge NWR.

Blue Ridge NWR Strategies:

1.1.1 Expand remote population monitoring capabilities by providing a site for remote telemetry stations located on-refuge.

1.1.2 Coordinate with communication tower stakeholders to inform owners of potentially adverse effects of towers and discuss options to minimize adverse effects on condors.

1.1.3 Work with communication tower owners and ridge top landowners to develop measures to mitigate the hazards associated with communication towers, energy distribution lines, and associated infrastructure on Blue Ridge NWR and the surrounding Blue Ridge region.

Communication towers, Blue Ridge NWR. Photo: USFWS

Objective 1.2:
Maintain existing quantity and quality of condor roosting habitat on-refuge.

Rationale 1.2:
The CCRP establishes a mandate to protect and enhance habitat critical for California condor recovery. See Rationale for Objective 1.4 for Hopper Mountain NWR.

Additionally, 2 of the roost habitat management objectives of the Blue Ridge Habitat Management Plan (HMP) (U.S. Bureau of Land Management 1985) are: Assess current and future management needs at Blue Ridge through monitoring condor use, human use, and habitat conditions; and assure continued availability of suitable roost trees and bathing pools through appropriate silvicultural and manipulative techniques. Structure of the tree/snag (good large lateral branches) and location/aspect (mid-slope updrafts) are likely to be important characteristics. Five of the 24 historic roost snags/trees identified in the HMP were located within the refuge. Based on vegetation maps in the HMP, 3 of the roosts within the refuge appear to be located in yellow pine forest, and 2 are in chaparral. The remaining historic roosts identified in the HMP were located in other ownerships throughout the surrounding 11,000 acres. The Service would like to investigate whether historic roosting sites are still available at the refuge, whether new roost sites have become available, whether there is sufficient recruitment to insure roost sites will be available in the future when the condor is expected to return to this area of the Sierra, and whether climate change considerations may affect roost site availability.

Climate change is already affecting wildlife throughout the state (Parmesan and Galbraith 2004). The projected impacts of climate change on temperature in the Sierra Nevada will be warmer winter temperatures, earlier warming in the spring, and increased summer temperatures. In this ecoregion, the topographic diversity will likely result in high variability in the magnitude of temperature increases. Spring melt timing has advanced and will likely advance more rapidly on the west slope than the east slope due to weakening westerly winds (Lundquist and Cayan 2007). Although the effects of temperature increases on the California condor are unknown, the strategies that follow are expected to inform the Service's management decisions about condor roosting habitat.

Proper management of the area to restrict disturbance to these areas will improve condor survival rates, strengthen pair bonds, and allow for proper behavioral development of juvenile condors.

Blue Ridge NWR Strategies:

1.2.1 Survey and map existing and historical condor roost sites on-refuge.

1.2.2 Evaluate and monitor threats to condor roost sites (e.g., fire, insects).

1.2.3 Minimize human disturbance near condor roosting areas.

1.2.4 Coordinate with U.S. Forest Service and other agencies that are leading efforts to assess the effects of climate change on the rate of snag creation and deterioration, intensity and duration of wildfires and altering historic fire cycles, and modification and timing and availability of water during summer months (i.e., determine if predictions show there may be less water available in the late summer).

Objective 1.3:
Within 10 years of CCP approval, work with other interested agencies and stakeholders to benefit condor foraging habitat in the foraging area described in the regional, multi-agency 1985 Blue Ridge Habitat Management Plan.

Rationale 1.3:
One of the 5 key actions in the CCRP is maintaining habitat for condor recovery (USFWS 1984). (For the 5 key actions, refer to Hopper Mountain NWR Rationale 1.1.) In accordance with CCRP 235, "Protection should be provided by management plans on public lands…maintaining habitat for condor recovery." In 1976, the Blue Ridge area, which includes what is now the Blue Ridge NWR, was among the 9 condor activity areas determined to be critical habitat for the condor (USFWS 1976).

Blue Ridge NWR Strategies:

1.3.1 Quantify and maintain current quantity and quality of condor foraging habitat and available forage in the Blue Ridge area (as defined in the 1985 Blue Ridge Habitat Management Plan).

1.3.2 Develop partnerships with foothill ranchers and other stakeholders in the region.

1.3.3 Within 1 year of CCP approval, contact signatory agencies of the 1985 Blue Ridge Habitat Management Plan to discuss status and feasibility of updating the 1985 Plan.

Objective 1.4:
Within 2 years of CCP approval, develop an estimate of the carbon footprint for the operation of Blue Ridge NWR, and implement mitigation measures to offset the Refuge Complex's carbon footprint.

Rationale 1.4:
This objective meets with the Service's Climate Change policy, which recommends reducing refuge staff carbon footprint to offset climate change impacts. See Rationale 1.6 for Hopper Mountain NWR.

Blue Ridge NWR Strategies:

1.4.1 Quantify the carbon footprint (emissions) from annual refuge operations.

1.4.2 Develop measures to reduce the carbon footprint of refuge management operations.

1.4.3 Improve efficiency where feasible both at the refuge and the Refuge Complex headquarters (e.g., reduce vehicle trips, carpool to the refuges, reuse and recycle).

1.4.4 Educate and empower refuge staff and volunteers about "green" activities that offset carbon emission, climate change, and climate change effects on refuge resources.

GOAL 2: ***Maintain healthy and representative examples of Sierra foothill communities, such as coniferous forests, woodland savannas, and chaparral.***

Objective 2.1:
Obtain baseline information on presence and distribution of special status species likely to exist on the refuge.

Rationale 2.1:
Federally-listed threatened, endangered, and candidate species are trust responsibilities under the jurisdiction of the Service. Listed species that have been documented in areas near the refuge and may be present on the refuge include: Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), California red-legged frog, Springville clarkia (*Clarkia springvillensis*), and the California condor.

The possible effects of climate change at Blue Ridge NWR include increases in the rate of snag creation and deterioration, increasing intensity and duration of wildfires and altered timing of fire cycle, increases in the number of outbreaks of forest pests, and modification of the timing and availability of water during summer months (most likely less water in late summer). The Service seeks to consider potential climate change influences when planning future habitat management actions. See also the Rationale for 1.2.

Blue Ridge NWR Strategies:

2.1.1 Conduct presence/absence surveys of select special status species, including the Springville clarkia, Kaweah brodiaea (*Brodiaea insignis*), mountain yellow-legged frog (*Rana muscosa*), and fisher (*Martes pennanti*).

2.1.2 Develop partnerships with other agencies, NGOs, and universities to pursue research supporting refuge goals.

2.1.3 Assess water sources and flow regimes for refuge riparian habitats (seasonal, year-round, etc.).

2.1.4 Within 10 years of CCP approval, work with U.S. Forest Service and others to conduct monitoring to identify climate change-related impacts and potential effects to refuge resources. Support research and modeling of the future impacts of climate change on refuge resources.

Objective 2.2:
Identify and prioritize non-native invasive species for management action. Reduce or extirpate targeted non-native invasive species to eliminate adverse effects on refuge resources.

Rationale 2.2:
See Rationale 2.3 for Hopper Mountain NWR for managing invasive species.

Blue Ridge NWR Strategies:

2.2.1 Determine potential invasive plants that could infest the refuge. Coordinate with area agencies and local partners to identify invasive plants in the region that may be considered threats to the refuge.

2.2.2 Develop IPM Plan for plant and animal species (including feral pigs), including monitoring and control methods.

2.2.3 Coordinate with the U.S. Forest Service to use their existing monitoring program for bark beetles and other potential future pest insects on the refuge.

Objective 2.3:
Manage for natural fire regimens, with a return interval of 15–20 years, to encourage old-growth forest characteristics and maintain native plant diversity and naturalness to benefit special status species.

Rationale 2.3:
Encouraging the development of old-growth characteristics will benefit many species, including California condors and old-growth associates (Siegel and DeSante 1999). If prescribed fire is utilized, avoid damage or disturbance to historic and potential condor roost sites.

Blue Ridge NWR. Photo: USFWS

Restoration of forested habitats on the refuge to the fire-resilient conditions that existed historically would likely require mechanical thinning of understory trees followed by prescribed burning (van Wagtendonk and Fites-Kaufman 2006).

Blue Ridge NWR Strategies:

2.3.1 Update and maintain a Fire Management Plan focused on natural fire regimes and fuel treatment options for forest/shrub communities (yellow pine forest, chaparral, riparian, and foothill woodland).

2.3.2 Use prescribed fire as appropriate and recommended in the Fire Management Plan.

2.3.3 Become a member of the local Fire Safe Council.

2.3.4 Meet annually with U.S. Forest Service, BLM, and private organizations to coordinate fire management response with respect to protection of special status species and their habitats.

2.3.5 When appropriate, implement thinning operations in combination with conducting understory prescribed burns to develop old-growth characteristics within the mixed conifer forests.

GOAL 3: ***Provide quality interpretive and wildlife-dependent recreational opportunities for refuge visitors and the community to promote a deeper understanding and appreciation of the refuge and California condor.***

Objective 3.1:
Provide quality interpretation, wildlife observation, and wildlife photography opportunities on more than 1 mile of trail at Blue Ridge NWR.

Rationale 3.1:
Since its establishment, Blue Ridge NWR has been closed to public use. However, the refuge's location in the southern Sierra Nevada foothills provides an ideal venue for the Service to reach people in the region and provide the public with information about the Service, the Refuge System, Blue Ridge's wildlife and habitat, and the California Condor Recovery Program (including threats to condors, such as lead poisoning and microtrash). The Refuge Improvement Act requires national wildlife refuges to prioritize 6 wildlife-dependent recreational uses. To fulfill this mandate, Blue Ridge NWR will open to the public for wildlife-dependent recreation experiences, including interpretation, wildlife observation, and photography.

Blue Ridge NWR Strategies:

3.1.1 Develop a Visitor Services Plan for Blue Ridge NWR.

3.1.2 Establish interpretive hiking trails using existing roads, trails, and/or fire roads, while avoiding sensitive condor roosting and nesting habitat.

3.1.3 Ensure adequate signage for refuge visitors.

Objective 3.2:
Within 10 years of CCP approval, 500 refuge visitors will learn and gain appreciation of Blue Ridge NWR and the California Condor Recovery Program. Conduct at least 1 volunteer opportunity per year to promote stewardship and appreciation of the Blue Ridge NWR and Recovery Program.

Rationale 3.2:
Knowledge and awareness about national wildlife refuges and the Recovery Program is not widespread in the southern Sierra Nevada foothills region. Opening Blue Ridge NWR to visitors will provide a unique opportunity for the Service to reach wildlife-dependent recreationists. Interpretive information at trailheads and other key locations will educate refuge visitors on threats to condors, the refuge's purposes, and the Refuge System.

Volunteers, Friends, and partners are valuable allies of the Service. These individuals and groups are vital to fulfilling the Service's mission and goals (USFWS 2010b). Volunteers and intern biologists provide thousands of hours of service to the Refuge Complex and Recovery Program. During 2009, volunteers and interns donated approximately 8,464

hours (USFWS 2009). These activities included plant inventories, maintenance, condor monitoring and other Recovery Program activities.

Due to staff size, Blue Ridge NWR is dependent on volunteer staff to conduct biological and maintenance work, tours, and special projects. The National Wildlife Refuge System Volunteer and Partnership Enhancement Act of 1998 (PL 105–242) identifies the importance of volunteers and strengthens the Refuge System's role in developing relationships with volunteers. Volunteers possess knowledge, skills, and abilities that can enhance the scope of refuge operations. Volunteers and Friends groups may have a good understanding of community needs and how the refuge may conduct outreach to the community.

Blue Ridge NWR Strategies:

3.2.1 Install interpretive signage (including about lead awareness) at boundaries, roads, and trails/trailheads on the refuge.

3.2.2 Provide volunteer opportunities, such as invasive plant removal, wildlife and plant surveys, and trail building/cleanup.

Objective 3.3:
Within 10 years of CCP approval, 500 residents of Tulare and surrounding counties will learn and gain appreciation for the Blue Ridge NWR and the California Condor Recovery Program.

Rationale 3.3:
The Blue Ridge NWR is located in a remote area of Tulare County, nestled in the Sierra foothills. Its distance from population centers and its closure to public visitation since its establishment has resulted in a low awareness of the refuge within the surrounding region. Although the Recovery Program is a bi-national program that is often cited as one of the most successful endangered species recovery programs in the world, current threats to condors and challenges for the Recovery Program are not well understood in the area. Therefore, education and outreach about Blue Ridge NWR and the Recovery Program is needed to raise knowledge and awareness within the region. Further, "implementing condor information and education programs" is identified in the CCRP as one of the 5 key actions included in the Strategy for Recovery. Some of the primary threats to the recovery of condors, such as lead poisoning and the ingestion of microtrash, depend on educating the public and raising awareness in the community for overcoming and minimizing these dangers to the long-term survival of the species.

Blue Ridge NWR Strategies:

3.3.1 Develop updated outreach materials on Blue Ridge NWR and coordinate with similar materials for the Recovery Program.

3.3.2 Expand and improve the Blue Ridge NWR website.

3.3.3 Develop refuge-specific brochure.

Objective 3.4:
Within 5 years of CCP approval, provide a safer environment for visitors.

Rationale 3.4:
Safety is the Service's number one concern for refuge staff and visitors. Because of Blue Ridge NWR's remote location, safety and medical services are not readily available and can have long response times. Safety hazards on the refuge include such things as insect/reptile/animal bites and stings, fire, and extreme temperatures, among others. Illegal hunting (poaching) takes place on the refuge. The potential for illegal marijuana plantations both on the refuge and on adjacent lands are threats to resources, the public, and agency personnel. Increased law enforcement patrols will help deter these unlawful uses of the refuge.

Blue Ridge NWR Strategies:

3.4.1 Periodic patrols by law enforcement.

3.4.2 Complete posting of the full boundary.

3.4.3 Cooperate with neighboring land management agencies to provide law enforcement on-refuge.

Chapter 5. Implementation and Monitoring

Full moon at Bitter Creek NWR. Photo: USFWS

5.1 Introduction

This chapter summarizes the actions, funding, coordination, and monitoring required for implementing Alternative B, the preferred alternative, as presented in this Draft CCP. A full description of all alternatives can be found in the Environmental Assessment (Appendix B). The CCP will serve as the primary management reference document for refuge planning, operations, and management for the next 15 years or until it is formally revised or amended within that period. Detailed step-down plans that follow the CCP process and describe how management strategies are implemented will also be prepared during the 15-year period (see section 5.3). The Service will implement the Final CCP with assistance from existing and new partner agencies and organizations and from the public. The timing and achievement of the management strategies proposed in this document are contingent upon a variety of factors, including:

- Funding and staffing
- Completion of step-down management plans
- Compliance requirements
- Adaptive management
- Monitoring and evaluation

As noted on the inside cover of this document, these plans do not constitute a commitment for staffing increases, operational and maintenance increases, or funding for future land acquisition. Decisions about the aforementioned commitments are at the discretion of Congress in overall appropriations and in budget allocation decisions made at the Washington, regional, and Refuge Complex levels of the Service.

5.2 Priority Setting

In the Refuge Improvement Act, Congress established 3 priorities for refuge management. As a first priority, every refuge is to be managed to fulfill its purposes and the Refuge System mission, namely conservation of fish, wildlife, and plants. Secondly, refuges are to facilitate wildlife-dependent or "big 6" public uses—hunting, fishing, wildlife observation and photography, and environmental education and interpretation. Of lowest priority is managing other uses and activities such as general recreation.

However, setting priorities in a linear or in-order fashion (e.g., implementing from top to bottom on a list of prioritized actions) is generally not realistic when dealing with the complexities and multi-program nature of managing a national wildlife refuge. In practice, a linear approach is not always workable. Following are a few of the reasons why some actions identified in this chapter must be done simultaneously or why some general recreation actions are done before other resource-related actions.

- Funding allocations from Congress may not follow an established hierarchy. For example, there may be no appropriations for land acquisition or habitat restoration in a given year, but Congress may choose to fund visitor services enhancement packages.
- A high priority such as habitat restoration is costly on an impaired habitat and dependent on funding from other sources. Thus, habitat restoration may be the highest priority for the

refuge, but it cannot be accomplished if the funding is lacking.

- The public or other units of government may strongly urge actions that may not be high resource priorities, or staff may be confronted with health, safety, or societal needs that must be addressed. Examples include a right-of-way expansion for a utility or highway project or protection of archeological resources.
- Some actions may only be conducted when weather or climate conditions are suitable.

5.3 Step-Down Management Plans

Some refuge programs or initiatives require more in-depth planning than the CCP process is designed to provide; for these programs and initiatives, the Service prepares step-down management plans. What follows is a list of step-down plans called for in the Draft CCP or as required by Service policy. These refuge-specific plans provide the details of implementing the respective program or initiative described in broad terms in the objectives and strategies. These plans will be developed in consultation with other agencies and partners and in coordination with the Pacific Southwest Region's Migratory Birds Program and Inventory and Monitoring Program. The public will be given ample opportunity for plan review and comment. Environmental assessments or other documentation may also be needed to comply with the National Environmental Policy Act (NEPA) or other requirements.

California condor in nest cave with 30-day old chick. Photo: USFWS

Hopper Mountain NWR:

- Habitat Management Plan (including grassland, riparian/wetland, and black walnut and oak woodland)
- Integrated Pest Management Plan
- Visitor Services Plan
- Cultural Resources Management Plan

Bitter Creek NWR:

- Habitat Management Plan (including grassland, riparian, and woodland)
- Integrated Pest Management Plan
- Visitor Services Plan
- Cultural Resources Management Plan
- Avian Monitoring Plan

Blue Ridge NWR:

- Integrated Pest Management Plan
- Visitor Services Plan

5.4 Funding and Staffing

Resources are required to operate a national wildlife refuge, including capital outlay for equipment, facilities, labor, other expenses, and recurring expenses. Many of the goals and objectives listed in Chapter 4 can be accomplished with existing resources. Some of these actions reflect current, ongoing efforts. Other actions identified in Chapter 4 require new funding and/or staffing to fully implement. The completion target for all actions is generally 2027 (15 years from CCP approval), given the unknown nature of funding. Actions in the biological goals for each refuge are the highest priority since they directly support the protection and enhancement of wildlife and their habitat. Details of these actions are identified in Chapter 4.

The estimated initial capital outlay (one-time costs) to implement the actions described in this CCP is approximately $5.2 million (Table 5-1). Not all of these capital expenditures would occur in the same year. Some contracts or cooperative agreements will be needed to provide specialized services beyond the core refuge functions for which staff are required. The estimated annual recurring cost

Table 5-1. Estimated initial capital (one-time) costs to fully implement the CCP

Action	Estimated Cost
Hopper Mountain NWR	
Construct a new, earthquake-resistant 1,600-square-foot pole barn (no electricity) [HM1.1.3]	$697,760
Replace unusable housing to accommodate up to 8 additional residents (1,500-square-foot wood, non-modular house) and optimize energy efficiency by following Green Building Council's LEED standards [HM1.3.2, 1.3.3]	$350,500
Work with partners to identify potential climate change effects on condor roosts and other resources [HM1.4.4]	$1,000
Quantify and develop measures to reduce the carbon footprint (emissions) for the refuge [HM1.6.1, 1.6.2]	$10,000
Prepare grassland Habitat Management Plan [HM2.1.1, 2.1.2]	$20,000
Prepare and implement survey protocols for grasslands [HM2.1.3]	$15,000
Prepare and implement IPM Plan for Hopper Mountain NWR, including invasive plants and wildlife [HM2.1.4, 2.3.1, 2.3.2, 3.2.1, 3.2.2]	$15,000
Remove invasive plants (initial removal) [HM2.1.5, 2.1.7]	$5,000
Map the approximate current distribution of native grasses and forbs [HM2.2.1]	$5,000
Conduct presence/absence surveys for special status species [HM2.2.2, 3.1.1, 5.1.1, 5.1.2, 5.1.3]	$75,000
Prepare and implement survey protocols for riparian/wetlands [HM3.1.4, 3.3.5]	$15,000
Conduct inventory of water rights and springs [HM3.3.1]	$7,000
Prepare riparian/wetland Habitat Management Plan [HM3.4.1]	$20,000
Replace culvert with 24" diameter water control structure for adaptive management of existing wetland [HM3.4.2]	$19,540
Prepare black walnut and oak woodlands Habitat Management Plan [HM4.1.1]	$20,000
Prepare a brochure for Hopper Mountain NWR [HM6.1.6]	$3,000
Inventory and evaluate cultural resources on the refuge and develop GIS database [HM6.5.1, 6.5.2]	$3,000
Subtotal Hopper Mountain NWR	*$1,281,800*
Bitter Creek NWR	
Construct 1,000-square-foot condor treatment facility (on-site care of sick/injured condors) [BC1.1.5]	$500,000
Construct 2 trailer pads with RV hookups (with sewer, water, and electricity) to support staff field work and research [BC1.3.2]	$29,440
Work with partners to identify potential climate change effects on condor roosts and other resources [BC1.4.5]	$1,000
Define and map habitat data of condor foraging areas on refuge [BC1.5.3]	$3,000
Quantify and implement measures to reduce the carbon footprint (emissions) for the refuge [BC1.6.1, 1.6.2]	$10,000
Prepare and implement survey protocols for focal and special status species [BC2.1.1]	$35,000
Survey and map select special status species [BC2.1.2, 2.1.5, 2.2.6, 3.1.4]	$75,000
Survey and map select unique native grasses and forb communities [BC2.1.3]	$50,000
Survey for vernal pools and federally-protected vernal pool species [BC4.1.4, 4.1.5]	$10,000

Continued on next page

Action	Estimated Cost
Prepare grassland Habitat Management Plan with restoration strategies to benefit migratory birds [BC2.3.1]	$20,000
Prepare and implement IPM Plan for Bitter Creek NWR [BC2.4.1, 2.5.1, 4.5.1]	$15,000
Conduct woodland vertebrate surveys (mammals, reptiles, and amphibians) and initial point count survey for birds (using refuge traps) [BC3.1.1, 3.1.5]	$75,000
Conduct woodland and savanna plant inventory [BC3.1.2]	$20,000
Prepare woodland Habitat Management Plan [BC3.1.3]	$20,000
Restoration planting and plant protection to reach target (if determined applicable by 3.2.2, 3.2.3) [BC3.2.4]	$40,000
Replace invasive non-native tree of heaven with native trees specified in Habitat Management Plan (1 acre, cost based on using liners or D-pot plantings) [BC3.3.2]	$20,000
Prepare and implement an Avian Monitoring Plan for Bitter Creek NWR [BC4.1.1]	$14,000
Conduct aquatic/riparian habitat assessment and survey for California red-legged and foothill yellow-legged frogs [BC4.1.2]	$15,000
Install wind/rain gauge weather station [BC4.1.3]	$10,000
Inventory springs and test water quality [BC4.2.1]	$57,000
Document water rights on the refuge [BC4.2.2]	$7,000
Prepare riparian Habitat Management Plan [BC4.3.1]	$20,000
Remove diversions and repair water control structures to restore natural flows except for fire suppression, bunkhouse supply, and prescribed livestock grazing [BC4.3.2]	$10,000
Install exclusionary fencing to protect riparian areas prior to grazing [BC4.3.3]; ~20 miles of new fencing to define management units based on biological considerations [BC4.3.4]; and exclusionary fencing to protect tricolored blackbird prior to grazing [BC4.4.3]	$400,000
Remove invasive tamarisk (initial removal) [BC4.5.2]	$20,000
Revegetate tamarisk removal areas with native plants specified in Habitat Management Plan (2 acres, cost based on using liners or pole cutting plantings) [BC4.5.4]	$40,000
Remove and/or replace unneeded fencing with wildlife-friendly fencing to define management units based on biological considerations [BC1.5.4,5.2.3, 5.2.4]	$5,000
Prepare a brochure for Bitter Creek NWR [BC6.1.7]	$3,000
Build Klipstein Canyon Road interpretive walking trail, 1-mile loop [BC6.3.1]	$4,500
Build Klipstein Canyon Road 2-panel visitor kiosk at trailhead [BC6.3.1]	$10,500
Build Klipstein Canyon roadside interim parking and signage [BC6.3.1, 6.3.2]	$4,000
Remove unsafe and unusable structures at Cliff Hudson house site [BC6.3.3]	$100,000
Restore historic/cultural structures for interpretation [BC6.3.3]	$50,000
Build refuge administrative office, 3,500-4,000 sf (3 offices, admin space, visitor area, wood frame, fire sprinkler system), septic, water well, kiosk, and parking (graded gravel) at Cliff Hudson home site [BC6.3.3]	$2,100,000
Build Cerro Noroeste Road pull-off for condor observation with low panels and overhead shade structure [BC6.3.4]	$30,000
Identify archaeological sites affected by existing and future refuge projects and map into GIS database, and evaluate affected sites and structures for National Register of Historic Places eligibility [BC6.4.1, 6.4.2, 6.4.3, 6.4.4]	$10,000
Subtotal Bitter Creek NWR	*$3,833,440*

Continued on next page

Action	Estimated Cost
Blue Ridge NWR	
Survey and map existing and historical condor roost sites [BR1.2.1]	$5,000
Work with partners to identify potential effects of climate change on condor roost snags and refuge resources [BR1.2.4, 2.1.4]	$15,000
Quantify and implement measures to reduce the carbon footprint (emissions) for the refuge [BR1.4.1, 1.4.2]	$1,000
Conduct presence/absence surveys for special status species [BR2.1.1]	$25,000
Prepare and implement IPM Plan for Blue Ridge NWR [BR2.2.2]	$15,000
Establish interpretive hiking trails on existing roads/trails [BR3.1.2]	$2,000
Install 1-panel interpretive signage [BR3.2.1]	$5,000
Prepare a brochure for Blue Ridge NWR [BR3.3.3]	$2,500
Subtotal Blue Ridge NWR	*$70,500*
TOTAL (Hopper Mountain, Bitter Creek, and Blue Ridge NWRs)	**$5,185,740**

HM = Hopper Mountain NWR
BC = Bitter Creek NWR
BR = Blue Ridge NWR
IPM = Integrated Pest Management
GIS = Geographic Information System

to fully implement the CCP is approximately $1.5 million (Table 5-2).

Costs are estimates and will likely be higher or lower based on detailed project planning and timing of implementation. Staff costs reflect salary and benefit rates at grades normal for the positions described. These needs will be reflected in key Refuge System databases such as the Refuge Operating Needs System (RONS) and Financial and Budget Management System (FBMS), which provide information used in budget formulation and allocation. The Service will also seek other project funding such as cost share agreements with partners, agency grant programs, grants from non-profit groups, and cost-saving or reprogramming measures within existing budget allocations.

5.5 Partnership Opportunities

As described in Chapter 1, a wide array of private and public partners play an important role in helping the Service achieve its goals and objectives for the refuges. The Service will continue to rely on these and other partners to help implement the final CCP and to provide input for future CCP revisions.

The CCP identifies many projects that provide new opportunities for existing or new partners. The forum for bringing together such a diversity of partners, who often have different missions and agendas, is both formal and informal. Established associations, commissions, committees, and working groups bring people together; individual plan development, internal Service planning sessions, interagency planning sessions, and public meetings allow input from everyone. Specific projects and events let citizens lend a helping hand. These partnerships will remain an important part of plan implementation, both in gaining and maintaining public and partner understanding and support, and through the joint funding of specific actions.

Refuge staff works with the California Department of Fish and Game in designing and carrying out projects and programs. The Bureau of Land Management (BLM) (Bakersfield Field Office area) and the U.S. Forest Service (the Western Divide Ranger District of the Sequoia National Forest and the Ojai Ranger District of the Los Padres National Forest) are also important partners due to their land ownership around the refuges and throughout the watersheds.

Table 5-2. Estimated annual, recurring costs to fully implement the CCP[1]

Expenditure	Quantity	Unit[2]		Estimated Cost[3]
Salaries and Benefits[2]				
Staff positions - existing	9.0	FTE		537,486
Staff positions - vacant[4]	4.0	FTE		336,576
Biological Science Technicians GS-7 (Term)(3 FTEs), 1 Refuge Complex Law Enforcement Officer GS-7/9 (.75 FTE), 1 Maintenance Worker WG-7/8 (.75 FTE) - proposed	4.5	FTE		288,755
Subtotal Salaries and Benefits				***$1,162,817***
Programs				
California Condor Recovery Program coordination (Recovery Program costs to the Refuge Complex that are not funded by Recovery Program)	5,000	ea	1.0	5,000
Maintenance (repairs, replacement, rentals, etc.) and utilities (fuel, propane, electricity, phones, postage, etc.)	75,000	ea	1.0	75,000
Invasive weed program (herbicide, materials, contracts, equipment repairs, and replacements)	50,000	ea	3.0	150,000
Water/pumping costs and water quality monitoring	10,000	ea	2.0	20,000
Vegetation and wildlife monitoring (at each refuge)	25,000	ea	3.0	75,000
Environmental education program	2,000	ea	1.0	2,000
Travel/training	10,000	ea	1.0	10,000
Supplies	15,000	ea	1.0	15,000
Printing	1,000	ea	1.0	1,000
Computer services and maintenance, field supplies and equipment	1,000	ea	12.0	12,000
Volunteer program and stipends	1,500	ea	1.0	1,500
Law enforcement agreements	5,000	ea	1.0	5,000
Fire response agreements	10,000	ea	1.0	10,000
Oil and gas coordination	5,000	ea	1.0	5,000
Subtotal Programs				***$386,500***
TOTAL (Salaries, Benefits, and Programs)				**$1,549,317**

[1] Staffing and funding would be sought over the 15-year life of this Plan subject to approval and funding by Congress.

[2] FTE (full time equivalent) reflects the fraction of time dedicated to exclusively Hopper Mountain, Bitter Creek, or Blue Ridge NWRs' work; Guadalupe-Nipomo Dunes NWR is not included in this estimate. California Condor Recovery Program funding is not included in this estimate.

[3] Estimates are based on 2011 salary levels with 35% added for benefits. Existing salaries are calculated using the current grade and step level of the position, and proposed salaries are calculated using the highest grade the position will attain at a step 1 level.

[4] Unfilled, but included in approved staffing model.

The U.S. Geological Survey, Environmental Protection Agency, U.S. Department of Agriculture Animal and Plant Health Inspection Service (APHIS), and state-level counterpart agencies all play a role in biological monitoring, research, environmental regulation, and policy making within the region, and thus the refuges. Other Service programs such as Ecological Services and Law Enforcement can also play a key role in supporting refuge projects and programs. The Service's Partners for Fish and Wildlife Program will continue to play a critical role in working with private landowners to provide technical and financial assistance to conservation minded farmers, ranchers, and other private (non-federal and non-state) landowners who wish to restore fish and wildlife habitat on their land.

Conservation organizations are active in policy issues and/or land acquisition affecting the refuge and include the Audubon Society, The Nature Conservancy, and Defenders of Wildlife. Additionally, many citizen conservationists help the refuges as volunteers or as members of the refuge Friends group (Friends of California Condors Wild and Free).

5.6 Monitoring and Evaluation

The CCP is designed to be effective for a 15-year period. The plan will be reviewed and revised as required to ensure that established goals and objectives are still applicable and that the CCP is implemented as scheduled. The monitoring program will focus on issues involving public use activities, habitat management programs, wildlife inventory, and other management activities. Monitoring and evaluation will use the adaptive management process described in this chapter.

Collection of baseline data on plants and wildlife will continue at all 3 refuges. These data will be used to update existing species lists, wildlife habitat requirements, and seasonal use patterns. Special status species, migratory birds, raptors, and other species of primary management concern will be the focus of monitoring efforts. Where information gaps exist, a concerted effort will be made to obtain more information. With new information, goals and objectives may need modification. Environmental monitoring will be conducted to evaluate the effects of refuge public use on wildlife habitat and wildlife populations.

Improving and expanding the wildlife monitoring and habitat evaluation activities will be a primary focus during implementation of the CCP. In this regard, adequate refuge staffing and continued partnerships with U.S. Forest Service, BLM, California Department of Fish and Game, and other agencies will continue to be important.

Many actions in the CCP are new directions in management. Monitoring will help the Service understand the effects of various management actions on habitat and wildlife populations, and public use patterns and levels. Land use changes, invasive species, wildfires, disease outbreaks, and climate changes may alter expected outcomes, and monitoring will be critical to detecting and reacting to such change.

5.7 Plan Amendment and Revision

The CCP is intended to evolve as the refuge changes, and the Refuge Improvement Act specifically requires that CCPs be formally revised and updated at least every 15 years. The formal revision process will follow the same steps as the CCP creation process. In the meantime, the Service will be reviewing and may update this CCP periodically based on the results of the adaptive management program, which uses monitoring, evaluation, and experimentation to learn and change aspects of the management plan as needed. The CCP may also be reviewed during routine inspections or programmatic evaluations and while preparing annual work plans. Results of any or all of these reviews may indicate a need to modify the plan. The goals described in this CCP will not change until they are re-evaluated as part of the formal CCP revision process. However, the objectives and strategies may be revised to better address changing circumstances or to take advantage of increased knowledge of the resources on the refuge. It is the intent of the Service for the CCP to apply to any new lands that may be acquired. If changes are required, the refuge manager will determine the appropriate level of public involvement and environmental permitting and review.

The intent of the CCP is for refuge objectives and strategies to be attained during the next 15 years. Management activities will be phased in over time, and implementation is contingent upon and subject to results of monitoring and evaluation, funding through congressional appropriations and other sources, and staffing.

5.8 Adaptive Management

Adaptive management is the process of implementing policy decisions as scientifically-driven experiments that test predictions and assumptions about management plans, using the resulting information to improve the plans. Adaptive management provides the framework within which biological measures and public use can be evaluated by comparing the results of management to results expected from objectives. Management direction is periodically evaluated within a system that applies several options, monitors the objectives, and adapts original strategies to reach desired objectives. Habitat, wildlife, and public use management techniques and specific objectives will be evaluated regularly as results of a monitoring program and other new technology and information become available. These periodic evaluations would be used over time to adapt both the management objectives and strategies to better achieve management goals. Such a system provides new information for future decision making while allowing resource use.

5.9 Appropriate Use Requirements

The Appropriate Use policy describes the initial decision process the refuge manager follows when first considering whether to allow a proposed use on a refuge. The refuge manager must find a use is appropriate before undertaking a compatibility review of the use. Uses that have been administratively determined to be appropriate are the 6 wildlife-dependent recreational uses (hunting, fishing, wildlife observation and photography, environmental education, and interpretation) and the take of fish and wildlife under state regulations. A review of appropriateness of existing and proposed refuge uses was completed for the refuges. Grazing for wildlife habitat management, research, and native plant gathering were found to be additional appropriate uses beyond the administratively approved uses listed. If a use is determined to be appropriate, a compatibility determination is prepared for those uses.

5.10 Compatibility Determinations

Federal law and policy provide the direction and planning framework to protect the Refuge System from incompatible or harmful human activities and to insure that Americans can enjoy Refuge System lands and waters. The Refuge Improvement Act is the key legislation on managing public uses and compatibility. Before activities or uses are allowed on a refuge, uses must be found to be "compatible" through a written compatibility determination. A compatible use is defined as a proposed or existing wildlife-dependent recreational use or any other use of a national wildlife refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the Refuge System mission or the purposes of the national wildlife refuge. Sound professional judgment is defined as a decision that is consistent with the principles of the fish and wildlife management and administration, available science and resources, and adherence to the requirements of the Refuge Improvement Act, and other applicable laws. Wildlife-dependent recreational uses may be authorized on a refuge when they are compatible and not inconsistent with public safety. Compatibility determinations for wildlife observation and photography, environmental education and interpretation, grazing for wildlife habitat management, research, and native plant gathering are included in Appendix C.

5.11 Compliance Requirements

This CCP was developed to comply with all federal laws, Executive orders, and legislative acts as applicable. Some activities (particularly those that involve a major revision to an existing step-down management plan or preparing a new one) may need to comply with additional laws or regulations besides NEPA and the Refuge Improvement Act. A table of key policies related to national wildlife refuges is presented in Chapter 1.

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Bitter Creek NWR, photo: USFWS
California condor, photo: USFWS
Kern mallow, photo: 1989 Dean Wm. Taylor
Nuttall's woodpecker, photo: Mike Baird