California State Wildlife Action Plan

2015 UPDATE

A Conservation Legacy for Californians

Volume II: Appendices

September 2015

Appendix A

Appendix A Required Report Elements and Compliance

The California State Wildlife Action Plan (SWAP) 2015 update process has been guided by several documents provided by the Association of Fish and Wildlife Agencies' (AFWA) Teaming with Wildlife (TWW) coalition. TWW consists of more than 6,300 state fish and wildlife agencies, wildlife biologists, hunters, anglers, birdwatchers, hikers, nature-based businesses, and other conservationists. The TWW coalition is the leading advocate for the State and Tribal Wildlife Grants program and the implementation of SWAPs. The guidance documents provide the content necessary to fulfill the eight required elements, including supporting statements, of a SWAP (NAAT 2004), plan revisions strategies (AFWA 2012), and guidance on integrating climate change into management plans, including the SWAP (AFWA 2009).

Table A-1 lists the eight required elements with a description of where in the SWAP the elements are addressed. Table A-2 provides climate change-related guidance specific to each of the eight required elements.

Eight Required Elements of a State Comprehensive Wildlife Conservation Strategy

Table A-1 Location of the Eight Required Elements in California's State Wildlife Action Plan 2015

Required Element	Location in SWAP 2015
1. Information on the distribution and abundance of species of wildlife, including low and declining populations, that is indicative of the diversity and health of the state's wildlife	
A. The Strategy indicates sources of information (e.g., literature, data bases, agencies, individuals) on wildlife abundance and distribution consulted during the planning process.	Section 1.4 State and Tribal Wildlife Grant Program Section 1.5 SWAP 2015 Approach Chapter 2 California's Natural Diversity and Conservation Issues Section 3.2 CDFW Planning Tools Chapter 6 Anadromous Fishes Chapter 10 Bibliography Appendix C Species of Greatest Conservation Need Appendix D Ranked List of Vegetation Communities (Macrogroups) by Ecoregion Appendix H Offshore Islands

Table A-1 Location of the Eight Required Elements in California's State Wildlife Action Plan 2015

Required Element	Location in SWAP 2015
B. The Strategy includes information about both abundance and distribution for species in all major groups to the extent that data are available. There are plans for acquiring information about species for which adequate abundance and/or distribution information is unavailable.	Chapter 2 California's Natural Diversity and Conservation Issues Section 2.3 Habitat and Species Diversity Section 4.2.1 Data Collection and Analysis Section 5.1.4 Species of Greatest Conservation Need (North Coast and Klamath) Section 5.1.6 Conservation Strategies (North Coast and Klamath) Section 5.2.4 Species of Greatest Conservation Need (Cascades and Modoc Plateau) Section 5.2.6 Conservation Strategies (Cascades and Modoc Plateau) Section 5.3.4 Species of Greatest Conservation Need (Bay Delta and Central Coast) Section 5.3.6 Conservation Strategies (Bay Delta and Central Coast) Section 5.4.4 Species of Greatest Conservation Need (Central Valley and Sierra Nevada) Section 5.4.6 Conservation Strategies (Central Valley and Sierra Nevada) Section 5.5.4 Species of Greatest Conservation Need (South Coast) Section 5.5.6 Conservation Strategies (South Coast) Section 5.6.4 Species of Greatest Conservation Need (Deserts) Section 5.6.6 Conservation Strategies (Deserts) Section 5.7.4 Species of Greatest Conservation Need (Marine) Chapter 6 Anadromous Fishes Chapter 8 Monitoring California's Conservation Strategies Appendix C Species of Greatest Conservation Need (Tables C-8 though C-28) Appendix H Offshore Islands
C. The Strategy identifies low and declining populations to the extent data are available.	Section 2.4 Species of Greatest Conservation Need Section 5.1.4 Species of Greatest Conservation Need (North Coast and Klamath) Section 5.2.4 Species of Greatest Conservation Need (Cascades and Modoc Plateau) Section 5.3.4 Species of Greatest Conservation Need (Bay Delta and Central Coast) Section 5.4.4 Species of Greatest Conservation Need (Central Valley and Sierra Nevada) Section 5.5.4 Species of Greatest Conservation Need (South Coast) Section 5.6.4 Species of Greatest Conservation Need (Deserts) Section 5.7.4 Species of Greatest Conservation Need (Marine) Chapter 6 Anadromous Fishes Appendix C Species of Greatest Conservation Need Appendix H Offshore Islands
D. All major groups of wildlife have been considered or an explanation is provided as to why they were not (e.g., including reference to implemented marine fisheries management plans). The State may indicate whether these groups are to be included in a future Strategy revision.	Chapter 2 California's Natural Diversity and Conservation Issues Section 2.4 Species of Greatest Conservation Need Chapter 6 Anadromous Fishes Appendix C Species of Greatest Conservation Need
E. The Strategy describes the process used to select the species in greatest need of conservation. The quantity of information in the Strategy is determined by the State with input from its partners, based on what is available to the State.	Section 2.4 Species of Greatest Conservation Need Appendix C Species of Greatest Conservation Need

Table A-1 Location of the Eight Required Elements in California's State Wildlife Action Plan 2015

Required Element	Location in SWAP 2015
2. Descriptions of locations and relative condition of key habitats and community types essential to conservation of species identified in the first element.	
A. The Strategy provides a reasonable explanation for the level of detail provided; if insufficient, the Strategy identifies the types of future actions that will be taken to obtain the information.	Section 1.4 State and Tribal Wildlife Grant Program Section 1.5 SWAP 2015 Approach Chapter 2 California's Natural Diversity and Conservation Issues Section 2.3 Habitat and Species Diversity Section 2.5 Challenges in California Ecosystems Section 5.1.2 Conservation Units and Targets (North Coast and Klamath) Section 5.2.2 Conservation Units and Targets (Cascades and Modoc Plateau) Section 5.3.2 Conservation Units and Targets (Bay Delta and Central Coast) Section 5.4.2 Conservation Units and Targets (Central Valley and Sierra Nevada) Section 5.5.2 Conservation Units and Targets (South Coast) Section 5.6.2 Conservation Units and Targets (Deserts) Section 5.7.2 Marine Conservation Units and Targets Chapter 6 Anadromous Fishes Appendix C Species of Greatest Conservation Need Appendix D Ranked List of Vegetation Communities (Macrogroups) by Ecoregion
B. Key habitats and their relative conditions are described in enough detail such that the State can determine where (i.e., in which regions, watersheds, or landscapes within the State) and what conservation actions need to take place.	Section 1.5 SWAP 2015 Approach Chapter 2 California's Natural Diversity and Conservation Issues Section 2.3 Habitat and Species Diversity Section 2.5 Challenges in California Ecosystems Section 5.1.2 Conservation Units and Targets (North Coast and Klamath) Section 5.1.3 Key Ecological Attributes (North Coast and Klamath) Section 5.1.5 Pressures on Conservation Targets (North Coast and Klamath) Section 5.1.6 Conservation Strategies (North Coast and Klamath) (Stress-Pressure Tables) Section 5.2.2 Conservation Units and Targets (Cascades and Modoc Plateau) Section 5.2.3 Key Ecological Attributes (Cascades and Modoc Plateau) Section 5.2.5 Pressures on Conservation Targets (Cascades and Modoc Plateau) Section 5.2.6 Conservation Strategies (Cascades and Modoc Plateau) (Stress-Pressure Tables)Section 5.3.2 Conservation Units and Targets (Bay Delta and Central Coast) Section 5.3.3 Key Ecological Attributes (Bay Delta and Central Coast) Section 5.3.5 Pressures on Conservation Targets (Bay Delta and Central Coast) Section 5.3.6 Conservation Strategies (Bay Delta and Central Coast) (Stress-Pressure Tables) Section 5.4.2 Conservation Units and Targets (Central Valley and Sierra Nevada) Section 5.4.3 Key Ecological Attributes (Central Valley and Sierra Nevada) Section 5.4.5 Pressures on Conservation Targets (Central Valley and Sierra Nevada) Section 5.4.6 Conservation Strategies (Central Valley and Sierra Nevada) (Stress-Pressure Tables) Section 5.5.2 Conservation Units and Targets (South Coast) Section 5.5.3 Key Ecological Attributes (South Coast) Section 5.5.5 Pressures on Conservation Targets (South Coast) Section 5.5.6 Conservation Strategies (South Coast) (Stress-Pressure Tables) Section 5.6.2 Conservation Units and Targets (Deserts) Section 5.6.3 Key Ecological Attributes (Deserts) Section 5.6.5 Pressures on Conservation Targets (Deserts) Section 5.6.6 Conservation Strategies (Deserts) (Stress-Pressure Tables) Section 5.7.2 Marine Conservation Units and Targets Section 5.7.3 Key Ecological Attributes (Marine) Section 5.7.5 Pressures on Conservation Targets (Marine) Chapter 6 Anadromous Fishes Appendix D Ranked List of Vegetation Communities (Macrogroups) by Ecoregion Appendix H Offshore Islands

Table A-1 Location of the Eight Required Elements in California's State Wildlife Action Plan 2015

Required Element	Location in SWAP 2015
3. Descriptions of problems and threats that may adversely affect species at risk or their habitats, and priority research and survey work needed for restoration and conservation of these species and habitats.	
A. The Strategy indicates sources of information (e.g., literature, databases, agencies, or individuals) used to determine the problems or threats.	Section 1.4 State and Tribal Wildlife Grant Program Section 1.5 SWAP 2015 Approach Chapter 2 California's Natural Diversity and Conservation Issues Section 2.5 Challenges in California Ecosystems Chapter 3 Existing Conservation Approaches Section 5.1.5 Pressures on Conservation Targets (North Coast and Klamath) Section 5.2.5 Pressures on Conservation Targets (Cascades and Modoc Plateau) Section 5.3.5 Pressures on Conservation Targets (Bay Delta and Central Coast) Section 5.4.5 Pressures on Conservation Targets (Central Valley and Sierra Nevada) Section 5.5.5 Pressures on Conservation Targets (South Coast) Section 5.6.5 Pressures on Conservation Targets (Deserts) Section 5.7.5 Pressures on Conservation Targets (Marine) Chapter 6 Anadromous Fishes Appendix H Offshore Islands
B. The threats/problems are described in sufficient detail to develop focused conservation actions (for example, "increased highway mortalities" or "acid mine drainage" rather than generic descriptions such as "development" or "poor water quality").	Section 2.5 Challenges in California Ecosystems Section 5.1.5 Pressures on Conservation Targets (North Coast and Klamath) Section 5.1.6 Conservation Strategies (North Coast and Klamath) (Stress-Pressure Tables) Section 5.2.5 Pressures on Conservation Targets (Cascades and Modoc Plateau) Section 5.2.6 Conservation Strategies (Cascades and Modoc Plateau) (Stress-Pressure Tables) Section 5.3.5 Pressures on Conservation Targets (Bay Delta and Central Coast) Section 5.3.6 Conservation Strategies (Bay Delta and Central Coast) (Stress-Pressure Tables) Section 5.4.5 Pressures on Conservation Targets (Central Valley and Sierra Nevada) Section 5.4.6 Conservation Strategies (Central Valley and Sierra Nevada) (Stress-Pressure Tables) Section 5.5.5 Pressures on Conservation Targets (South Coast) Section 5.5.6 Conservation Strategies (South Coast) (Stress-Pressure Tables) Section 5.6.5 Pressures on Conservation Targets (Deserts) Section 5.6.6 Conservation Strategies (Deserts) (Stress-Pressure Tables) Section 5.7.5 Pressures on Conservation Targets (Marine) Chapter 6 Anadromous Fishes Appendix H Offshore Islands
C. The Strategy considers threats/problems, regardless of their origins (local, State, regional, national and international), where relevant to the State's species and habitats.	Section 2.5 Challenges in California Ecosystems Section 5.1.5 Pressures on Conservation Targets (North Coast and Klamath) Section 5.1.6 Conservation Strategies (North Coast and Klamath) (Stress-Pressure Tables) Section 5.2.5 Pressures on Conservation Targets (Cascades and Modoc Plateau) Section 5.2.6 Conservation Strategies (Cascades and Modoc Plateau) (Stress-Pressure Tables) Section 5.3.5 Pressures on Conservation Targets (Bay Delta and Central Coast) Section 5.3.6 Conservation Strategies (Bay Delta and Central Coast) (Stress-Pressure Tables) Section 5.4.5 Pressures on Conservation Targets (Central Valley and Sierra Nevada) Section 5.4.6 Conservation Strategies (Central Valley and Sierra Nevada) (Stress-Pressure Tables) Section 5.5.5 Pressures on Conservation Targets (South Coast) Section 5.5.6 Conservation Strategies (South Coast) (Stress-Pressure Tables) Section 5.6.5 Pressures on Conservation Targets (Deserts) Section 5.6.6 Conservation Strategies (Deserts) (Stress-Pressure Tables) Section 5.7.5 Pressures on Conservation Targets (Marine) Chapter 6 Anadromous Fishes Appendix H Offshore Islands

Table A-1 Location of the Eight Required Elements in California's State Wildlife Action Plan 2015

Required Element	Location in SWAP 2015
D. If available information is insufficient to describe threats/problems, research and survey efforts are identified to obtain needed information.	Section 2.5 Challenges in California Ecosystems Chapter 3 Existing Conservation Approaches Section 5.1.5 Pressures on Conservation Targets (North Coast and Klamath) Section 5.1.6 Conservation Strategies (North Coast and Klamath) Section 5.2.5 Pressures on Conservation Targets (Cascades and Modoc Plateau) Section 5.2.6 Conservation Strategies (Cascades and Modoc Plateau) Section 5.3.5 Pressures on Conservation Targets (Bay Delta and Central Coast) Section 5.3.6 Conservation Strategies (Bay Delta and Central Coast) Section 5.4.5 Pressures on Conservation Targets (Central Valley and Sierra Nevada) Section 5.4.6 Conservation Strategies (Central Valley and Sierra Nevada) Section 5.5.5 Pressures on Conservation Targets (South Coast) Section 5.5.6 Conservation Strategies (South Coast) Section 5.6.5 Pressures on Conservation Targets (Deserts) Section 5.6.6 Conservation Strategies (Deserts) Section 5.7.5 Pressures on Conservation Targets (Marine) Chapter 6 Anadromous Fishes Section 7.3 Resources Need for Conservation Actions Section 7.4 Coordination with Partners Section 7.6 Adaptive Response to Emerging Issues Section 8.3 SWAP 2015 Effectiveness Measure Framework Appendix H Offshore Islands
E. The priority research and survey needs, and resulting products, are described sufficiently to allow for the development of research and survey projects after the Strategy is approved.	Section 2.5 Challenges in California Ecosystems Chapter 3 Existing Conservation Approaches Section 5.1.5 Pressures on Conservation Targets (North Coast and Klamath) Section 5.1.6 Conservation Strategies (North Coast and Klamath) Section 5.2.5 Pressures on Conservation Targets (Cascades and Modoc Plateau) Section 5.2.6 Conservation Strategies (Cascades and Modoc Plateau) Section 5.3.5 Pressures on Conservation Targets (Bay Delta and Central Coast) Section 5.3.6 Conservation Strategies (Bay Delta and Central Coast) Section 5.4.5 Pressures on Conservation Targets (Central Valley and Sierra Nevada) Section 5.4.6 Conservation Strategies (Central Valley and Sierra Nevada) Section 5.5.5 Pressures on Conservation Targets (South Coast) Section 5.5.6 Conservation Strategies (South Coast) Section 5.6.5 Pressures on Conservation Targets (Deserts) Section 5.6.6 Conservation Strategies (Deserts) Section 5.7.5 Pressures on Conservation Targets (Marine) Section 5.7.6 Conservation Strategies (Marine) Chapter 6 Anadromous Fishes Section 7.3 Resources Need for Conservation Actions Section 7.4 Coordination with Partners Section 7.6 Adaptive Response to Emerging Issues Section 8.3 SWAP 2015 Effectiveness Measure Framework Appendix H Offshore Islands

Table A-1 Location of the Eight Required Elements in California's State Wildlife Action Plan 2015

Required Element	Location in SWAP 2015
4. Descriptions of conservation actions determined to be necessary to conserve the identified species and habitats, and priorities for implementing such actions.	
A. The Strategy identifies how conservation actions address identified threats to species of greatest conservation need and their habitats.	Section 1.4 State and Tribal Wildlife Grant Program Chapter 4 Statewide Conservation Categories Section 5.1.6 Conservation Strategies (North Coast and Klamath) Section 5.2.6 Conservation Strategies (Cascades and Modoc Plateau) Section 5.3.6 Conservation Strategies (Bay Delta and Central Coast) Section 5.4.6 Conservation Strategies (Central Valley and Sierra Nevada) Section 5.5.6 Conservation Strategies (South Coast) Section 5.6.6 Conservation Strategies (Deserts) Section 5.7.6 Conservation Strategies (Marine) Chapter 6 Anadromous Fishes Chapter 8 Monitoring California's Conservation Strategies Appendix H Offshore Islands
B. The Strategy describes conservation actions sufficiently to guide implementation of those actions through the development and execution of specific projects and programs.	Chapter 4 Statewide Conservation Categories Section 5.1.6 Conservation Strategies (North Coast and Klamath) Section 5.2.6 Conservation Strategies (Cascades and Modoc Plateau) Section 5.3.6 Conservation Strategies (Bay Delta and Central Coast) Section 5.4.6 Conservation Strategies (Central Valley and Sierra Nevada) Section 5.5.6 Conservation Strategies (South Coast) Section 5.6.6 Conservation Strategies (Deserts) Section 5.7.6 Conservation Strategies (Marine) Chapter 6 Anadromous Fishes Chapter 7 Integration and Implementation Chapter 8 Monitoring California's Conservation Strategies Appendix H Offshore Islands
C. The Strategy links conservation actions to objectives and indicators that will facilitate monitoring and performance measurement of those conservation actions (outlined in Element #5).	Chapter 1.5.4 Open Standards for the Practice of Conservation – Planning Framework Chapter 4 Statewide Conservation Categories Section 5.1.6 Conservation Strategies (North Coast and Klamath) Section 5.2.6 Conservation Strategies (Cascades and Modoc Plateau) Section 5.3.6 Conservation Strategies (Bay Delta and Central Coast) Section 5.4.6 Conservation Strategies (Central Valley and Sierra Nevada) Section 5.5.6 Conservation Strategies (South Coast) Section 5.6.6 Conservation Strategies (Deserts) Section 5.7.6 Conservation Strategies (Marine) Chapter 6 Anadromous Fishes Chapter 8 Monitoring California's Conservation Strategies Appendix H Offshore Islands
D. The Strategy describes conservation actions (where relevant to the State's species and habitats) that could be addressed by Federal agencies or regional, national or international partners and shared with other States.	Chapter 4 Statewide Conservation Categories Section 5.1.6 Conservation Strategies (North Coast and Klamath) Section 5.2.6 Conservation Strategies (Cascades and Modoc Plateau) Section 5.3.6 Conservation Strategies (Bay Delta and Central Coast) Section 5.4.6 Conservation Strategies (Central Valley and Sierra Nevada) Section 5.5.6 Conservation Strategies (South Coast) Section 5.6.6 Conservation Strategies (Deserts) Section 5.7.6 Conservation Strategies (Marine) Chapter 6 Anadromous Fishes Chapter 7 Integration and Implementation Appendix H Offshore Islands

Table A-1 Location of the Eight Required Elements in California's State Wildlife Action Plan 2015

Required Element	Location in SWAP 2015
E. If available information is insufficient to describe needed conservation actions, the Strategy identifies research or survey needs for obtaining information to develop specific conservation actions.	Chapter 3 Existing Conservation Approaches Section 4.2.1 Data Collection and Analysis Section 5.1.6 Conservation Strategies (North Coast and Klamath) Section 5.2.6 Conservation Strategies (Cascades and Modoc Plateau) Section 5.3.6 Conservation Strategies (Bay Delta and Central Coast) Section 5.4.6 Conservation Strategies (Central Valley and Sierra Nevada) Section 5.5.6 Conservation Strategies (South Coast) Section 5.6.6 Conservation Strategies (Deserts) Section 5.7.6 Conservation Strategies (Marine) Section 6.7 Anadromous Fish Conservation Targets and Strategies Section 7.2 Companion Plans Section 7.3 Resources Need for Conservation Actions Section 7.4 Coordination with Partners Section 7.6 Adaptive Response to Emerging Issues Section 8.3 SWAP 2015 Effectiveness Measure Framework Appendix H Offshore Islands
F. The Strategy identifies the relative priority of conservation actions.	Section 1.5.3 Process to Prioritize Conservation Targets Section 5.1.6 Conservation Units and Targets (North Coast and Klamath) Section 5.2.6 Conservation Units and Targets (Cascades and Modoc Plateau) Section 5.3.6 Conservation Units and Targets (Bay Delta and Central Coast) Section 5.4.6 Conservation Units and Targets (Central Valley and Sierra Nevada) Section 5.5.6 Conservation Units and Targets (South Coast) Section 5.6.6 Conservation Units and Targets (Deserts) Section 5.7.2 Marine Conservation Units and Targets Appendix D Ranked List of Vegetation Communities (Macrogroups) by Ecoregion Appendix H Offshore Islands
5. Descriptions of the proposed plans for monitoring species at risk and their habitats for monitoring the effectiveness of the conservation actions proposed in Element 4 and for adapting these conservation actions to respond appropriately to new information or changing conditions.	
A. The Strategy describes plans for monitoring species identified in Element #1, and their habitats.	Section 4.2.1 Data Collection and Analysis Section 6.8.3 Research, Monitoring, and Resource Assessment (Anadromous Fish) Chapter 7 Implementation and Integration Section 8.3 SWAP 2015 Effectiveness Measure Framework
B. The Strategy describes how the outcomes of the conservation actions will be monitored.	Section 4.2.1 Data Collection and Analysis Section 6.8.3 Research, Monitoring, and Resource Assessment (Anadromous Fish) Chapter 7 Implementation and Integration Section 8.3 SWAP 2015 Effectiveness Measure Framework
C. If monitoring is not identified for a species or species group, the Strategy explains why it is not appropriate, necessary or possible.	N/A See Required Element 5.B.
D. Monitoring is to be accomplished at one of several levels including individual species, guilds, or natural communities.	Chapter 1.5.4 Open Standards for the Practice of Conservation – Planning Framework Section 4.2.1 Data Collection and Analysis Section 6.8.3 Research, Monitoring, and Resource Assessment (Anadromous Fish) Chapter 7 Implementation and Integration Section 8.3 SWAP 2015 Effectiveness Measure Framework

Table A-1 Location of the Eight Required Elements in California's State Wildlife Action Plan 2015

Required Element	Location in SWAP 2015
E. The monitoring utilizes or builds on existing monitoring and survey systems or explains how information will be obtained to determine the effectiveness of conservation actions.	Section 1.5.2 Geographic Scales Chapter 3 Existing Conservation Approaches Section 4.2.1 Data Collection and Analysis Section 6.8.3 Research, Monitoring, and Resource Assessment (Anadromous Fish) Chapter 7 Implementation and Integration Section 8.1 Adaptive Management Section 8.2 Monitoring Effectiveness of SWAP 2005 Implementation Section 8.3 SWAP 2015 Effectiveness Measure Framework
F. The monitoring considers the appropriate geographic scale to evaluate the status of species or species groups and the effectiveness of conservation actions.	Section 1.5.2 Geographic Scales Chapter 1.5.4 Open Standards for the Practice of Conservation – Planning Framework Section 4.2.1 Data Collection and Analysis Section 6.8.3 Research, Monitoring, and Resource Assessment (Anadromous Fish) Chapter 7 Implementation and Integration Section 8.3 SWAP 2015 Effectiveness Measure Framework
G. The Strategy is adaptive in that it allows for evaluating conservation actions and implementing new actions accordingly.	Chapter 1.5.4 Open Standards for the Practice of Conservation – Planning Framework Section 7.6 Adaptive Response to Emerging Issues Section 8.1 Adaptive Management Section 8.2 Monitoring Effectiveness of SWAP 2005 Implementation Section 8.3 SWAP 2015 Effectiveness Measure Framework
6. Descriptions of procedures to review the strategy at intervals not to exceed 10 years.	
A. The State describes the process that will be used to review the Strategy within the next ten years.	Chapter 7 Integration and Implementation Section 7.7 Review and Revision Chapter 8 Monitoring California's Conservation Strategies
7. Description of the plans for coordinating, to the extent feasible, the development, implementation, review, and revision of the strategy with federal, state, and local agencies and Indian tribes that manage significant land and water areas within the state or administer programs that significantly affect the conservation of identified species and habitats.	
A. The State describes the extent of its coordination with and efforts to involve Federal, State and local agencies, and Indian Tribes in the development of its Strategy.	Acknowledgements Section 1.3.1 Vision Components Section 1.6 Companion Plans Section 4.2.2 Partner Engagement Chapter 5 Province-Specific Conservation Strategies Chapter 6 Anadromous Fishes Chapter 7 Integration and Implementation Section 8.3.2 Effectiveness Measures - Partner Engagement Appendix H Public Scoping Meeting Materials Appendix I California State Wildlife Action Plan Implementation Evaluation Report 2005-2014
B. The State describes its continued coordination with these agencies and tribes in the implementation, review and revision of its Strategy.	Section 1.6 Companion Plans Section 4.2.2 Partner Engagement Chapter 5 Province-Specific Conservation Strategies Chapter 6 Anadromous Fishes Section 7.2 Companion Plans Section 7.4 Coordination with Partners Section 7.7 Review and Revision Section 8.3.2 Effectiveness Measures - Partner Engagement Appendix H Offshore Islands Appendix I California State Wildlife Action Plan Implementation Evaluation Report 2005–2014

Table A-1 Location of the Eight Required Elements in California's State Wildlife Action Plan 2015

Required Element	Location in SWAP 2015
8. Description of the necessary public participation in the development, revision, and implementation of the strategy.	
A. The State describes the extent of its efforts to involve the public in the development of its Strategy.	Section 1.3.1 Vision Components Chapter 6 Anadromous Fishes Chapter 7 Integration and Implementation Section 7.5 Public Outreach Strategies Appendix J Public Scoping Meeting Materials
B. The State describes its continued public involvement in the implementation and revision of its Strategy.	Section 1.6 Companion Plans Chapter 7 Integration and Implementation Section 7.2 Companion Plans Section 7.5 Public Outreach Strategies

Voluntary Guidance for States to Incorporate Climate Change into State Wildlife Action Plans and Other Management Plans

Table A-2 Guidance to Incorporate Climate Change into SWAPs

Climate Change-Related Guidance (specific to the eight required elements in Table A-1)	Location in SWAP 2015
1. Species Distribution: states may want to use vulnerability assessments to support the addition/removal of species from their list of species in greatest need of conservation and examine how climate change could impact distribution and abundance of species and their status as native or exotic.	Section 2.4 Species of Greatest Conservation Need Appendix C Species of Greatest Conservation Need
2. Location and Condition of Key Habitats: states may want to assess how habitats and species ranges may change as a result of current and future climate change through scenario-building; both temporally and spatially and plan for novel communities/ecosystems that appear due to these shifts.	Section 2.5.3 Vulnerability to Climate Change
3. Descriptions of Problems and Priority Research Survey Efforts: states may want to consider both direct and indirect impacts of climate change; identify and execute research in partnership with other states/regions to gain economy of scale and consider climate change as an additional "layer" of threats to existing threats.	Section 1.4.2 Summary of Key Changes from SWAP 2005 (list of climate change related studies) Section 2.5.3 Vulnerability to Climate Change Chapter 5 Province-Specific Conservation Strategies
4. Descriptions of Conservation Actions: states should consider actions for a range of likely future climate conditions; identify/describe how conservation actions will be prioritized when considering multiple threats; identify actions that minimize, not necessarily eliminate climate change impacts; provide for wildlife adaptation; and provide for resilience and/or facilitate movement to suitable habitats and conditions.	Chapter 5 Province-Specific Conservation Strategies Chapter 6 Anadromous Fishes
5. Monitoring Plans: states should strive to implement streamlined and affordable monitoring programs that inform management decisions under a changing climate and should consider working with other states and partners to monitor species and habitats across their entire range.	Chapter 5 Province-Specific Conservation Strategies Chapter 6 Anadromous Fishes Section 7.4 Coordination with Partners Chapter 8 Monitoring California's Conservation Strategies
6. Plans for Revision: states should contact the US Fish and Wildlife Service regional office early in the revision process and refer to the 2007 USFWS/AFWA Revision Guidance letter to determine if a "major" or "minor" revision will be required.	Chapter 6 Anadromous Fishes Section 7.7 Review and Revision
7. Coordinating with Partners: states should consider coordinating and collaborating with partners since the scope, scale and uncertainty of climate change impacts will require a high level of expertise support and collaboration; agencies in coastal states should consider addressing marine environments and/or collaborating with sister agencies with jurisdiction over marine species.	Chapter 5 Province-Specific Conservation Strategies Chapter 6 Anadromous Fishes Section 7.4 Coordination with Partners Section 7.7 Review and Revision
8. Public Participation: states should consider public participation planning since the potential for controversy associated with climate change could be high; strive to improve understanding of the impacts to wildlife and gain public support or acceptance for revising your Wildlife Action Plan; use terms that are tested with the public like "safeguarding wildlife" as opposed to "wildlife adaption" and involve conservation partners early during the public participation planning process, but recognize there may not be agreement on messages or approaches.	Section 7.5 Public Outreach Strategies Appendix H Public Scoping Meeting Materials

References

Association of Fish and Wildlife Agencies. 2009 (November). *Voluntary Guidance for States to Incorporate Climate Change into State Wildlife Action Plans & Other Management Plans*.

_______. 2012 (November). *Best Practices for State Wildlife Action Plans*. Voluntary Guidance to States for Revision and Implementation.

NAAT. *See* National Advisory Acceptance Team.

National Advisory Acceptance Team. 2004 (July 15). National Advisory Acceptance Team Review Reference Guide for the Members.

Appendix B

Appendix B California State Wildlife Action Plan 2015 Revision Summary

The California State Wildlife Action Plan (SWAP) 2015 is the first major revision of the first California SWAP, which was developed in 2005. California's approach to the SWAP is much more than meeting the requirements for federal grants eligibility. California's vision for SWAP 2015 is to be an overarching blueprint for conservation of fish and wildlife resources. The SWAP can be useful not just for California Department of Fish and Wildlife (CDFW) purposes as the state's trustee for fish and wildlife resources, but also for other natural resource agencies, hunters and anglers, conservation groups, landowners, and people who manage working landscapes. A summary of the revisions to SWAP 2015 is provided below.

New geographic boundaries are defined to organize the identification and discussion of conservation issues and to develop conservation strategies. SWAP 2015 uses three geographic scales to differentiate and organize California's terrestrial plant communities, freshwater aquatic habitats, and marine ecosystems. Three geographic scales are used to analyze key conservation factors and their influences on Species of Greatest Conservation Need (SGCN) and their habitats, as well as to identify conservation strategies. The three geographic scales in SWAP 2015 are, from largest to smallest in size: statewide, province, and regional conservation unit (see Section 1.5). Using vegetation and geophysical features to define boundaries, the provinces and conservation units are based on U.S. Department of Agriculture mapping of ecoregions and provinces (Bailey 1976) and adapted by CDFW. To address freshwater aquatic issues, watersheds based on U.S. Geologic Survey (USGS) hydrologic units are included. Marine conservation units were defined from Marine Life Protection Act (MLPA).

Revisions to the list of SGCN are comprehensive for SWAP 2015. For SWAP 2005, CDFW relied on a designated Special Animals List, also referred to as "species at risk" or "special-status species" to identify SGCN. The SGCN list in SWAP 2015 includes over 1,000 species, representing marine, aquatic, and terrestrial habitats, and includes birds, mammals, reptiles, amphibians, fish, invertebrates, and plants. It focuses not only on threatened and endangered species and species of special concern, but also other species that are rare or declining in numbers and that are vulnerable to climate change.

The SWAP 2015 technical team updated the list of SGCN for the SWAP 2015 using three criteria (see Section 2.4):

- Criterion 1 includes species listed as threatened, endangered or candidate species in California under the federal Endangered Species Act (ESA) or the California Endangered Species Act (CESA). State and Tribal Wildlife Grants (SWG) discourages the use of funds solely on federally listed species and on species that already have dedicated funding. Although these species are included in the SGCN list, it does not imply a funding preference or prioritization.
- Criterion 2 includes species for which there is a conservation concern. The species under the second criterion are generally equivalent to the California Species of Special Concern (SSC) identified by CDFW; all the SSC are recognized as SGCN. Other conservation concern designations are described

under each category of species. The SSC designation carries no formal legal protection; the intent of the designation is to focus attention on animals of conservation risk, stimulate research on poorly known species, and achieve conservation and recovery of these animals before they meet criteria for listing as threatened or endangered. More information about CDFW's process of evaluating SSC, as well as their lists by taxa and life history accounts, including habitat association, population trends, and range maps, can be found online at http://www.dfg.ca.gov/wildlife/nongame/ssc/.

- Criterion 3 includes species that were identified by CDFW as being highly vulnerable to climate change. The methods used to identify SGCN are described in Appendix C for each category of species.

A multi-species, ecosystem approach was used as the guiding framework for developing SWAP 2015. An ecosystem approach to conservation is the broad management of natural resources using ecosystems as a unit to ensure that native plants and animals bound to the system are maintained at viable levels. It involves maintaining and enhancing the processes, structure, and conditions of an ecosystem, recognizing that all components are interrelated. Large-scale landscape approaches are generally the most reliable and preferred method to conserve ecological integrity, including biological diversity. The approach benefits both game and non-game (or harvested and non-harvested) wildlife species, and creates many co-benefits related to both natural values (such as enhanced water quality, soil retention, or resilience to the effects of climate change) and societal values (such as open space, scenic quality, or outdoor recreation opportunities). Ecosystem-based management is defined and mandated in the California Fish and Game Code (FGC Sections 43 and 703.3, see Section 8.1 "Adaptive Management" for more discussion).

Imperative for initiating a comprehensive approach to conservation in California, and in order to represent California in a spatially explicit manner, habitats have been categorized to represent terrestrial, freshwater, and marine ecosystems. Since SWAP 2015 has identified over 1,000 SGCN, applying a species-based conservation approach to develop SWAP 2015 was not feasible. However, it is recognized that dividing California's landscape into habitat categories may present limitations that must be balanced with species-specific efforts when needed to effectively address conservation of species.

The process for providing the required SWAP elements and for developing multi-species conservation strategies began by identifying the broad habitat categories of natural resource interest in California. These were defined as terrestrial, freshwater aquatic, and marine habitats. Within each of these resource categories there are strategies applicable to specific geographic regions, and others that apply more broadly across many regions or possibly statewide. To assess conservation needs at a manageable scale, the state was subdivided for each resource category using established and accepted units for analysis, as described above (i.e., ecoregions, hydrologic units, and marine conservation units), collectively referred to as conservation units. The conservation units were grouped into provinces.

Anadromous fishes are treated as a unique, statewide guild of fishes, and their ecological and management needs are addressed in a single chapter.

Plants are included in SWAP 2015, although they are not eligible for State Wildlife and Tribal Grant funds. Plants are addressed in the update in several important ways. The terrestrial conservation targets are based on plant communities, classified using the *Manual of California Vegetation*, based on the national vegetation classification standard. In addition, CDFW has been working with the California Department of Forestry and Fire Protection to refine a spatial map of California Wildlife Habitat Relationships habitat types (Mayer and Laudenslayer 1988) and then cross-walk them to major vegetation types. CDFW has also included plants on the SGCN list, and is working with California Native Plant Society (CNPS) to refine the list to identify conservation priorities.

A transparent and systematic planning framework was used to develop the conservation strategies. CDFW followed the *Open Standards for the Practice of Conservation,* which is an internationally accepted conservation planning framework that brings together common concepts, approaches, and terminology in conservation project design, management, and monitoring to help practitioners improve the practice of conservation. The *Open Standards* offers an adaptive management approach that helps conservation practitioners systematically design their conservation strategies and determine if their strategies are on track, why they are on track or not, and what adjustments they need to make. The five steps composing the adaptive project management cycle supported by *Open Standards* are: (1) conceptualizing the project vision and context; (2) planning actions and monitoring; (3) implementing actions and monitoring; (4) analyzing data, using the results, and adapting the project; and (5) capturing and sharing what has been learned.

Conservation targets were identified for each conservation unit. A conservation target is an element of biodiversity at a project site, which can be a species, habitat, or ecological system that a project has chosen to focus on. For SWAP 2015, conservation targets are plant communities, native freshwater aquatic species assemblages, and marine ecosystems. Conservation targets were selected based on a systematic assessment of biodiversity, rarity, endemism, along local expert knowledge and other considerations.

Systematic identification and ranking of stresses and pressures on conservation targets were articulated by regional teams. A stress is an impaired aspect of a conservation target that results directly or indirectly from human activities. Stresses are ranked by scope, the proportion of the target that can reasonably be expected to be affected by the stress, and severity, i.e., the level of damage to the target from the stress that can reasonably be expected within the next 50 years given the continuation of current circumstances and trends.

A pressure is a human induced or natural driver that could result in stress to the conservation target. Pressures were ranked by the contribution to degradation of the target and the irreversibility, the degree to which the degradation can be undone. Stresses and pressures were considered at both a local and statewide scale. Conservation strategies were developed to respond to the highest ranking stresses and pressures.

Climate change influences are integrated into the development of conservation strategies in SWAP 2015. The revised list of SGCN includes a criterion of species that are vulnerable to climate change. CDFW engaged University of California, Davis researchers to conduct a habitat-based climate vulnerability study. CDFW integrates climate stress data when developing strategies for conservation targets. CDFW also aligns conservation actions recommended in SWAP 2015 to be consistent with recommendations and goals set in the state and federal climate adaptation strategies.

Consistency with other statewide and national plans and initiatives is foremost in SWAP 2015 (see Section 7.1). Since approval of SWAP 2005, several new plans and initiatives have been completed or are in progress that have relevance to strategies and priorities for managing the state's natural resources.

These plans and initiatives include but are not limited to the following:

- California Natural Resources Agency's 2009 Climate Change Adaptation Strategies
- California Natural Resources Agency 2014 Safeguarding California Report
- U.S. Fish and Wildlife Service (USFWS) 2012 National Fish, Wildlife and Plant Climate Adaptation Strategy
- CDFW and Caltrans 2011 California Essential Habitat Connectivity Project
- CDFW 2011 Areas of Conservation Emphasis Mapping Model Phase II
- Implementation of the Marine Life Protection Act
- Wildlife Conservation Board Strategic Plan 2014
- State Water Plan 2013
- Water Action Plan 2014
- Forest and Rangeland Assessment 2015
- California Transportation Plan
- California State Parks Strategic Action Plan
- Forest Plans using new Forest Planning Rule
- Ecoregional Assessments from the Bureau of Land Management
- Strategic Habitat Conservation (USFWS)
- Development of a large-scale conservation planning effort in the Sacramento-San Joaquin Rivers Delta (This effort was known previously as Bay Delta Conservation Plan (BDCP). The conservation components under BDCP were replaced by California EcoRestore in April 2015.)
- Development of a large-scale conservation planning effort in the southern California deserts region (Desert Renewable Energy Conservation Plan)
- California Fish and Wildlife Strategic Vision Plan
- Adoption of CDFW's Policy for Quality in Science and Key Elements of Scientific Work

Emphasis on partnerships and collaboration is one of the keys to successful implementation of the conservation strategies in SWAP 2015 (see Section 7.4). CDFW recognizes that land is a shared entity and successful conservation strategies cannot be implemented without partnerships, especially with limited budgets and staff. CDFW is seeking through implementation of SWAP 2015 to engage in high-value, highly leveraged conservation planning efforts with other agencies and organizations. The goal for partnerships is to share information, expertise, and vision for building a robust natural resource conservation infrastructure that supports California's unparalleled wildlife diversity.

Development of Companion Plans is included in SWAP 2015 to identify common goals and actions for specific sectors, so that agencies and organizations can work together towards achieving conservation goals within those sectors (see Section 7.2). The Companion Plans are economic and resource-sector focused plans and have been developed in collaboration with partners in each of these sectors:

- Agriculture
- Commercial and Recreational Uses
- Energy Development
- Forests and Rangelands
- Land Use Planning
- Marine
- Transportation Planning
- Tribal Lands
- Water Management

Monitoring the effectiveness of conservation actions is built into an adaptive management framework for SWAP 2015 (see Section 8.3). CDFW has entered the conservation strategies, performance objectives, indicators, and metrics into a database called *Miradi* that will allow tracking of their success at implementation of the actions and allow for adaptive management to adjust actions and improve success. Monitoring plans will be presented and reviewed at regional public scoping meetings.

SWAP 2015 is a dynamic, online resource. As new information is developed, new research is completed, or a new issue emerge, it will be necessary to update the SWAP periodically to address these new issues. As an electronic, online document, SWAP 2015 can be efficiently and frequently updated, as needed (see Sections 7.6 and 7.7). In addition the timeframe for assessment of pressures to conservation targets and the strategies and actions to address these pressures will be from one year to 50 years to take into account the effects of climate change and the need for a long view towards climate change adaptation. As such, monitoring and evaluation of progress towards goals and objectives will need to take place over a long timeframe to allow for adaptive management as understanding is improved regarding the effects of climate and influences of pressures on fish and wildlife. The SWAP update process will continue to be an iterative, adaptive management process, where information gaps, uncertainties, and planning and research needs will be recognized and incorporated.

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Appendix C

Appendix C Species of Greatest Conservation Need

A key element of updating the California State Wildlife Action Plan (SWAP) is identifying and compiling information on the species of wildlife that are indicative of the state's biological diversity and that have the greatest need for conservation. These species are referred to as Species of Greatest Conservation Need (SGCN). For SWAP 2015, technical teams developed criteria and evaluated species, resulting in a revised SGCN list of invertebrates, amphibians, reptiles, fish, birds, mammals, and plants. The improved set of criteria was developed to ensure a more scientifically rigorous list compared to the list in SWAP 2005.

Criteria

Criterion 1 includes species listed as threatened, endangered or candidate species in California under the federal Endangered Species Act (ESA) or the California Endangered Species Act (CESA). State and Tribal Wildlife Grants (SWG) discourages the use of funds solely on federally listed species and on species that already have dedicated funding. Although these species are included in the SGCN list, it does not imply a funding preference or prioritization.

Criterion 2 includes species for which there is a conservation concern. The species under the second criterion are generally equivalent to the California Species of Special Concern (SSC) designation. Other conservation concern designations are described below under each category of species. The SSC designation carries no formal legal protection; the intent of the designation is to focus attention on animals of conservation risk, stimulate research on poorly known species, and achieve conservation and recovery of these animals before they meet criteria for listing as threatened or endangered. More information about CDFW's process of evaluating SSC, as well as their lists by taxa and life history accounts, including habitat association, population trends, and range maps, can be found online at http://www.dfg.ca.gov/wildlife/nongame/ssc/.

Criterion 3 includes species that were identified by CDFW as being highly vulnerable to climate change. The methods used to identify SGCN are described below for each category of species.

Invertebrates

Invertebrates that are state or federally listed are included under Criterion 1. Invertebrate species under Criterion 2 have a NatureServe State Conservation Rank of S1. The NatureServe ranking represents a score that reflects a combination of rarity, threat, and trend factors within California's state boundaries. Rarity is weighed heavier than the other two factors. An S1 ranking is defined as critically imperiled in the state because of extreme rarity (often five or fewer populations) or because of factor(s), such as very steep declines, making it especially vulnerable to extirpation from the state. Marine invertebrates are included under Criterion 2 if they are subject to a take or harvest prohibition by CDFW or National Marine Fisheries Service (NMFS), if they are under a federal rebuilding plan, or if they are considered to be overfished.

Fish

Fishes that are state or federally listed are included under Criterion 1. Freshwater and anadromous fish species identified under Criterion 2 include SSC and species subject to a take or harvest prohibition by CDFW or NMFS, a federal rebuilding plan, or consideration of being overfished. The SSC report update from the 1995 report for fish includes information on the distribution, abundance, and status of species (http://www.dfg.ca.gov/wildlife/nongame/ssc/fish.html). Climate vulnerability for fish was determined using the methods and evaluation presented in Moyle et al. 2012. The methodology uses expert opinions of the authors and literature reviews of the status and biology of the fishes to score both status of each species ("baseline vulnerability") and likely impact of climate change ("climate vulnerability"). When the total scores for baseline and climate vulnerability were combined, they produced a score that indicated the overall vulnerability to climate change. Species with a highly vulnerable or critically vulnerable score are included as SGCN under Criterion 3.

Amphibians and Reptiles

Amphibians and reptiles that are state or federally listed are included under Criterion 1. CDFW updated the list of amphibian and reptile SSC (Thomson et al. 2012) and those species are included as SGCN under Criterion 2. The SSC report (in process, see http://www.dfg.ca.gov/wildlife/nongame/ssc/amphibian-reptile.html) contains species accounts and distribution maps for 48 amphibian and reptile special concern taxa (11 salamanders, 14 anurans, 2 turtles, 12 lizards, and 9 snakes). Each species account contains a description of the animal, taxonomic remarks, distribution and life history information, habitat description, status, management recommendations, and a range map. Under Criterion 3, a highly vulnerable status was assigned to amphibians and reptiles, if any of the following occurred:

- 90-100 percent of the (sub)species' currently occupied cells were predicted to decline in suitability by 2050 (Warren et al. 2014);
- greater than 40 percent of currently occupied localities and/or greater than 50 percent of the species' range were predicted to become unsuitable by 2050 (Wright et al. 2013); or
- expert opinion by the SSC Technical Advisory Committee predicted the (sub)species would be highly sensitive to climate change over the next 100 years (Thomson et al. 2012).

Birds

Birds that are state or federally listed are included under Criterion 1. Since the 2005 version of the SWAP, CDFW updated the bird SSC list (BSSC; Shuford and Gardali 2008) and those are included as SGCN under Criterion 2. The BSSC report includes species accounts for the 63 ranked taxa to document general range and abundance, seasonal status in California, historical range and abundance in

California, ecological requirements, and threats; additionally, management, research, and monitoring recommendations are presented (http://www.dfg.ca.gov/wildlife/nongame/ssc/birds.html). Species with a high vulnerability score are included as SGCN under Criterion 3. These species were determined through an extensive climate change vulnerability assessment for birds (Gardali et al. 2012). The methodology is described below.

To quantify climate vulnerability, a taxon's sensitivity and exposure were considered. Sensitivity was determined by intrinsic traits of species (habitat specialization, physiological tolerances, migratory status, and dispersal ability) that make them vulnerable to climate change. Exposure was determined by the extrinsic factors (habitat suitability, food availability, and extreme weather) that will result from climate change. Sensitivity and exposure were scored independently; then, the two scores were multiplied to generate a climate change vulnerability index. To integrate the climate change vulnerability index with the BSSC list, Gardali et al. (2012) took a similar approach to that proposed by U.S. Environmental Protection Agency (EPA) to integrate climate change vulnerability with existing stresses for threatened and endangered species (EPA 2009). A matrix combined the priority Climate Change Vulnerability of California ranks from each list to produce a final integrated list.

Mammals

Mammals that are state or federally listed are included under Criterion 1. Since the 2005 version of the SWAP, CDFW is in the process of updating the mammal SSC list (MSSC). Species listed on the current MSSC list are included as SGCN under Criterion 2. The MSSC report (in process, see http://www.dfg.ca.gov/wildlife/nongame/ssc/mammals.html) lists 36 species and subspecies of land mammals native to California determined to be potentially threatened with extinction in California. Species accounts for each taxon include initial description references, information on distribution, population status, and habitat, recommendations for additional assessment and conservation actions, taxonomic remarks, and distribution records. The vulnerability of California's land mammals was assessed for SWAP 2015 using scores developed for the MSSC update. For the MSSC project, a team of experts used a scoring system to quantify the conservation status of all the approximately 580 native land mammal taxa (species and subspecies) in California. Score definitions were developed for eight conservation factors, including population size, population trend, range size, range trend, population concentration, threats, endemism, and climate change. Mammals with a high risk ranking are included as SGCN under Criterion 3.

Plants

Plants that are state or federally listed are included under Criterion 1. Marine plant species where take or harvest is prohibited by CDFW or NMFS are included under Criterion 2. Plants with a California Rare Plant Rank of 1B.1, which indicates they are rare or endangered in California and elsewhere and are seriously threatened, are also included as SGCN under Criterion 2.

List of Species of Greatest Conservation Need

The list of SGCN for SWAP 2015 is included in this Appendix. The list includes 264 invertebrate species (Table C-1), 414 fish and wildlife species (Tables C-2 through C-6), and 475 plant species (Table C-7). Also in this Appendix, SGCN are identified as they occur within the provinces, ecoregions, and macrogroups (Tables C-8 through C-28). Common stresses and pressures affecting SGCN habitats are described in Chapter 5. Conservation strategies intended to relieve conservation targets from negative impacts and/or enhance habitat conditions are also identified in Chapter 5.

While plants are included in the list of SGCN, the presence of SGCN plants was not included as a separate criterion used to prioritize or select targets when developing regional SWAP strategies. USFWS accepts plants as SGCN, but they are not currently eligible for SWG funding. However, plants will benefit from implementation of SWAP 2015 strategies incidentally when occurring in habitats conserved for animal SGCN. CDFW has chosen to include plants on the SGCN list, so SWAP 2015 would be a comprehensive conservation planning document.

Table C-1 Invertebrate Species of Greatest Conservation Need

Scientific Name	Common Name	Legal Status	Conservation Concern	Climate Vulnerable
Molluska (clams, snails, squid, octopi)				
Gonidea angulata	Western ridged mussel		S1	X
Pelecypoda (clams and mussels)				
Pisidium ultramontanum	montane peaclam		S1	
Gastropoda (snails, slugs, and abalone)				
Ammonitella yatesii	tight coin (=Yates' snail)		S1	
Assiminea infima	Badwater snail		S1	
Binneya notabilis	Santa Barbara shelled slug		S1	
Eremarionta immaculata	white desertsnail		S1	
Eremarionta millepalmarum	Thousand Palms desertsnail		S1	
Eremarionta morongoana	Morongo (=Colorado) desertsnail		S1	
Eremarionta rowelli bakerensis	Baker's desertsnail		S1	
Eremarionta rowelli mccoiana	California Mccoy snail		S1	
Fontelicella sp.	Deep Springs fontelicella		S1	
Haliotis corrugata	pink abalone		NT	X
Haliotis cracherodii	black abalone	FE		X
Haliotis fulgens	green abalone		NT	X
Haliotis kamtschatkana	pinto abalone		NT	X
Haliotis sorenseni	white abalone	FE		X
Haliotis walallensis	flat abalone		NT	X
Haplotrema catalinense	Santa Catalina lancetooth		S1	
Helisoma newberryi	Great Basin rams-horn		S1	
Helminthoglypta allynsmithi	Merced Canyon shoulderband		S1	
Helminthoglypta arrosa monticola	mountain shoulderband		S1	
Helminthoglypta arrosa pomoensis	Pomo bronze shoulderband		S1	
Helminthoglypta callistoderma	Kern shoulderband		S1	
Helminthoglypta coelata	mesa shoulderband		S1	
Helminthoglypta fontiphila	Soledad shoulderband		S1	
Helminthoglypta hertleini	Oregon shoulderband		S1	
Helminthoglypta milleri	peak shoulderband		S1	
Helminthoglypta mohaveana	Victorville shoulderband		S1	
Helminthoglypta nickliniana awania	Peninsula coast range shoulderband		S1	
Helminthoglypta nickliniana bridgesi	Bridges' coast range shoulderband		S1	
Helminthoglypta sequoicola consors	redwood shoulderband		S1	
Helminthoglypta stiversiana williamsi	Williams' bronze shoulderband		S1	
Helminthoglypta taylori	westfork shoulderband		S1	
Helminthoglypta traskii pacoimensis	Pacoima shoulderband		S1	
Helminthoglypta traskii traskii	Trask shoulderband		S1	
Helminthoglypta uvasana	Grapevine shoulderband		S1	
Helminthoglypta vasquezi	Vasquez shoulderband		S1	

Legal Status
FE = Federally endangered
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FPL = Federally proposed for listing
FC = Federal candidate for listing
SE = State endangered
ST = State threatened
SCL = State candidate for listing

Conservation Concern
S1 = NatureServe State Conservation Rank of S1 (Invertebrates)
SSC = CDFW Species of Special Concern
NT = No take allowed by state and/or federal harvesting/fishing regulations
R = Under federal rebuilding plan
O = Overfished

Table C-1 Invertebrate Species of Greatest Conservation Need

Scientific Name	Common Name	Legal Status	Conservation Concern	Climate Vulnerable
Helminthoglypta walkeriana	Morro shoulderband (=banded dune) snail	FE		
Herpeteros angelus	Soledad desertsnail		S1	
Ipnobius robustus	robust tryonia		S1	
Juga chacei	Chace juga		S1	
Juga occata	scalloped juga		S1	
Lanx klamathensis	scale lanx		S1	
Micrarionta feralis	San Nicolas islandsnail		S1	
Micrarionta gabbi	San Clemente islandsnail		S1	
Micrarionta opuntia	pricklypear islandsnail		S1	
Monadenia circumcarinata	keeled sideband		S1	
Monadenia fidelis pronotis	rocky coast Pacific sideband		S1	
Monadenia infumata ochromphalus	yellow-based sideband		S1	
Monadenia infumata setosa	Trinity bristle snail	ST		
Monadenia marmarotis	marble sideband		S1	
Monadenia mormonum buttoni	Button’s Sierra sideband		S1	
Monadenia mormonum hirsuta	hirsute Sierra sideband		S1	
Monadenia tuolumneana	Tuolumne sideband		S1	
Monadenia yosemitensis	Yosemite Mariposa sideband		S1	
Pomatiopsis binneyi	robust walker		S1	
Pomatiopsis californica	Pacific walker		S1	
Pomatiopsis chacei	marsh walker		S1	
Pristiloma shepardae	Shepard’s snail		S1	
Pristinicola hemphilli	pristine pyrg		S1	
Pyrgulopsis aardahli	Benton Valley (=Aahrdahl’s) springsnail		S1	
Pyrgulopsis diablensis	Diablo Range pyrg		S1	
Pyrgulopsis falciglans	Likely pyrg		S1	
Pyrgulopsis greggi	Kern River pyrg		S1	
Pyrgulopsis longae	Long Valley pyrg		S1	
Pyrgulopsis perturbata	Fish Slough springsnail		S1	
Pyrgulopsis rupinicola	Sucker Springs pyrg		S1	
Pyrgulopsis taylori	San Luis Obispo pyrg		S1	
Pyrgulopsis ventricosa	Clear Lake pyrg		S1	
Radiocentrum avalonense	Catalina mountainsnail		S1	
Rothelix warnerfontis	Warner Springs shoulderband		S1	
Sterkia clementina	San Clemente Island blunt-top snail		S1	
Trilobopsis roperi	Shasta chaparral		S1	
Trilobopsis tehamana	Tehama chaparral		S1	
Tryonia margae	Grapevine Springs elongate tryonia		S1	
Tryonia rowlandsi	Grapevine Springs squat tryonia		S1	

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Table C-1 Invertebrate Species of Greatest Conservation Need

Scientific Name	Common Name	Legal Status	Conservation Concern	Climate Vulnerable
Vespericola pressleyi	Big Bar hesperian		S1	
Vespericola scotti	Benson Gulch hesperian		S1	
Vespericola shasta	Shasta hesperian		S1	
Xerarionta intercisa	horseshoe snail		S1	
Xerarionta redimita	wreathed cactussnail		S1	
Xerarionta tryoni	Bicolor cactussnail		S1	
Bivalvia (clams, oysters, scallops, geoducks, mussels)				
Anodonta californiensis	California floater			X
Anodonta kennerlyi	Western floater			X
Anodonta nuttalliana	Winged floater			X
Anodonta oregonensis	Oregon floater			X
Argopecten circularis	Speckled (Bay) scallop		NT	X
Margaritifera falcata	Western pearlshell			X
Arachnida (spiders and relatives)				
Banksula galilei	Galile’s cave harvestman		S1	
Banksula grubbsi	Grubbs’ cave harvestman		S1	
Banksula incredula	incredible harvestman		S1	
Banksula martinorum	Martins’ cave harvestman		S1	
Banksula melones	Melones Cave harvestman		S1	
Banksula rudolphi	Rudolph’s cave harvestman		S1	
Banksula tuolumne	Tuolumne cave harvestman		S1	
Banksula tutankhamen	King Tut Cave harvestman		S1	
Calicina arida	San Benito harvestman		S1	
Calicina breva	Stanislaus harvestman		S1	
Calicina cloughensis	Clough Cave harvestman		S1	
Calicina conifera	Crane Flat harvestman		S1	
Calicina diminua	Marin blind harvestman		S1	
Calicina dimorphica	Watts Valley harvestman		S1	
Calicina macula	marbled harvestman		S1	
Calicina mesaensis	Table Mountain harvestman		S1	
Calicina minor	Edgewood blind harvestman		S1	
Calicina piedra	Piedra harvestman		S1	
Calileptoneta briggsi	Briggs’ leptonetid spider		S1	
Calileptoneta oasa	Andreas Canyon leptonetid spider		S1	
Calileptoneta ubicki	Ubick’s leptonetid spider		S1	
Calileptoneta wapiti	Mendocino leptonetid spider		S1	
Fissilicreagris imperialis	Empire Cave pseudoscorpion		S1	
Hubbardia idria	Idria short-tailed whipscorpion		S1	
Hubbardia secoensis	Arroyo Seco short-tailed whipscorpion		S1	
Hubbardia shoshonensis	Shoshone Cave whip-scorpion		S1	

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Table C-1 Invertebrate Species of Greatest Conservation Need

Scientific Name	Common Name	Legal Status	Conservation Concern	Climate Vulnerable
Larca laceyi	Lacey's Cave pseudoscorpion		S1	
Meta dolloff	Dolloff Cave spider		S1	
Microcina edgewoodensis	Edgewood Park micro-blind harvestman		S1	
Microcina homi	Hom's micro-blind harvestman		S1	
Microcina jungi	Jung's micro-blind harvestman		S1	
Microcina leei	Lee's micro-blind harvestman		S1	
Microcina lumi	Lum's micro-blind harvestman		S1	
Microcina tiburona	Tiburon micro-blind harvestman		S1	
Neochthonius imperialis	Empire Cave pseudoscorpion		S1	
Pseudogarypus orpheus	Music Hall Cave pseudoscorpion		S1	
Socalchemmis gertschi	Gertsch's socalchemmis spider		S1	
Socalchemmis icenoglei	Icenogle's socalchemmis spider		S1	
Socalchemmis monterey	Monterey socalchemmis spider		S1	
Talanites ubicki	Ubick's gnaphosid spider		S1	
Texella deserticola	Whitewater Canyon harvestman		S1	
Texella kokoweef	Kokoweef Crystal Cave harvestman		S1	
Texella shoshone	Shoshone Cave harvestman		S1	
Crustacea, Order Anostraca (fairy shrimp)				
Branchinecta campestris	pocket pouch fairy shrimp		S1	
Branchinecta conservatio	Conservancy fairy shrimp	FE		
Branchinecta longiantenna	longhorn fairy shrimp	FE		
Branchinecta lynchi	vernal pool fairy shrimp	FT		
Branchinecta sandiegonensis	San Diego fairy shrimp	FE		
Linderiella santarosae	Santa Rosa Plateau fairy shrimp		S1	
Streptocephalus woottoni	Riverside fairy shrimp	FE		
Crustacea, Order Notostraca (tadpole shrimp)				
Lepidurus packardi	vernal pool tadpole shrimp	FE		
Crustacea, Order Anomopoda (water fleas)				
Dumontia oregonensis	hairy water flea		S1	
Crustacea, Order Isopoda (isopods)				
Bowmanasellus sequoiae	Sequoia cave isopod		S1	
Calasellus longus	An isopod		S1	
Crustacea, Order Amphipods (amphipods)				
Hyalella muerta	Texas Spring amphipod		S1	
Hyalella sandra	Death Valley amphipod		S1	
Stygobromus cherylae	Barr's amphipod		S1	
Stygobromus cowani	Cowan's amphipod		S1	
Stygobromus gallawayae	Gallaway's amphipod		S1	
Stygobromus gradyi	Grady's Cave amphipod		S1	
Stygobromus hyporheicus	Hypoheic amphipod		S1	

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Stygobromus imperialis	Empire Cave amphipod		S1	
Stygobromus lacicolus	Lake Tahoe amphipod		S1	
Stygobromus mackenziei	Mackenzie's Cave amphipod		S1	
Stygobromus mysticus	Secret Cave amphipod		S1	
Stygobromus rudolphi	Rudolph's amphipod		S1	
Stygobromus sheldoni	Sheldon's amphipod		S1	
Stygobromus sierrensis	Sierra amphipod		S1	
Stygobromus tahoensis	Lake Tahoe stygobromid		S1	
Stygobromus trinus	Trinity County amphipod		S1	
Stygobromus wengerorum	Wengerors' Cave amphipod		S1	
Crustacea, Order Decapoda (crayfish and shrimp)				
Pacifastacus fortis	Shasta crayfish	FE/SE		
Syncaris pacifica	California freshwater shrimp	FE/SE		
Insecta, Order Plecoptera (stoneflies)				
Capnia lacustra	Lake Tahoe benthic stonefly		S1	
Insecta, Order Orthoptera (grasshoppers, katydids, and crickets)				
Ammopelmatus muwu	Point Conception jerusalem cricket		S1	
Idiostatus middlekauffi	Middlekauff's shieldback katydid		S1	
Trimerotropis infantilis	Zayante band-winged grasshopper	FE		
Insecta, Order Heteroptera (true bugs)				
Ambrysus funebris	Nevares Spring naucorid bug	FC		
Belostoma saratogae	Saratoga Springs belostoman bug		S1	
Oravelia pege	Dry Creek cliff strider bug		S1	
Saldula usingeri	Wilbur Springs shorebug		S1	
Insecta, Order Coleoptera (beetles				
Aegialia concinna	Ciervo aegilian scarab beetle		S1	
Agabus rumppi	Death Valley agabus diving beetle		S1	
Anomala carlsoni	Carlson's dune beetle		S1	
Anomala hardyorum	Hardy's dune beetle		S1	
Anthicus antiochensis	Antioch Dunes anthicid beetle		S1	
Anthicus sacramento	Sacramento anthicid beetle		S1	
Cicindela gabbii	western tidal-flat tiger beetle		S1	
Cicindela hirticollis gravida	sandy beach tiger beetle		S1	
Cicindela latesignata latesignata	western beach tiger beetle		S1	
Cicindela ohlone	Ohlone tiger beetle	FE		
Cicindela senilis frosti	senile tiger beetle		S1	
Cicindela tranquebarica ssp.	San Joaquin tiger beetle		S1	
Cicindela tranquebarica viridissima	greenest tiger beetle		S1	
Coelus gracilis	San Joaquin dune beetle		S1	
Deltaspis ivae	marsh-elder long-horned beetle		S1	

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Desmocerus californicus dimorphus	valley elderberry longhorn beetle	FT		
Dinacoma caseyi	Casey's June beetle	FE		
Dubiraphia brunnescens	brownish dubiraphian riffle beetle		S1	
Elaphrus viridis	Delta green ground beetle	FT		
Hygrotus curvipes	curved-foot hygrotus diving beetle		S1	
Hygrotus fontinalis	travertine band-thigh diving beetle		S1	
Juniperella mirabilis	juniper metallic wood-boring beetle		S1	
Lepismadora algodones	Algodones sand jewel beetle		S1	
Lichnanthe albipilosa	white sand bear scarab beetle		S1	
Microcylloepus formicoideus	Furnace Creek riffle beetle		S1	
Nebria darlingtoni	South Forks ground beetle		S1	
Nebria sahlbergii triad	Trinity Alps ground beetle		S1	
Ochthebius recticulus	Wilbur Springs minute moss beetle		S1	
Onychobaris langei	Lange's El Segundo Dune weevil		S1	
Optioservus canus	Pinnacles optioservus riffle beetle		S1	
Polyphylla anteronivea	Saline Valley snow-front June beetle		S1	
Polyphylla barbata	Mount Hermon (=barbate) June beetle	FE		
Polyphylla erratica	Death Valley June beetle		S1	
Polyphylla nubila	Atascadero June beetle		S1	
Pseudocotalpa andrewsi	Andrew's dune scarab beetle		S1	
Trachykele hartmani	serpentine cypress wood-boring beetle		S1	
Trichinorhipis knulli	Knull's metallic wood-boring beetle		S1	
Trigonoscuta dorothea dorothea	Dorothy's El Segundo Dune weevil		S1	
Trigonoscuta sp.	Doyen's trigonoscuta dune weevil		S1	
Vandykea tuberculata	serpentine cypress long-horned beetle		S1	
Insecta, Order Mecoptera (scorpionflies)				
Orobittacus obscurus	gold rush hanging scorpionfly		S1	
Insecta, Order Diptera (flies)				
Ablautus schlingeri	Oso Flaco robber fly		S1	
Paracoenia calida	Wilbur Springs shore fly		S1	
Rhaphiomidas terminatus abdominalis	Delhi Sands flower-loving fly	FE		
Rhaphiomidas terminatus terminatus	El Segundo flower-loving fly		S1	
Rhaphiomidas trochilus	Valley mydas fly		S1	
Insecta, Order Lepidoptera (butterflies and moths)				
Apodemia mormo langei	Lange's metalmark butterfly	FE		
Areniscythris brachypteris	Oso Flaco flightless moth		S1	
Callophrys mossii bayensis	San Bruno elfin butterfly	FE		
Callophrys mossii marinensis	Marin elfin butterfly		S1	
Callophrys thornei	Thorne's hairstreak		S1	
Carterocephalus palaemon magnus	Sonoma arctic skipper		S1	

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Coenonympha tullia yontockett	Yontocket satyr		S1	
Danaus plexippus	monarch butterfly	FPL		
Euchloe hyantis andrewsi	Andrew's marble butterfly		S1	
Eucosma hennei	Henne's eucosman moth		S1	
Euphilotes battoides allyni	El Segundo blue butterfly	FE		
Euphilotes enoptes smithi	Smith's blue butterfly	FE		
Euphydryas editha bayensis	Bay checkerspot butterfly	FT		
Euphydryas editha quino	quino checkerspot butterfly	FE		
Euproserpinus euterpe	Kern primrose sphinx moth	FT		
Glaucopsyche lygdamus palosverdesensis	Palos Verdes blue butterfly	FE		
Hesperia miriamae longaevicola	White Mountains skipper		S1	
Lycaena hermes	Hermes copper butterfly	FC		
Lycaena rubidus incana	White Mountains copper		S1	
Philotiella speciosa bohartorum	Boharts' blue butterfly		S1	
Plebejus icarioides missionensis	Mission blue butterfly	FE		
Plebejus idas lotis	lotis blue butterfly	FE		
Plebejus saepiolus aureolus	San Gabriel Mountains blue butterfly		S1	
Polites mardon	mardon skipper		S1	
Pseudocopaeodes eunus obscurus	Carson wandering skipper	FE		
Pyrgus ruralis lagunae	Laguna Mountains skipper	FE		
Speyeria adiaste adiaste	unsilvered fritillary		S1	
Speyeria callippe callippe	callippe silverspot butterfly	FE		
Speyeria nokomis carsonensis	Carson Valley silverspot		S1	
Speyeria zerene behrensii	Behren's silverspot butterfly	FE		
Speyeria zerene hippolyta	Oregon silverspot butterfly	FT		
Speyeria zerene myrtleae	Myrtle's silverspot butterfly	FE		
Speyeria zerene sonomensis	Sonoma zerene fritillary		S1	
Insecta, Order Trichoptera (caddisflies)				
Limnephilus atercus	Fort Dick limnephilus caddisfly		S1	
Insecta, Order Hymenoptera (ants, bees, and wasps)				
Argochrysis lassenae	Lassen cuckoo wasp		S1	
Bombus caliginosus	Obscure bumble bee		S1	
Bombus crotchii	Crotch bumble bee		S1	
Bombus franklini	Franklin's bumble bee		S1	
Bombus morrisoni	Morrison bumble bee		S1	
Bombus occidentalis	western bumble bee		S1	
Bombus suckleyi	Suckley cuckoo bumble bee		S1	
Ceratochrysis bradleyi	Bradley's cuckoo wasp		S1	
Ceratochrysis gracilis	Piute Mountains cuckoo wasp		S1	
Ceratochrysis longimala	Desert cuckoo wasp		S1	

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Ceratochrysis menkei	Menke's cuckoo wasp		S1	
Halictus harmonius	haromonius halictid bee		S1	
Lasioglossum channelense	Channel Island sweat bee		S1	
Paranomada californica	California cuckoo bee		S1	
Perdita scitula antiochensis	Antioch andrenid bee		S1	
Philanthus nasalis	Antioch specid wasp		S1	
Protodufourea wasbaueri	Wasbauer's protodufourea bee		S1	
Protodufourea zavortinki	Zavortink's protodufourea bee		S1	
Rhopalolemma robertsi	Roberts' rhopalolemma bee		S1	
Sphecodogastra antiochensis	Antioch Dunes halcitid bee		S1	
Trachusa gummifera	San Francisco Bay Area leaf-cutter bee		S1	

Table C-2 Fish Species of Greatest Conservation Need

Scientific Name	Common Name	Legal Status	Conservation Concern	Climate Vulnerable
Petromyzontidae (lampreys)				
Entosphenus hubbsi	Kern brook lamprey		SSC	X
Entosphenus similis	Klamath River lamprey		SSC	
Entosphenus tridentatus	Pacific lamprey			X
Entosphenus ssp. 1	Goose Lake lamprey		SSC	X
Lampetra ayresii	river lamprey		SSC	X
Lampetra lethophaga	Pit Klamath brook lamprey		SSC	
Lamnidae (mackerel sharks and white sharks)				
Carcharodon carcharias	white shark		NT	
Acipenseridae (sturgeon)				
Acipenser medirostris	green sturgeon	FT	SSC	X
Acipenser transmontanus	white sturgeon			X
Salmonidae (trout and salmon)				
Oncorhynchus clarkii clarkii	coastal cutthroat trout		SSC	X
Oncorhynchus clarkii henshawi	Lahontan cutthroat trout	FT		X
Oncorhynchus clarkii seleniris	Paiute cutthroat trout	FT		X
Oncorhynchus kisutch	coho salmon - southern Oregon / northern California ESU	FT/ST		X
Oncorhynchus kisutch	coho salmon - central California coast ESU	FE/SE	NT	X
Oncorhynchus mykiss aguabonita	Volcano Creek golden trout		SSC	X
Oncorhynchus mykiss aquilarum	Eagle Lake rainbow trout		SSC	X
Oncorhynchus mykiss gilberti	Kern River rainbow trout		SSC	X
Oncorhynchus mykiss irideus	southern steelhead - southern	FE	SSC	X

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Scientific Name	Common Name	Legal Status	Conservation Concern	Climate Vulnerable
	California DPS			
Oncorhynchus mykiss irideus	steelhead - Klamath Mountains Province DPS		SSC	X
Oncorhynchus mykiss irideus	steelhead - northern California DPS	FT	SSC/NT	X
Oncorhynchus mykiss irideus	steelhead - south/central California coast DPS	FT	SSC/NT	X
Oncorhynchus mykiss irideus	summer-run steelhead trout		SSC	X
Oncorhynchus mykiss irideus	steelhead - central California coast DPS	FT	NT	X
Oncorhynchus mykiss irideus	steelhead - Central Valley DPS	FT	NT	X
Oncorhynchus mykiss ssp. 1	Goose Lake redband trout		SSC	X
Oncorhynchus mykiss ssp. 2	McCloud River redband trout		SSC	X
Oncorhynchus mykiss whitei	Little Kern golden trout	FT		X
Oncorhynchus tshawytscha	Chinook salmon - Central Valley fall / late fall-run ESU		SSC	X
Oncorhynchus tshawytscha	Chinook salmon - spring-run Klamath-Trinity Rivers pop.		SSC	X
Oncorhynchus tshawytscha	Chinook salmon - California coastal ESU	FT		X
Oncorhynchus tshawytscha	Chinook salmon - Central Valley spring-run ESU	FT/ST		X
Oncorhynchus tshawytscha	Chinook salmon - Sacramento River winter-run ESU	FE/SE		X
Salvelinus confluentus	bull trout	FT/SE	Extirpated	X
Osmeridae (smelt)				
Hypomesus transpacificus	Delta smelt	FT/SE		X
Spirinchus thaleichthys	longfin smelt	FC/ST		X
Thaleichthys pacificus	eulachon	FT	SSC/NT	X
Cyprinidae (minnows and carp)				
Gila coerulea	blue chub		SSC	
Gila elegans	bonytail	FE/SE	Extirpated	
Gila orcuttii	arroyo chub		SSC	
Lavinia exilicauda chi	Clear Lake hitch	ST	SSC	X
Lavinia symmetricus mitrulus	Pit roach		SSC	
Lavinia symmetricus navarroensis	Navarro roach		SSC	
Lavinia symmetricus parvipinnis	Gualala roach		SSC	
Lavinia symmetricus ssp. 1	San Joaquin roach		SSC	X
Lavinia symmetricus ssp. 2	Tomales roach		SSC	
Lavinia symmetricus ssp. 3	Red Hills roach		SSC	X
Lavinia symmetricus subditus	Monterey roach		SSC	
Mylopharodon conocephalus	hardhead		SSC	
Pogonichthys macrolepidotus	Sacramento splittail		SSC	

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Ptychocheilus lucius	Colorado pikeminnow	FE/SE		
Rhinichthys osculus ssp. 1	Amargosa Canyon speckled dace		SSC	
Rhinichthys osculus ssp. 2	Owens speckled dace		SSC	X
Rhinichthys osculus ssp. 3	Santa Ana speckled dace		SSC	X
Siphateles bicolor mohavensis	Mohave tui chub	FE/SE		X
Siphateles bicolor pectinifer	Lahontan Lake tui chub		SSC	
Siphateles bicolor snyderi	Owens tui chub	FE/SE		X
Siphateles bicolor ssp. 1	Eagle Lake tui chub		SSC	X
Siphateles bicolor ssp. 2	High Rock Spring tui chub		SSC/ Extirpated	
Siphateles bicolor thalassina	Goose Lake tui chub		SSC	X
Siphateles bicolor vaccaceps	Cow Head tui chub		SSC	X
Catostomidae (suckers)				
Catostomus fumeiventris	Owens sucker		SSC	
Catostomus microps	Modoc sucker	FE/SE		
Catostomus occidentalis lacusanserinus	Goose Lake sucker		SSC	X
Catostomus platyrhynchus	mountain sucker		SSC	
Catostomus santaanae	Santa Ana sucker	FT	SSC	X
Catostomus snyderi	Klamath largescale sucker		SSC	
Chasmistes brevirostris	shortnose sucker	FE/SE		
Deltistes luxatus	Lost River sucker	FE/SE		
Xyrauchen texanus	razorback sucker	FE/SE		
Cyprinodontidae (killifishes)				
Cyprinodon macularius	desert pupfish	FE/SE		X
Cyprinodon nevadensis amargosae	Amargosa pupfish		SSC	X
Cyprinodon nevadensis nevadensis	Saratoga Springs pupfish		SSC	X
Cyprinodon nevadensis shoshone	Shoshone pupfish		SSC	X
Cyprinodon radiosus	Owens pupfish	FE/SE		X
Cyprinodon salinus milleri	Cottonball Marsh pupfish	ST		X
Cyprinodon salinus salinus	Salt Creek pupfish		SSC	X
Gasterosteidae (sticklebacks)				
Gasterosteus aculeatus williamsoni	unarmored threespine stickleback	FE/SE		X
Scorpaenidae (scorpionfishes)				
Sebastes alutus	Pacific Ocean perch		R	
Sebastes crameri	darkblotched rockfish		R	
Sebastes gilli	bronzespotted rockfish		NT	
Sebastes levis	cowcod		NT/R	
Sebastes paucispinis	Bocaccio rockfish		R	
Sebastes pinniger	canary rockfish		NT/R	
Sebastes ruberrimus	yelloweye rockfish		NT/R	

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Polyprionidae (wreckfishes)				
Stereolepis gigas	giant sea bass		NT	
Epinephelidae (groupers)				
Mycteroperca jordani	gulf grouper		NT	
Mycteroperca xenarcha	broomtail grouper		NT	
Centrarchidae (sunfishes)				
Archoplites interruptus	Sacramento perch		SSC	
Gobiidae (gobies)				
Eucyclogobius newberryi	tidewater goby	FE/SE	SSC	X
Scombridae (mackerels, tunas, and bonitos)				
Thunnus orientalis	bluefin tuna		O	
Pleuronectidae (righteye flounders)				
Eopsetta jordani	Petrale sole		R	
Cottidae (sculpins)				
Cottus asperrimus	rough sculpin	ST		
Cottus klamathensis macrops	bigeye marbled sculpin		SSC	
Cottus perplexus	reticulate sculpin		SSC	
Embiotocidae (surfperches)				
Hysterocarpus traski pomo	Russian River tule perch		SSC	
Pomacentridae (damselfishes)				
Hypsypops rubicundus	Garibaldi		NT	

Table C-3 Amphibian Species of Greatest Conservation Need

Scientific Name	Common Name	Legal Status	Conservation Concern	Climate Vulnerable
Ambystomatidae (mole salamanders)				
Ambystoma californiense	California tiger salamander	FE/FT/ST		X
Ambystoma macrodactylum croceum	Santa Cruz long-toed salamander	FE/SE		
Ambystoma macrodactylum sigillatum	southern long-toed salamander		SSC	X
Rhyacotritonidae (Olympic salamanders)				
Rhyacotriton variegatus	southern torrent salamander		SSC	X
Salamandridae (newts)				
Taricha rivularis	red-bellied newt		SSC	
Taricha torosa	California newt (Monterey County and South)		SSC	
Dicamptodontidae (Pacific giant salamanders)				
Dicamptodon ensatus	California giant salamander		SSC	
Plethodontidae (lungless salamanders)				
Aneides flavipunctatus niger	Santa Cruz black salamander		SSC	

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Scientific Name	Common Name	Legal Status	Conservation Concern	Climate Vulnerable
Batrachoseps campi	Inyo Mountains salamander		SSC	X
Batrachoseps incognitus	San Simeon slender salamander			X
Batrachoseps luciae	Santa Lucia Mountains slender salamander			X
Batrachoseps major aridus	desert slender salamander	FE/SE		
Batrachoseps minor	lesser slender salamander		SSC	X
Batrachoseps relictus	relictual slender salmander		SSC	X
Batrachoseps simatus	Kern Canyon slender salamander	ST		
Batrachoseps stebbinsi	Tehachapi slender salamander	ST		X
Hydromantes brunus	limestone salamander	ST		
Hydromantes platycephalus	Mount Lyell salamander			X
Hydromantes shastae	Shasta salamander	ST		
Plethodon asupak	Scott Bar salamander	ST		
Plethodon dunni	Dunn’s salamander			X
Plethodon stormi	Siskiyou Mountains salamander	ST		
Ascaphodae (tailed frogs)				
Ascaphus truei	coastal tailed frog		SSC	X
Scaphiopodidae (spadefoot toads)				
Scaphiopus couchii	Couch’s spadefoot		SSC	X
Spea hammondii	western spadefoot		SSC	
Bufonidae (true toads)				
Anaxyrus californicus	arroyo toad	FE	SSC	X
Anaxyrus canorus	Yosemite toad	FT	SSC	X
Anaxyrus exsul	black toad	ST		X
Incilus alvarius	Sonoran Desert toad		SSC/ Extirpated	
Ranidae				
Lithobates pipiens	northern leopard frog		SSC	X
Lithobates yavapaiensis	lowland leopard frog		SSC/ Extirpated	X
Rana aurora	northern red-legged frog		SSC	X
Rana boylii	foothill yellow-legged frog		SSC	X
Rana cascadae	Cascades frog		SSC	X
Rana draytonii	California red-legged frog	FT	SSC	
Rana muscosa	southern mountain yellow-legged frog	FE/SE		X
Rana pretiosa	Oregon spotted frog	FT	SSC	
Rana sierrae	Sierra Nevada yellow-legged frog	FE/ST		X

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Table C-4 Reptile Species of Greatest Conservation Need

Scientific Name	Common Name	Legal Status	Conservation Concern	Climate Vulnerable
Cheloniidae (green sea turtles and relatives)				
Caretta caretta	loggerhead sea turtle (North Pacific)	FE	SSC	X
Chelonia mydas	green sea turtle	FT	SSC	X
Lepidochelys olivacea	olive ridley sea turtle	FT	SSC	X
Dermochelyidae (leatherback turtles)				
Dermochelys coriacea	leatherback sea turtle	FE	SSC	X
Kinosternidae (musk and mud turtles)				
Kinosternon sonoriense	Sonora mud turtle		SSC/ Extirpated	
Emydidae (box and water turtles)				
Actinemys marmorata	northernwestern western pond turtle		SSC	
Actinemys pallida	southern western pond turtle		SSC	
Testudinidae (land tortoises)				
Gopherus agassizii	Mohave Desert tortoise	FT/ST		
Gekkonidae (geckos)				
Coleonyx switaki	Switak's banded gecko	ST		
Coleonyx variegatus abbotti	San Diego banded gecko		SSC	
Crotaphytidae (collared and leopard lizards)				
Gambelia copeii	Cope's leopard lizard		SSC	
Gambelia sila	blunt-nosed leopard lizard	FE/SE		
Phrynosomatidae (spiny lizards)				
Phrynosoma blainvillii	Blainville's horned lizard		SSC	X
Phrynosoma mcallii	flat-tailed horned lizard	SCL	SSC	
Uma inornata	Coachella Valley fringe-toed lizard	FT/SE		
Uma notata	Colorado Desert fringe-toed lizard		SSC	
Uma scoparia	Mohave fringe-toed lizard		SSC	X
Xantusiidae (night lizards)				
Xantusia gracilis	sandstone night lizard		SSC	
Xantusia riversiana	island night lizard			X
Xantusia sierrae	Sierra night lizard		SSC	X
Teiidae (whiptails and relatives)				
Aspidoscelis hyperythra	orange-throated whiptail			X
Aspidoscelis tigris stejnegeri	San Diegan tiger whiptail		SSC	
Anguidae (alligator lizards)				
Elgaria panamintina	Panamint alligator lizard		SSC	X
Anniellidae (legless lizards)				
Anniella alexanderae	Temblor legless lizard		SSC	X
Anniella campi	Southern Sierra legless lizard		SSC	X
Anniella grinnelli	Bakersfield legless lizard		SSC	X
Anniella pulchra	California legless lizard		SSC	X

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Table C-4 Reptile Species of Greatest Conservation Need

Scientific Name	Common Name	Legal Status	Conservation Concern	Climate Vulnerable
Anniella stebbinsi	Southern California legless lizard		SSC	X
Helodermatidae (venomous lizards)				
Heloderma suspectum	Gila monster		SSC	X
Boidae (boas)				
Charina umbratica	southern rubber boa	ST		
Colubridae (egg-laying snakes)				
Arizona elegans occidentalis	California glossy snake		SSC	
Coluber [= Masticophis] flagellum ruddocki	San Joaquin coachwhip		SSC	
Coluber [= Masticophis] fuliginosus	Baja California coachwhip		SSC	
Coluber [= Masticophis] lateralis euryxanthus]	Alameda striped racer (whipsnake)	FT/ST		
Contia longicauda	forest sharp-tailed snake			X
Diadophis punctatus regalis	regal ring-necked snake		SSC	
Salvadora hexalepis virgultea	coast patch-nosed snake		SSC	X
Natricidae (live-bearing snakes)				
Thamnophis gigas	giant gartersnake	FT/ST		
Thamnophis hammondii	two-striped gartersnake		SSC	
Thamnophis sirtalis infernalis	California red-sided gartersnake (Ventura County and South)		SSC	
Thamnophis sirtalis tetrataenia	San Francisco gartersnake	FE/SE		
Viperiidae (vipers)				
Crotalus ruber	red diamond rattlesnake		SSC	

Table C-5 Bird Species of Greatest Conservation Need

Scientific Name	Common Name	Legal Status	Conservation Concern	Climate Vulnerable
Anatidae (ducks, geese, and swans)				
Anser albifrons elgasi	tule greater white-fronted goose		SSC	
Aythya americana	redhead		SSC	
Branta bernicla	brant		SSC	
Bucephala islandica	Barrow's goldeneye		SSC/ Extirpated (breeding)	
Dendrocygna bicolor	fulvous whistling-duck		SSC	
Histrionicus histrionicus	harlequin duck		SSC	
Phasianidae (grouse and ptarmigan)				
Centrocercus urophasianus	greater sage-grouse	FC (NE. CA pops)	SSC	X
Dendragapus fuliginosus howardi	Mount Pinos sooty grouse		SSC	

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Scientific Name	Common Name	Legal Status	Conservation Concern	Climate Vulnerable
Tympanuchus phasianellus columbianus	Columbian sharp-tailed grouse		SSC/ Extirpated	
Odontophoridae (partridge and quail)				
Callipepla californica catalinensis	Catalina California quail		SSC	
Gaviidae (loons)				
Gavia immer	common loon		SSC/ Extirpated	
Diomedeidea (albatross)				
Phoebastria albatrus	short-tailed albatross	FE	SSC	
Hydrobatidae (storm petrels)				
Oceanodroma furcata	fork-tailed storm-petrel		SSC	
Oceanodroma homochroa	ashy storm-petrel		SSC	X
Oceanodroma melania	black storm-petrel		SSC	
Pelecaniidae (pelicans)				
Pelecanus erythrorhynchos	American white pelican		SSC	X
Pelecanus occidentalis californicus	California brown pelican			X
Phalacrocoracidae (cormorants)				
Phalacrocorax pelagicus	pelagic cormorant			X
Phalacrocorax penicillatus	Brandt's cormorant			X
Ardeidea (herons, egrets, and bitterns)				
Ixobrychus exilis	least bittern		SSC	
Ciconiidae (storks)				
Mycteria americana	wood stork		SSC	
Cathartidae (New World vultures)				
Gymnogyps californianus	California condor	FE/SE		
Accipitridae (hawks, kites, harriers, and eagles)				
Accipiter gentilis	northern goshawk		SSC	
Buteo swainsoni	Swainson's hawk	ST		X
Circus cyaneus	northern harrier		SSC	
Haliaeetus leucocephalus	bald eagle	SE		
Rallidae (rails, coots, and gallinules)				
Coturnicops noveboracensis	yellow rail		SSC	X
Laterallus jamaicensis coturniculus	California black rail	ST		X
Rallus obsoletus levipes	Light-footed Ridgway's rail	FE/SE		X
Rallus obsoletus obsoletus	California Ridgway's rail	FE/SE		X
Rallus obsoletus yumanensis	Yuma Ridgway's rail	FE/SE		X
Gruidae (cranes)				
Grus canadensis canadensis	lesser sandhill crane		SSC	
Grus canadensis tabida	greater sandhill crane	ST		

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Scientific Name	Common Name	Legal Status	Conservation Concern	Climate Vulnerable
Charadriidae (plovers and relatives)				
Charadrius nivosus	snowy plover (coastal population)	FT	SSC	X
Charadrius nivosus	snowy plover (interior population)		SSC	X
Charadrius montanus	mountain plover		SSC	
Haematopodidae (oystercatchers)				
Haematopus bachmani	black oystercatcher			X
Scolopacidae (sandpipers and relatives)				
Arenaria interpres	ruddy turnstone			X
Arenaria melanocephala	black turnstone			X
Calidris alba	sanderling			X
Calidris canutus	red knot			X
Calidris virgata	surfbird			X
Tringa incana	wandering tattler			X
Laridae (gulls and terns)				
Chlidonias niger	black tern		SSC	X
Gelochelidon nilotica	gull-billed tern		SSC	X
Rynchops niger	black skimmer		SSC	X
Sternula antillarum browni	California least tern	FE/SE		X
Thalasseus elegans	elegant tern			X
Thalasseus maximus	royal tern			X
Alcidea (auklets, puffins, and relatives)				
Brachyramphus marmoratus	marbled murrelet	FT/SE		X
Cepphus columba	pigeon guillemot			X
Cerorhinca monocerata	rhinoceros auklet			X
Fratercula cirrhata	tufted puffin		SSC	X
Ptychoramphus aleuticus	Cassin’s auklet		SSC	X
Synthliboramphus craveri	Craveri’s murrelet			X
Synthliboramphus hypoleucus	Guadalupe murrelet	ST		X
Synthliboramphus scrippsi	Scripps’s murrelet	FC/ST		X
Uria aalge	common murre			X
Cuculidae (cuckoos and relatives)				
Coccyzus americanus occidentalis	western yellow-billed cuckoo	FT/SE		X
Strigidae (owls)				
Asio flammeus	short-eared owl		SSC	
Asio otus	long-eared owl		SSC	
Athene cunicularia	burrowing owl		SSC	
Micrathene whitneyi	elf owl	SE		X
Strix nebulosa	great gray owl	SE		X
Strix occidentalis caurina	northern spotted owl	FT/SCL	SSC	
Strix occidentalis occidentalis	California spotted owl		SSC	

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Apodidae (swifts)				
Chaetura vauxi	Vaux's swift		SSC	
Cypseloides niger	black swift		SSC	
Picidae (woodpeckers)				
Colaptes chrysoides	gilded flicker	SE		
Melanerpes uropygialis	gila woodpecker	SE		
Tyrannidae (tyrant flycatchers)				
Contopus cooperi	olive-sided flycatcher		SSC	
Empidonax traillii	willow flycatcher	SE		
Empidonax traillii extimus	southwestern willow flycatcher	FE/SE		
Myiarchus tyrannulus	brown-crested flycatcher			X
Pyrocephalus rubinus	vermilion flycatcher		SSC	
Laniidae (shrikes)				
Lanius ludovicianus	loggerhead shrike		SSC	
Lanius ludovicianus mearnsi	San Clemente loggerhead shrike	FE	SSC	
Vireonidae (vireos)				
Vireo bellii arizonae	Arizona Bell's vireo	SE		X
Vireo bellii pusillus	least Bell's vireo	FE/SE		X
Vireo huttoni unitti	Catalina Hutton's vireo		SSC	
Vireo vicinior	gray vireo		SSC	
Hirundinidae (swallows)				
Progne subis	purple martin		SSC	
Riparia riparia	bank swallow	ST		
Troglodytidae (wrens)				
Campylorhynchus brunneicapillus sandiegensis	coastal cactus wren (San Diego and Orange Counties)		SSC	
Cistothorus palustris clarkae	Clark's marsh wren		SSC	
Thryomanes bewickii leucophrys	San Clemente Bewick's wren		SSC/ Extirpated	
Sylviidae (gnatcatchers)				
Polioptila californica californica	coastal California gnatcatcher	FT	SSC	
Mimidae (mockingbirds and thrashers)				
Toxostoma bendirei	Bendire's thrasher		SSC	X
Toxostoma crissale	Crissal thrasher		SSC	
Toxostoma lecontei	Le Conte's thrasher (San Joaquin population)		SSC	
Parulidae (wood-warblers)				
Geothlypis trichas sinuosa	saltmarsh common yellowthroat/San Francisco common yellowthroat		SSC	X
Icteria virens	yellow-breasted chat		SSC	

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Scientific Name	Common Name	Legal Status	Conservation Concern	Climate Vulnerable
Oreothlypis luciae	Lucy's warbler		SSC	
Setophaga petechia	yellow warbler		SSC	
Emberizidae (sparrows, buntings, warblers, and relatives)				
Aimophila ruficeps obscura	Santa Cruz Island rufous-crowned sparrow		SSC	
Ammodramus savannarum	grasshopper sparrow		SSC	
Artemisiospiza belli clementeae	San Clemente Bell's sparrow	FT	SSC	
Melospiza melodia graminea	Channel Island song sparrow		SSC	
Melospiza melodia maillardi	song sparrow ("Modesto" population)		SSC	X
Melospiza melodia maxillaris	Suisun song sparrow		SSC	X
Melospiza melodia pusillula	Alameda song sparrow		SSC	X
Melospiza melodia samuelis	San Pablo (= Samuels) song sparrow		SSC	X
Melozone crissalis eremophilus	Inyo California towhee	FT/SE		X
Passerculus sandwichensis alaudinus	Bryant's savannah sparrow		SSC	
Passerculus sandwichensis beldingi	Belding's savannah sparrow	SE		
Passerculus sandwichensis rostratus	large-billed savannah sparrow		SSC	
Pipilo maculatus clementae	San Clemente spotted towhee		SSC	
Piranga rubra	summer tanager		SSC	
Pooecetes gramineus affinis	Oregon vesper sparrow		SSC	
Icteridae (blackbirds)				
Agelaius phoeniceus aciculatus	Kern red-winged blackbird		SSC	
Agelaius tricolor	tricolored blackbird		SSC	
Icterus parisorum	Scott's Oriole			X
Xanthocephalus xanthocephalus	yellow-headed blackbird		SSC	
Fringillidae (finches and relatives)				
Leucosticte tephrocotis	Gray-crowned Rosy-Finch			X

Table C-6 Mammal Species of Greatest Conservation Need

Scientific Name	Common Name	Legal Status	Conservation Concern	Climate Vulnerable
Talpidae (moles)				
Scapanus latimanus parvus	Alameda Island mole		SSC	
Soricidae (shrews)				
Sorex ornatus relictus	Buena Vista Lake shrew	FE	SSC	
Sorex ornatus salarius	Monterey shrew, Salinas ornate shrew		SSC	
Sorex ornatus salicornicus	Southern California salt marsh shrew		SSC	
Sorex ornatus sinuosus	Suisun shrew		SSC	
Sorex ornatus willeti	Santa Catalina Island shrew		SSC	
Sorex vagrans halicoetes	salt marsh wandering shrew		SSC	

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Scientific Name	Common Name	Legal Status	Conservation Concern	Climate Vulnerable
Sorex vagrans paludivagus	Monterey vagrant shrew		SSC	
Phyllostomidae (leaf-nosed bats)				
Choeronycteris mexicana	Mexican long-tongued bat		SSC	
Leptonycteris yerbabuenae	lesser long-nosed bat	FE	SSC	
Macrotus californicus	California leaf-nosed bat		SSC	
Vespertilionidae (evening bats)				
Antrozous pallidus	pallid bat		SSC	
Corynorhinus townsendii	Townsend's big-eared bat	SCL	SSC	
Myotis evotis	long-eared myotis		SSC	
Myotis occultus	Arizona myotis		SSC	
Myotis thysanodes	fringed myotis		SSC	
Myotis velifer	cave myotis		SSC	
Myotis volans	long-legged myotis		SSC	
Molossidae (free-tailed bats)				
Nyctinomops macrotis	big free-tailed bat		SSC	
Ochotonidae (pikas)				
Ochotona princeps	American pika			X
Leporidae (rabbits and hares)				
Brachylagus idahoensis	pygmy rabbit		SSC	
Lepus americanus klamathensis	Oregon snowshoe hare		SSC	
Lepus americanus tahoensis	Sierra Nevada snowshoe hare		SSC	
Sylvilagus bachmani riparius	riparian brush rabbit	FE/SE		
Aplodontidae (mountain beavers)				
Aplodontia rufa californica	Sierra Nevada mountain beaver		SSC	
Aplodontia rufa humboldtiana	Humboldt mountain beaver		SSC	
Aplodontia rufa nigra	Point Arena mountain beaver	FE	SSC	
Aplodontia rufa phaea	Point Reyes mountain beaver		SSC	
Sciuridae (squirrels and relatives)				
Ammospermophilus nelsoni	Nelson's antelope squirrel	ST		
Callospermophilus lateralis bernardinus	San Bernardino golden-mantled ground squirrel		SSC	
Glaucomys sabrinus californicus	San Bernardino flying squirrel		SSC	X
Neotamias [=Tamius] alpinus	alpine chipmunk		SSC	X
Spermophilus [=Xerospermophilus] mohavensis	Mohave ground squirrel	ST		
Tamias speciosus callipeplus	Mount Pinos lodgepole chipmunk		SSC	
Tamias speciosus speciosus	lodgepole chipmunk		SSC	
Xerospermophilus tereticaudus chlorus	Palm Springs round-tailed ground squirrel		SSC	
Urocitellus mollis	Piute ground squirrel		SSC	

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Castoridae (beavers)				
Castor canadensis frondator (incl. repentinus)	Sonora beaver		SSC	
Heteromyidae (kangaroo rats, pocket mice, and kangaroo mice)				
Dipodomys agilis	agile (=Pacific) kangaroo rat		SSC	
Dipodomys californicus eximius	Marysville California kangaroo rat		SSC	
Dipodomys heermanni arenae	Lompoc kangaroo rat		SSC	
Dipodomys heermanni berkeleyensis	Berkeley kangaroo rat		SSC	
Dipodomys heermanni dixoni	Merced kangaroo rat		SSC	
Dipodomys heermanni goldmani	Salinas kangaroo rat		SSC	
Dipodomys heermanni heermanni	Heermann's kangaroo rat		SSC	
Dipodomys heermanni morroensis	Morro Bay kangaroo rat	FE/SE		
Dipodomys ingens	giant kangaroo rat	FE/SE		
Dipodomys merriami collinus	Earthquake Merriam's kangaroo rat		SSC	
Dipodomys merriami parvus	San Bernardino kangaroo rat	FE	SSC	
Dipodomys merriami trinidadensis	Valle de la Trinidad kangaroo rat		SSC	
Dipodomys nitratoides	San Joaquin kangaroo rat		SSC	
Dipodomys nitratoides exilis	Fresno kangaroo rat	FE/SE		
Dipodomys nitratoides nitratoides	Tipton kangaroo rat	FE/SE		
Dipodomys simulans	Dulzura kangaroo rat		SSC	
Dipodomys stephensi	Stephens' kangaroo rat	FE/ST		
Dipodomys venustus	narrow-faced kangaroo rat		SSC	
Perognathus alticolus alticolus	white-eared pocket mouse		SSC	
Perognathus alticolus inexpectatus	Tehachapi pocket mouse		SSC	
Perognathus inornatus	San Joaquin pocket mouse		SSC	
Perognathus longimembris bangsi	Palm Springs pocket mouse		SSC	
Perognathus longimembris brevinasus	Los Angeles pocket mouse		SSC	
Perognathus longimembris internationalis	Jacumba pocket mouse		SSC	
Perognathus longimembris pacificus	Pacific pocket mouse	FE	SSC	
Perognathus parvus xanthanotus	yellow-eared pocket mouse		SSC	
Muridae (mice, rats, and voles)				
Arborimus pomo	Sonoma tree vole		SSC	X
Microtus californicus halophilus	Monterey vole		SSC	X
Microtus californicus mohavensis	Mohave river vole		SSC	
Microtus californicus paludicola	marsh vole		SSC	X
Microtus californicus sanpabloensis	San Pablo vole		SSC	X
Microtus californicus scirpensis	Amargosa vole	FE/SE		
Microtus californicus stephensi	Stephens' California vole		SSC	
Microtus longicaudus bernardinus	San Bernardino Mountains long-tailed vole		SSC	
Neotoma fuscipes riparia	riparian (=San Joaquin Valley) woodrat	FE	SSC	

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Onychomys torridus ramona	southern grasshopper mouse		SSC	
Onychomys torridus tularensis	Tulare grasshopper mouse		SSC	
Reithrodontomys megalotis distichlis	Salinas harvest mouse		SSC	
Reithrodontomys megalotis limicola	southern marsh harvest mouse		SSC	
Reithrodontomys raviventris	salt-marsh harvest mouse	FE/SE		
Dipodidae (jumping mice)				
Zapus trinotatus orarius	Point Reyes jumping mouse		SSC	
Erethizontidae				
Erethizon dorsatum	porcupine		SSC	
Felidae				
Panthera onca	jaguar	FE	SSC/ Extirpated	
Canidae (foxes, wolves, and coyotes)				
Canis lupus	gray wolf	FE/SE		
Urocyon littoralis catalinae	Santa Catalina Island fox	FE/ST		
Urocyon littoralis clementae	San Clemente Island fox	ST		
Urocyon littoralis dickeyi	San Nicolas Island fox	ST		
Urocyon littoralis littoralis	San Miguel Island fox	FE/ST		
Urocyon littoralis santacruzae	Santa Cruz Island fox	FE/ST		
Urocyon littoralis santarosae	Santa Rosa Island fox	FE/ST		
Vulpes macrotis macrotis	San Jacinto kit fox		SSC/ Extirpated	
Vulpes macrotis mutica	San Joaquin kit fox	FE/ST		
Vulpes vulpes necator	Sierra Nevada red fox	ST		X
Vulpes vulpes patwin	Sacramento Valley red fox		SSC	
Ursidea (bears)				
Ursus arctos	grizzly bear	FT	SSC/ Extirpated	
Otariidae (sea lions and fur seals)				
Arctocephalus townsendi	Guadalupe fur-seal	FT/ST		
Eumetopias jubatus	steller (=northern) sea-lion	FT	SSC	
Procyonidae (racoons and relatives)				
Bassariscus astutus octavus	Southern California ringtail		SSC	
Bassariscus astutus willetti	Palo Verde Mountains ringtail		SSC	
Bassariscus astutus yumanensis	Yuma ringtail		SSC	
Mustelidae (weasels and relatives)				
Enhydra lutris nereis	southern sea otter	FT	SSC	
Gulo gulo	California wolverine	ST		X
Lontra canadensis sonora	southwestern river otter		SSC	
Martes caurina [=americana]	Pacific marten		SSC	X

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Table C-6 Mammal Species of Greatest Conservation Need

Scientific Name	Common Name	Legal Status	Conservation Concern	Climate Vulnerable
Mustela frenata inyoensis	Inyo long-tailed weasel		SSC	
Mustela frenata xanthogenys	San Joaquin long-tailed weasel		SSC	
Pekania [=Martes] pennanti	fisher - West Coast DPS	FPL/SCL	SSC	
Taxidea taxus	American badger		SSC	
Mephitidae (skunks)				
Spilogale gracilis amphialus	Channel Islands spotted skunk		SSC	
Balaenopteridea (baleen whales)				
Balaenoptera borealis	sei whale	FE	SSC	
Balaenoptera musculus	blue whale	FE	SSC	
Balaenoptera physalus	fin whale	FE	SSC	
Eubalaena japonica	North Pacific right whale	FE	SSC	
Megaptera novaeangliae	humpback whale	FE	SSC	
Delphinidae				
Orcinus orca	killer whale (southern resident DPS)	FE	SSC	
Physeteridea (sperm whales)				
Physeter macrocephalus	sperm whale	FE	SSC	
Antilocapridae (pronghorn)				
Antilocapra americana	pronghorn		SSC	
Antilocapra americana sonoriensis	Sonoran pronghorn	FE	SSC / Extirpated	
Cervidae (deer)				
Cervus elaphus nannodes	tule elk		SSC	
Bovidae (sheep and relatives)				
Ovis canadensis	bighorn sheep		SSC	
Ovis canadensis nelsoni	Peninsular bighorn sheep DPS	FE/ST		
Ovis canadensis nelsoni	desert bighorn sheep		SSC	
Ovis canadensis sierrae	Sierra Nevada bighorn sheep	FE/SE		

Legal Status
FE = Federally endangered
FT = Federally threatened
FPL = Federally proposed for listing
FC = Federal candidate for listing

SE = State endangered
ST = State threatened
SCL = State candidate for listing

Conservation Concern
S1 = NatureServe State Conservation Rank of S1 (Invertebrates)
SSC = CDFW Species of Special Concern
NT = No take allowed by state and/or federal harvesting/fishing regulations
R = Under federal rebuilding plan
O = Overfished

Table C-7 Plant Species of Greatest Conservation Need

Scientific Name	Common Name	Legal Status	Conservation Concern	Rare Plant Rank
Abronia alpina	Ramshaw Meadows abronia	FC		1B.1
Abronia umbellata var. *breviflora*	pink sand-verbena			1B.1
Abronia villosa var. *aurita*	chaparral sand-verbena			1B.1
Acanthomintha duttonii	San Mateo thorn-mint	FE/SE		1B.1
Acanthomintha ilicifolia	San Diego thorn-mint	FT/SE		1B.1
Acanthoscyphus parishii var. *goodmaniana*	Cushenbury oxytheca	FE		1B.1
Acmispon argophyllus var. adsurgens	San Clemente Island bird's-foot trefoil	SE		1B.1
Acmispon argophyllus var. *niveus*	Santa Cruz Island bird's-foot trefoil	SE		4.2
Acmispon dendroideus var. *traskiae*	San Clemente Island lotus	FT/SE		1B.3
Acmispon prostratus	Nuttall's acmispon			1B.1
Acmispon rubriflorus	red-flowered bird's-foot-trefoil			1B.1
Agrostis lacuna-vernalis	vernal pool bent grass			1B.1
Allium marvinii	Yucaipa onion			1B.1
Allium munzii	Munz's onion	FE/ST		1B.1
Allium yosemitense	Yosemite onion	SR		1B.3
Alopecurus aequalis var. *sonomensis*	Sonoma alopecurus	FE		1B.1
Ambrosia pumila	San Diego ambrosia	FE		1B.1
Amsinckia grandiflora	large-flowered fiddleneck	FE/SE		1B.1
Ancistrocarphus keilii	Santa Ynez groundstar			1B.1
Arabis mcdonaldiana	Mcdonald's rockcress	FE		1B.1
Arctostaphylos bakeri ssp. *bakeri*	Baker's manzanita	SR		1B.1
Arctostaphylos bakeri ssp. *sublaevis*	The Cedars manzanita	SR		1B.2
Arctostaphylos confertiflora	Santa Rosa Island manzanita	FE		1B.2
Arctostaphylos crustacea ssp. *eastwoodiana*	Eastwood's brittle-leaf manzanita			1B.1
Arctostaphylos densiflora	Vine Hill manzanita	SE		1B.1
Arctostaphylos franciscana	Franciscan manzanita	FE		1B.1
Arctostaphylos glandulosa ssp. *crassifolia*	Del Mar manzanita	FE		1B.1
Arctostaphylos hookeri ssp. *hearstiorum*	Hearsts' manzanita	SE		1B.2
Arctostaphylos imbricata	San Bruno Mountain manzanita	SE		1B.1
Arctostaphylos montana ssp. ravenii	Presidio manzanita	FE/SE		1B.1
Arctostaphylos morroensis	Morro manzanita	FT		1B.1
Arctostaphylos myrtifolia	Ione manzanita	FT		1B.2
Arctostaphylos ohloneana	Ohlone manzanita			1B.1
Arctostaphylos pacifica	Pacific manzanita	SE		1B.2
Arctostaphylos pajaroensis	Pajaro manzanita			1B.1
Arctostaphylos pallida	pallid manzanita	FT/SE		1B.1

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SR = State Rare

Conservation Concern
NT = No take allowed by state and/or federal harvesting/fishing regulations

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Threat Ranks
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Table C-7 Plant Species of Greatest Conservation Need

Scientific Name	Common Name	Legal Status	Conservation Concern	Rare Plant Rank
Arctostaphylos purissima	La Purisima manzanita			1B.1
Arctostaphylos rainbowensis	Rainbow manzanita			1B.1
Arctostaphylos stanfordiana ssp. decumbens	Rincon Ridge manzanita			1B.1
Arctostaphylos stanfordiana ssp. raichei	Raiche's manzanita			1B.1
Arctostaphylos tomentosa ssp. daciticola	dacite manzanita			1B.1
Arenaria paludicola	marsh sandwort	FE/SE		1B.1
Astragalus agnicidus	Humboldt milk-vetch	SE		1B.1
Astragalus albens	Cushenbury milk-vetch	FE		1B.1
Astragalus atratus var. mensanus	Darwin Mesa milk-vetch			1B.1
Astragalus brauntonii	Braunton's milk-vetch	FE		1B.1
Astragalus claranus	Clara Hunt's milk-vetch	FE/ST		1B.1
Astragalus deanei	Dean's milk-vetch			1B.1
Astragalus hornii var. hornii	Horn's milk-vetch			1B.1
Astragalus jaegerianus	Lane Mountain milk-vetch	FE		1B.1
Astragalus johannis-howellii	Long Valley milk-vetch	SR		1B.2
Astragalus lentiginosus var. coachellae	Coachella Valley milk-vetch	FE		1B.2
Astragalus lentiginosus var. piscinensis	Fish Slough milk-vetch	FT		1B.1
Astragalus lentiginosus var. sesquimetralis	Sodaville milk-vetch	SE		1B.1
Astragalus magdalenae var. peirsonii	Peirson's milk-vetch	FT/SE		1B.2
Astragalus mohavensis var. hemigyrus	curved-pod milk-vetch			1B.1
Astragalus monoensis	Mono milk-vetch	SR		1B.2
Astragalus nyensis	Nye milk-vetch			1B.1
Astragalus pachypus var. jaegeri	Jaeger's milk-vetch			1B.1
Astragalus preussii var. laxiflorus	Lancaster milk-vetch			1B.1
Astragalus pycnostachyus var. lanosissimus	Ventura Marsh milk-vetch	FE/SE		1B.1
Astragalus tener var. ferrisiae	Ferris' milk-vetch			1B.1
Astragalus tener var. titi	coastal dunes milk-vetch	FE/SE		1B.1
Astragalus traskiae	Trask's milk-vetch	SR		1B.2
Astragalus tricarinatus	triple-ribbed milk-vetch	FE		1B.2
Atriplex argentea var. longitrichoma	Pahrump orache			1B.1
Atriplex coronata var. notatior	San Jacinto Valley crownscale	FE		1B.1
Atriplex minuscula	lesser saltscale			1B.1
Atriplex parishii	Parish's brittlescale			1B.1
Atriplex tularensis	Bakersfield smallscale	SE		1A
Baccharis malibuensis	Malibu baccharis			1B.1
Baccharis vanessae	Encinitas baccharis	FT/SE		1B.1

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Table C-7 Plant Species of Greatest Conservation Need

Scientific Name	Common Name	Legal Status	Conservation Concern	Rare Plant Rank
Bensoniella oregona	bensoniella	SR		1B.1
Berberis nevinii	Nevin's barberry	FE/SE		1B.1
Berberis pinnata ssp. insularis	island barberry	FE/SE		1B.2
Blennosperma bakeri	Sonoma sunshine	FE/SE		1B.1
Blennosperma nanum var. robustum	Point Reyes blennosperma	SR		1B.2
Blepharizonia plumosa	big tarplant			1B.1
Bloomeria clevelandii	San Diego goldenstar			1B.1
Bloomeria humilis	dwarf goldenstar	SR		1B.2
Boechera constancei	Constance's rockcress			1B.1
Boechera hoffmannii	Hoffmann's rockcress	FE		1B.1
Boechera rollei	Rolle's rockcress			1B.1
Boechera rubicundula	Mount Day rockcress			1B.1
Boechera shevockii	Shevock's rockcress			1B.1
Boechera ultraalsa	Snow Mountain rockcress			1B.1
Brodiaea filifolia	thread-leaved brodiaea	FT/SE		1B.1
Brodiaea insignis	Kaweah brodiaea	SE		1B.2
Brodiaea matsonii	Sulphur Creek brodiaea			1B.1
Brodiaea orcuttii	Orcutt's brodiaea			1B.1
Brodiaea pallida	Chinese Camp brodiaea	FT/SE		1B.1
Brodiaea rosea	Indian Valley brodiaea	SE		1B.1
Bryoria spiralifera	twisted horsehair lichen			1B.1
Calamagrostis foliosa	leafy reed grass	SR		4.2
California macrophylla	round-leaved filaree			1B.1
Calochortus dunnii	Dunn's mariposa-lily	SR		1B.2
Calochortus excavatus	Inyo County star-tulip			1B.1
Calochortus persistens	Siskiyou mariposa-lily	FC/SR		1B.2
Calochortus syntrophus	Callahan's mariposa-lily			1B.1
Calochortus tiburonensis	Tiburon mariposa-lily	FT/ST		1B.1
Calycadenia villosa	dwarf calycadenia			1B.1
Calyptridium parryi var. hesseae	Santa Cruz Mountains pussypaws			1B.1
Calyptridium pulchellum	Mariposa pussypaws	FT		1B.1
Calystegia sepium ssp. binghamiae	Santa Barbara morning-glory			1B.1
Calystegia stebbinsii	Stebbins' morning-glory	FE/SE		1B.1
Camissonia benitensis	San Benito evening-primrose	FT		1B.1
Carex tompkinsii	Tompkins' sedge	SR		4.3

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Table C-7 Plant Species of Greatest Conservation Need

Scientific Name	Common Name	Legal Status	Conservation Concern	Rare Plant Rank
Carpenteria californica	tree-anemone	ST		1B.2
Castilleja affinis var. neglecta	Tiburon paintbrush	FE/ST		1B.2
Castilleja ambigua var. insalutata	pink Johnny-nip			1B.1
Castilleja ambigua var. meadii	Mead's owls-clover			1B.1
Castilleja campestris var. succulenta	succulent owl's-clover	FT/SE		1B.2
Castilleja cinerea	ash-gray paintbrush	FT		1B.2
Castilleja gleasoni	Mt. Gleason paintbrush	SR		1B.2
Castilleja grisea	San Clemente Island paintbrush	FT/SE		1B.3
Castilleja mollis	soft-leaved paintbrush	FE		1B.1
Castilleja uliginosa	Pitkin Marsh paintbrush	SE		1A
Caulanthus amplexicaulis var. barbarae	Santa Barbara jewelflower			1B.1
Caulanthus californicus	California jewelflower	FE/SE		1B.1
Ceanothus confusus	Rincon Ridge ceanothus			1B.1
Ceanothus ferrisiae	Coyote ceanothus	FE		1B.1
Ceanothus foliosus var. vineatus	Vine Hill ceanothus			1B.1
Ceanothus hearstiorum	Hearsts' ceanothus	SR		1B.2
Ceanothus maritimus	maritime ceanothus	SR		1B.2
Ceanothus masonii	Mason's ceanothus	SR		1B.2
Ceanothus ophiochilus	Vail Lake ceanothus	FT/SE		1B.1
Ceanothus roderickii	Pine Hill ceanothus	FE		1B.2
Centromadia parryi ssp. australis	southern tarplant			1B.1
Centromadia parryi ssp. congdonii	Congdon's tarplant			1B.1
Centromadia pungens ssp. laevis	smooth tarplant			1B.1
Cercocarpus traskiae	Catalina Island mountain-mahogany	FE/SE		1B.1
Chaenactis glabriuscula var. orcuttiana	Orcutt's pincushion			1B.1
Chamaesyce hooveri	Hoover's spurge	FT		1B.2
Chlorogalum purpureum var. purpureum	Santa Lucia purple amole	FT		1B.1
Chlorogalum purpureum var. reductum	Camatta Canyon amole	FT/SR		1B.1
Chloropyron maritimum ssp. maritimum	salt marsh bird's-beak	FE/SE		1B.2
Chloropyron molle ssp. hispidum	hispid salty bird's-beak			1B.1
Chloropyron molle ssp. molle	soft salty bird's-beak	FE/SR		1B.2
Chloropyron palmatum	palmate-bracted salty bird's-beak	FE/SE		1B.1
Chorizanthe howellii	Howell's spineflower	FE/ST		1B.2
Chorizanthe orcuttiana	Orcutt's spineflower	FE/SE		1B.1
Chorizanthe parryi var. fernandina	San Fernando Valley spineflower	FC/SE		1B.1
Chorizanthe parryi var. parryi	Parry's spineflower			1B.1

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Table C-7 Plant Species of Greatest Conservation Need

Scientific Name	Common Name	Legal Status	Conservation Concern	Rare Plant Rank
Chorizanthe pungens var. hartwegiana	Ben Lomond spineflower	FE		1B.1
Chorizanthe pungens var. pungens	Monterey spineflower	FT		1B.2
Chorizanthe robusta var. hartwegii	Scotts Valley spineflower	FE		1B.1
Chorizanthe robusta var. robusta	robust spineflower	FE		1B.1
Chorizanthe valida	Sonoma spineflower	FE/SE		1B.1
Cirsium ciliolatum	Ashland thistle	SE		2B.1
Cirsium crassicaule	slough thistle			1B.1
Cirsium fontinale var. fontinale	Crystal Springs fountain thistle	FE/SE		1B.1
Cirsium fontinale var. obispoense	San Luis Obispo fountain thistle	FE/SE		1B.2
Cirsium hydrophilum var. hydrophilum	Suisun thistle	FE		1B.1
Cirsium rhothophilum	surf thistle	ST		1B.2
Cirsium scariosum var. loncholepis	La Graciosa thistle	FE/ST		1B.1
Clarkia amoena ssp. whitneyi	Whitney's farewell-to-spring			1B.1
Clarkia borealis ssp. arida	Shasta clarkia			1B.1
Clarkia concinna ssp. raichei	Raiche's red ribbons			1B.1
Clarkia franciscana	Presidio clarkia	FE/SE		1B.1
Clarkia imbricata	Vine Hill clarkia	FE/SE		1B.1
Clarkia lingulata	Merced clarkia	SE		1B.1
Clarkia mosquinii	Mosquin's clarkia			1B.1
Clarkia speciosa ssp. immaculata	Pismo clarkia	FE/SR		1B.1
Clarkia springvillensis	Springville clarkia	FT/SE		1B.2
Clarkia tembloriensis ssp. calientensis	Vasek's clarkia			1B.1
Cordylanthus nidularius	Mt. Diablo bird's-beak	SR		1B.1
Cordylanthus rigidus ssp. littoralis	seaside bird's-beak	SE		1B.1
Cordylanthus tenuis ssp. capillaris	Pennell's bird's-beak	FE/SR		1B.2
Corethrogyne filaginifolia var. incana	San Diego sand aster			1B.1
Corethrogyne filaginifolia var. linifolia	Del Mar Mesa sand aster			1B.1
Crocanthemum greenei	island rush-rose	FT		1B.2
Croton wigginsii	Wiggins' croton	SR		2B.2
Cryptantha ganderi	Gander's cryptantha			1B.1
Cryptantha roosiorum	bristlecone cryptantha	SR		1B.2
Cryptantha traskiae	Trask's cryptantha			1B.1
Cylindropuntia californica var. californica	snake cholla			1B.1
Dedeckera eurekensis	July gold	SR		1B.3
Deinandra arida	Red Rock tarplant	SR		1B.2

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Table C-7 Plant Species of Greatest Conservation Need

Scientific Name	Common Name	Legal Status	Conservation Concern	Rare Plant Rank
Deinandra bacigalupii	Livermore tarplant			1B.2
Deinandra conjugens	Otay tarplant	FT/SE		1B.1
Deinandra halliana	Hall's tarplant			1B.1
Deinandra increscens ssp. villosa	Gaviota tarplant	FE/SE		1B.1
Deinandra minthornii	Santa Susana tarplant	SR		1B.2
Deinandra mohavensis	Mojave tarplant	SE		1B.3
Delphinium bakeri	Baker's larkspur	FE/SE		1B.1
Delphinium hesperium ssp. cuyamacae	Cuyamaca larkspur	SR		1B.2
Delphinium luteum	golden larkspur	FE/SR		1B.1
Delphinium variegatum ssp. kinkiense	San Clemente Island larkspur	FE/SE		1B.1
Delphinium variegatum ssp. thornei	Thorne's royal larkspur			1B.1
Dieteria asteroides var. lagunensis	Mount Laguna aster	SR		2B.1
Dithyrea maritima	beach spectaclepod	ST		1B.1
Dodecahema leptoceras	slender-horned spineflower	FE/SE		1B.1
Downingia concolor var. brevior	Cuyamaca Lake downingia	SE		1B.1
Draba asterophora var. macrocarpa	Cup Lake draba			1B.1
Drymocallis cuneifolia var. cuneifolia	wedgeleaf woodbeauty			1B.1
Dudleya abramsii ssp. setchellii	Santa Clara Valley dudleya	FE		1B.1
Dudleya blochmaniae ssp. blochmaniae	Blochman's dudleya			1B.1
Dudleya blochmaniae ssp. insularis	Santa Rosa Island dudleya			1B.1
Dudleya brevifolia	short-leaved dudleya	SE		1B.1
Dudleya cymosa ssp. agourensis	Agoura Hills dudleya	FT		1B.2
Dudleya cymosa ssp. marcescens	marcescent dudleya	FT/SR		1B.2
Dudleya cymosa ssp. ovatifolia	Santa Monica dudleya	FT		1B.1
Dudleya densiflora	San Gabriel Mountains dudleya			1B.1
Dudleya gnoma	munchkin dudleya			1B.1
Dudleya nesiotica	Santa Cruz Island dudleya	FT/SR		1B.1
Dudleya parva	Conejo dudleya	FT		1B.2
Dudleya stolonifera	Laguna Beach dudleya	FT/ST		1B.1
Dudleya traskiae	Santa Barbara Island dudleya	FE/SE		1B.2
Dudleya verityi	Verity's dudleya	FT		1B.1
Echinocereus engelmannii var. howei	Howe's hedgehog cactus			1B.1
Enceliopsis nudicaulis var. corrugata	Ash Meadows daisy	FT		3.3
Eremalche kernensis	Kern mallow	FE		1B.1
Eremogone ursina	Big Bear Valley sandwort	FT		1B.2
Eriastrum brandegeeae	Brandegee's eriastrum			1B.1

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Scientific Name	Common Name	Legal Status	Conservation Concern	Rare Plant Rank
Eriastrum densifolium ssp. sanctorum	Santa Ana River woollystar	FE/SE		1B.1
Eriastrum ertterae	Lime Ridge eriastrum			1B.1
Eriastrum rosamondense	Rosamond eriastrum			1B.1
Eriastrum tracyi	Tracy's eriastrum	SR		3.2
Ericameria fasciculata	Eastwood's goldenbush			1B.1
Ericameria palmeri var. palmeri	Palmer's goldenbush			1B.1
Erigeron calvus	bald daisy			1B.1
Erigeron parishii	Parish's daisy	FT		1B.1
Eriodictyon altissimum	Indian Knob mountainbalm	FE/SE		1B.1
Eriodictyon capitatum	Lompoc yerba santa	FE		1B.2
Eriogonum alexanderae	Alexander's buckwheat			1B.1
Eriogonum alpinum	Trinity buckwheat	SE		1B.2
Eriogonum apricum var. apricum	Ione buckwheat	FE/SE		1B.1
Eriogonum apricum var. prostratum	Irish Hill buckwheat	FE/SE		1B.1
Eriogonum butterworthianum	Butterworth's buckwheat	SR		1B.3
Eriogonum callistum	Tehachapi buckwheat			1B.1
Eriogonum crocatum	conejo buckwheat	SR		1B.2
Eriogonum evanidum	vanishing wild buckwheat			1B.1
Eriogonum giganteum var. compactum	Santa Barbara Island buckwheat	SR		1B.3
Eriogonum grande var. timorum	San Nicolas Island buckwheat	SE		1B.1
Eriogonum kelloggii	Kellogg's buckwheat	FC/SE		1B.2
Eriogonum kennedyi var. austromontanum	southern mountain buckwheat	FT		1B.2
Eriogonum kennedyi var. pinicola	Kern buckwheat			1B.1
Eriogonum microthecum var. lacus-ursi	Bear Lake buckwheat			1B.1
Eriogonum nudum var. decurrens	Ben Lomond buckwheat			1B.1
Eriogonum nudum var. psychicola	Antioch Dunes buckwheat			1B.1
Eriogonum ovalifolium var. vineum	Cushenbury buckwheat	FE		1B.1
Eriogonum thornei	Thorne's buckwheat	SE		1B.2
Eriogonum truncatum	Mt. Diablo buckwheat			1B.1
Eriogonum twisselmannii	Twisselmann's buckwheat	SR		1B.2
Eriogonum umbellatum var. lautum	Scott Valley buckwheat			1B.1
Eriophyllum congdonii	Congdon's woolly sunflower	SR		1B.2
Eriophyllum lanatum var. hallii	Fort Tejon woolly sunflower			1B.1
Eriophyllum latilobum	San Mateo woolly sunflower	FE/SE		1B.1
Eryngium aristulatum var. hooveri	Hoover's button-celery			1B.1

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Eryngium aristulatum var. parishii	San Diego button-celery	FE/SE		1B.1
Eryngium constancei	Loch Lomond button-celery	FE/SE		1B.1
Eryngium pendletonense	Pendleton button-celery			1B.1
Eryngium racemosum	Delta button-celery	SE		1B.1
Erysimum capitatum var. angustatum	Contra Costa wallflower	FE/SE		1B.1
Erysimum menziesii	Menzies' wallflower	FE/SE		1B.1
Erysimum teretifolium	Santa Cruz wallflower	FE/SE		1B.1
Erythranthe carsonensis	Carson Valley monkeyflower			1B.1
Erythranthe hardhamiae	Santa Lucia monkeyflower			1B.1
Erythranthe rhodopetra	Red Rock Canyon monkeyflower			1B.1
Erythranthe taylorii	Shasta limestone monkeyflower			1B.1
Eschscholzia lemmonii ssp. kernensis	Tejon poppy			1B.1
Eschscholzia rhombipetala	diamond-petaled California poppy			1B.1
Euphorbia jaegeri	Orocopia Mountains spurge			1B.1
Fremontodendron decumbens	Pine Hill flannelbush	FE		1B.2
Fremontodendron mexicanum	Mexican flannelbush	FE/SR		1B.1
Fritillaria biflora var. ineziana	Hillsborough chocolate lily			1B.1
Fritillaria gentneri	Gentner's fritillary	FE		1B.1
Fritillaria lanceolata var. tristulis	Marin checker lily			1B.1
Fritillaria roderickii	Roderick's fritillary	SE		1B.1
Fritillaria striata	striped adobe-lily	ST		1B.1
Galium angustifolium ssp. borregoense	Borrego bedstraw	SR		1B.3
Galium buxifolium	box bedstraw	FE		1B.2
Galium californicum ssp. sierrae	El Dorado bedstraw	FE		1B.2
Galium catalinense ssp. acrispum	San Clemente Island bedstraw	SE		1B.2
Geothallus tuberosus	Campbell's liverwort			1B.1
Gilia capitata ssp. chamissonis	blue coast gilia			1B.1
Gilia capitata ssp. tomentosa	woolly-headed gilia			1B.1
Gilia tenuiflora ssp. arenaria	Monterey gilia	FE		1B.2
Gilia tenuiflora ssp. hoffmannii	Hoffmann's slender-flowered gilia	FE		1B.1
Gratiola heterosepala	Boggs Lake hedge-hyssop	SE		1B.2
Grimmia vaginulata	vaginulate grimmia			1B.1
Grindelia fraxinipratensis	Ash Meadows gumplant	FT		1B.2
Harmonia doris-nilesiae	Niles' harmonia			1B.1
Harmonia guggolziorum	Guggolz's harmonia			1B.1
Hazardia orcuttii	Orcutt's hazardia	ST		1B.1

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Helianthus inexpectatus	Newhall sunflower			1B.1
Helianthus niveus ssp. tephrodes	Algodones Dunes sunflower	SE		1B.2
Hesperocyparis abramsiana var. abramsiana	Santa Cruz cypress	FE/SE		1B.2
Hesperocyparis abramsiana var. butanoensis	Butano Ridge cypress	FE/SE		1B.2
Hesperocyparis forbesii	Tecate cypress			1B.1
Hesperocyparis goveniana	Gowen cypress	FT		1B.2
Hesperocyparis stephensonii	Cuyamaca cypress			1B.1
Hesperolinon congestum	Marin western flax	FT/ST		1B.1
Hesperolinon didymocarpum	Lake County western flax	SE		1B.2
Heterotheca sessiliflora ssp. sessiliflora	beach goldenaster			1B.1
Hoita strobilina	Loma Prieta hoita			1B.1
Holmgrenanthe petrophila	rock lady	SR		1B.2
Holocarpha macradenia	Santa Cruz tarplant	FT/SE		1B.1
Horkelia cuneata var. puberula	mesa horkelia			1B.1
Horkelia cuneata var. sericea	Kellogg’s horkelia			1B.1
Horkelia daucifolia var. indicta	Jepson’s horkelia			1B.1
Horkelia hendersonii	Henderson’s horkelia			1B.1
Horkelia wilderae	Barton Flats horkelia			1B.1
Hosackia crassifolia var. otayensis	Otay Mountain lotus			1B.1
Howellia aquatilis	water howellia	FT		2B.2
Isocoma arguta	Carquinez goldenbush			1B.1
Ivesia aperta var. canina	Dog Valley ivesia			1B.1
Ivesia callida	Tahquitz ivesia	SR		1B.3
Ivesia webberi	Webber’s ivesia	FT		1B.1
Juglans hindsii	Northern California black walnut			1B.1
Juncus digitatus	finger rush			1B.1
Juncus leiospermus var. leiospermus	Red Bluff dwarf rush			1B.1
Lagophylla dichotoma	forked hare-leaf			1B.1
Lasthenia burkei	Burke’s goldfields	FE/SE		1B.1
Lasthenia conjugens	Contra Costa goldfields	FE		1B.1
Lasthenia glabrata ssp. coulteri	Coulter’s goldfields			1B.1
Lathyrus biflorus	two-flowered pea			1B.1
Lavatera assurgentiflora ssp. assurgentiflora	island mallow			1B.1
Lavatera assurgentiflora ssp. glabra	southern island mallow			1B.1
Layia carnosa	beach layia	FE/SE		1B.1

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Layia discoidea	rayless layia			1B.1
Layia heterotricha	pale-yellow layia			1B.1
Layia leucopappa	Comanche Point layia			1B.1
Legenere limosa	legenere			1B.1
Leptosiphon croceus	coast yellow leptosiphon			1B.1
Leptosiphon rosaceus	rose leptosiphon			1B.1
Lessingia germanorum	San Francisco lessingia	FE/SE		1B.1
Lewisia congdonii	Congdon's lewisia	SR		1B.3
Lewisia serrata	saw-toothed lewisia			1B.1
Lilaeopsis masonii	Mason's lilaeopsis	SR		1B.1
Lilium maritimum	coast lily			1B.1
Lilium occidentale	western lily	FE/SE		1B.1
Lilium pardalinum ssp. pitkinense	Pitkin Marsh lily	FE/SE		1B.1
Limnanthes alba ssp. parishii	Parish's meadowfoam	SE		1B.2
Limnanthes bakeri	Baker's meadowfoam	SR		1B.1
Limnanthes douglasii ssp. ornduffii	Ornduff's meadowfoam			1B.1
Limnanthes douglasii ssp. sulphurea	Point Reyes meadowfoam	SE		1B.2
Limnanthes floccosa ssp. californica	Butte County meadowfoam	FE/SE		1B.1
Limnanthes vinculans	Sebastopol meadowfoam	FE/SE		1B.1
Lithophragma maximum	San Clemente Island woodland star	FE/SE		1B.1
Lomatium stebbinsii	Stebbins' lomatium			1B.1
Lupinus citrinus var. deflexus	Mariposa lupine	ST		1B.2
Lupinus milo-bakeri	Milo Baker's lupine	ST		1B.1
Lupinus nipomensis	Nipomo Mesa lupine	FE/SE		1B.1
Lupinus padre-crowleyi	Father Crowley's lupine	SR		1B.2
Lupinus tidestromii	Tidestrom's lupine	FE/SE		1B.1
Lycium brevipes var. hassei	Santa Catalina Island desert-thorn			1B.1
Macrocystis sp.	giant kelp			X
Madia radiata	showy golden madia			1B.1
Malacothamnus abbottii	Abbott's bush-mallow			1B.1
Malacothamnus clementinus	San Clemente Island bush-mallow	FE/SE		1B.1
Malacothamnus fasciculatus var. nesioticus	Santa Cruz Island bush-mallow	FE/SE		1B.1
Malacothrix indecora	Santa Cruz Island malacothrix	FE		1B.1
Malacothrix junakii	Junak's malcothrix			1B.1
Malacothrix squalida	island malacothrix	FE		1B.1
Meconella oregana	Oregon meconella			1B.1

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Mimulus fremontii var. vandenbergensis	Vandenberg monkeyflower	PFE		1B.1
Monardella australis ssp. jokerstii	Jokerst's monardella			1B.1
Monardella undulata ssp. arguelloensis	Point Arguello monardella			1B.1
Monardella venosa	veiny monardella			1B.1
Monardella viminea	willowy monardella	FE/SE		1B.1
Monolopia congdonii	San Joaquin woollythreads	FE		1B.2
Nasturtium gambelii	Gambel's water cress	FE/ST		1B.1
Navarretia fossalis	spreading navarretia	FT		1B.1
Navarretia gowenii	Lime Ridge navarretia			1B.1
Navarretia leucocephala ssp. bakeri	Baker's navarretia			1B.1
Navarretia leucocephala ssp. pauciflora	few-flowered navarretia	FE/ST		1B.1
Navarretia leucocephala ssp. plieantha	many-flowered navarretia	FE/SE		1B.2
Navarretia myersii ssp. deminuta	small pincushion navarretia			1B.1
Navarretia myersii ssp. myersii	pincushion navarretia			1B.1
Navarretia ojaiensis	Ojai navarretia			1B.1
Navarretia prostrata	prostrate vernal pool navarretia			1B.1
Navarretia setiloba	Piute Mountains navarretia			1B.1
Nemacladus twisselmannii	Twisselmann's nemacladus	SR		1B.2
Neostapfia colusana	Colusa grass	FT/SE		1B.1
Nitrophila mohavensis	Amargosa nitrophila	FE/SE		1B.1
Noccaea fendleri ssp. californica	Kneeland Prairie pennycress	FE		1B.1
Nolina interrata	Dehesa nolina	SE		1B.1
Oenothera californica ssp. eurekensis	Eureka Dunes evening-primrose	FE		1B.2
Oenothera deltoides ssp. howellii	Antioch Dunes evening-primrose	FE/SE		1B.1
Oenothera wolfii	Wolf's evening-primrose			1B.1
Opuntia basilaris var. treleasei	Bakersfield cactus	FE/SE		1B.1
Orcuttia californica	California Orcutt grass	FE/SE		1B.1
Orcuttia inaequalis	San Joaquin Valley Orcutt grass	FT/SE		1B.1
Orcuttia pilosa	hairy Orcutt grass	FE/SE		1B.1
Orcuttia tenuis	slender Orcutt grass	FT/SE		1B.1
Orcuttia viscida	Sacramento Orcutt grass	FE/SE		1B.1
Ornithostaphylos oppositifolia	Baja California birdbush	SE		2B.1
Orthocarpus pachystachyus	Shasta orthocarpus			1B.1
Packera ganderi	Gander's ragwort	SR		1B.2
Packera layneae	Layne's ragwort	FT		1B.2

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Panicum acuminatum var. thermale	Geysers panicum	SE		1B.2
Paronychia ahartii	Ahart's paronychia			1B.1
Pedicularis dudleyi	Dudley's lousewort	SR		1B.2
Penstemon albomarginatus	white-margined beardtongue			1B.1
Penstemon bicolor ssp. roseus	rosy two-toned beardtongue			1B.1
Pentachaeta aurea ssp. allenii	Allen's pentachaeta			1B.1
Pentachaeta bellidiflora	white-rayed pentachaeta	FE/SE		1B.1
Pentachaeta lyonii	Lyon's pentachaeta	FE/SE		1B.1
Phacelia argentea	sand dune phacelia			1B.1
Phacelia cookei	Cooke's phacelia			1B.1
Phacelia insularis var. insularis	northern Channel Islands phacelia	FE		1B.2
Phacelia monoensis	Mono County phacelia			1B.1
Phacelia parishii	Parish's phacelia			1B.1
Phacelia stellaris	Brand's star phacelia			1B.1
Phlox hirsuta	Yreka phlox	FE/SE		1B.2
Physaria kingii ssp. bernardina	San Bernardino Mountains bladderpod	FE		1B.1
Phyllospadix sp.	surfgrass		NT	
Pinus radiata	Monterey pine			1B.1
Piperia elegans ssp. decurtata	Point Reyes rein orchid			1B.1
Piperia yadonii	Yadon's rein orchid	FE		1B.1
Plagiobothrys diffusus	San Francisco popcornflower	SE		1B.1
Plagiobothrys hystriculus	bearded popcornflower			1B.1
Plagiobothrys parishii	Parish's popcornflower			1B.1
Plagiobothrys strictus	Calistoga popcornflower	FE		1B.1
Pleuropogon hooverianus	North Coast semaphore grass	ST		1B.1
Poa atropurpurea	San Bernardino blue grass	FE		1B.2
Poa napensis	Napa blue grass	FE/SE		1B.1
Pogogyne abramsii	San Diego mesa mint	FE/SE		1B.1
Pogogyne clareana	Santa Lucia mint	SE		1B.2
Pogogyne nudiuscula	Otay Mesa mint	FE/SE		1B.1
Polygonum hickmanii	Scotts Valley polygonum	FE/SE		1B.1
Polygonum polygaloides ssp. esotericum	Modoc County knotweed			1B.1
Postelsia sp.	sea palm		NT	
Potentilla hickmanii	Hickman's cinquefoil	FE/SE		1B.1
Pseudobahia bahiifolia	Hartweg's golden sunburst	FE/SE		1B.1
Pseudobahia peirsonii	San Joaquin adobe sunburst	FT/SE		1B.1

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Puccinellia howellii	Howell's alkali grass			1B.1
Puccinellia parishii	Parish's alkali grass			1B.1
Quercus dumosa	Nuttall's scrub oak			1B.1
Rhynchospora californica	California beaked-rush			1B.1
Rorippa subumbellata	Tahoe yellow cress	FC/SE		1B.1
Rosa minutifolia	small-leaved rose	SE		2B.1
Sanicula maritima	adobe sanicle	SR		1B.1
Sanicula saxatilis	rock sanicle	SR		1B.2
Sedella leiocarpa	Lake County stonecrop	FE/SE		1B.1
Sedum laxum ssp. eastwoodiae	Red Mountain stonecrop	FC		1B.2
Sedum oblanceolatum	Applegate stonecrop			1B.1
Sibara filifolia	Santa Cruz Island winged-rockcress	FE		1B.1
Sidalcea covillei	Owens Valley checkerbloom	SE		1B.1
Sidalcea hickmanii ssp. anomala	Cuesta Pass checkerbloom	SR		1B.2
Sidalcea hickmanii ssp. napensis	Napa checkerbloom			1B.1
Sidalcea hickmanii ssp. parishii	Parish's checkerbloom	SR		1B.2
Sidalcea keckii	Keck's checkerbloom	FE		1B.1
Sidalcea oregana ssp. valida	Kenwood Marsh checkerbloom	FE/SE		1B.1
Sidalcea pedata	bird-foot checkerbloom	FE/SE		1B.1
Sidalcea stipularis	Scadden Flat checkerbloom	SE		1B.1
Silene campanulata ssp. campanulata	Red Mountain catchfly	SE		4.2
Sisyrinchium hitchcockii	Hitchcock's blue-eyed grass			1B.1
Solanum wallacei	Wallace's nightshade			1B.1
Sphaerocarpos drewei	bottle liverwort			1B.1
Streptanthus albidus ssp. albidus	Metcalf Canyon jewelflower	FE		1B.1
Streptanthus glandulosus ssp. niger	Tiburon jewelflower	FE/SE		1B.1
Stylocline citroleum	oil neststraw			1B.1
Stylocline masonii	Mason's neststraw			1B.1
Suaeda californica	California seablite	FE		1B.1
Sulcaria isidiifera	splitting yarn lichen			1B.1
Swallenia alexandrae	Eureka Valley dune grass	FE		1B.2
Taraxacum californicum	California dandelion	FE		1B.1
Thelypodium stenopetalum	slender-petaled thelypodium	FE/SE		1B.1
Thermopsis macrophylla	Santa Ynez false lupine	SR		1B.3
Thysanocarpus conchuliferus	Santa Cruz Island fringepod	FE		1B.2

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Table C-7 Plant Species of Greatest Conservation Need

Scientific Name	Common Name	Legal Status	Conservation Concern	Rare Plant Rank
Trichostema austromontanum ssp. compactum	Hidden Lake bluecurls	FT		1B.1
Trifolium amoenum	showy rancheria clover	FE		1B.1
Trifolium buckwestiorum	Santa Cruz clover			1B.1
Trifolium polyodon	Pacific Grove clover	SR		1B.1
Trifolium siskyouense	Siskiyou clover			1B.1
Trifolium trichocalyx	Monterey clover	FE/SE		1B.1
Tropidocarpum californicum	Kings gold			1B.1
Tropidocarpum capparideum	caper-fruited tropidocarpum			1B.1
Tuctoria greenei	Greene's tuctoria	FE/SR		1B.1
Tuctoria mucronata	Crampton's tuctoria or Solano grass	FE/SE		1B.1
Verbena californica	Red Hills vervain	FT/ST		1B.1
Verbesina dissita	big-leaved crownbeard	FT/ST		1B.1
Zostera sp.	eelgrass		NT	

Legal Status
FE = Federally endangered
FT = Federally threatened
FC = Federal candidate for listing
SE = State endangered
ST = State threatened
SR = State Rare

Conservation Concern
NT = No take allowed by state and/or federal harvesting/fishing regulations

Rare Plant Rank
1A = Plants Presumed Extirpated in California and Either Rare or Extinct Elsewhere
1B = Plants Rare, Threatened, or Endangered in California and Elsewhere
2B = Plants Rare, Threatened, or Endangered in California, But More Common Elsewhere
3 = Plants About Which More Information is Needed - A Review List
Threat Ranks
0.1-Seriously threatened in California (over 80% of occurrences threatened/high degree and immediacy of threat)
0.2-Moderately threatened in California (20-80% occurrences threatened/moderate degree and immediacy of threat)
0.3-Not very threatened in California (less than 20% of occurrences threatened/low degree and immediacy of threat or no current threats known)

Species of Greatest Conservation Need by Macrogroup and Ecoregion

Table C-8 provides a summary of SGCN associated with each ecoregion and province in California. Tables C-9 through C-28 identify SGCN associated with individual Manual of California Vegetation (MCV) macrogroups, consistent with the U.S. National Vegetation Classification (USNVC) standard, for each ecoregion. The association was based on a crosswalk (Sawyer and Keeler-Wolf, in process) developed by CDFW between the MCV macrogroups using CALVEG system and the California Wildlife Habitats Relationship (CWHR) model (Mayer and Laudenslayer 1988).

The CALVEG (“Classification and Assessment with LANDSAT of Visible Ecological Groupings”) system was initiated in January 1978 by the Region 5 Ecology Group of the U.S. Forest Service. The CALVEG team’s mission was to classify California existing vegetation communities for use in statewide resource planning considerations. This was originally accomplished with the use of color infrared satellite imagery and field verification of types by current soil-vegetation mapping efforts as well as professional guidance through a network of contacts throughout the state. It is a hierarchical classification originally based on “formation” categories: forest, woodland, chaparral, shrubs, and herbaceous, in addition to non-vegetated units. They were originally identified by distinctions calculated among canopy reflectance values used in the LANDSAT satellite. Since then, the classification has been expanded from an initial 129 types occurring throughout the eight regions of the state to the current 213 occurring in nine regions, and image resolution has been enhanced. The data span a period from approximately 1990 to 2014. Typically the most current, detailed and consistent data were collected for various regions of the state. Decision rules were developed that controlled which layers were given priority in areas of overlap. Cross-walks were used to compile the various sources into the common classification scheme, the CWHR model.

Using the relationship between the MCV macrogroups and the CWHR, the following tables provide lists of SGCN associated with each ecoregion, grouped by province.

Table C-8 Species of Greatest Conservation Need by Province and Ecoregion

Common Name	North Coast and Klamath				Cascades and Modoc Plateau			Bay Delta and Central Coast		Central Valley and Sierra Nevada			South Coast		Desert					Marine
	Northern California Coast	Northern California Coast Ranges	Northern California Interior Coast Ranges	Klamath	Southern Cascades	Modoc Plateau	Northwest Basin and Range	Central California Coast	Central California Coast Ranges	Great Valley	Sierra Nevada Foothills	Sierra Nevada	Southern California Coast	Southern California Mountain and Valleys	Mono	Mojave Desert	Sonoran Desert	Colorado Desert	Southeastern Great Basin	Marine and Offshore Islands
agile (=Pacific) kangaroo rat								X	X	X	X	X	X	X						
Alameda Island mole								X												
Alameda song sparrow								X												
Alameda striped racer (whipsnake)								X	X											
alpine chipmunk												X								
Amargosa vole																X				
American badger	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
American pika					X	X	X					X			X				X	
American white pelican					X	X	X			X		X				X	X	X		
Arizona Bell's vireo																X	X	X		
Arizona myotis																X	X	X		
arroyo toad									X				X	X						
ashy storm-petrel	X							X					X							X
Baja California coachwhip													X	X						
Bakersfield legless lizard									X	X										
bald eagle	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
bank swallow	X		X	X	X	X	X	X	X	X	X	X	X		X					
Barrow's goldeneye					X							X								
Belding's savannah sparrow								X					X							
Bendire's thrasher																X				
Berkeley kangaroo rat								X	X											
big free-tailed bat								X					X	X		X	X	X		
bighorn sheep					X	X	X					X		X	X	X	X	X	X	
black oystercatcher	X							X					X							X
black skimmer								X		X			X					X		
black storm-petrel													X							X
black swift				X	X			X			X	X		X						
black tern					X	X	X			X		X								
black toad															X				X	
black turnstone	X							X					X							X
Blainville's horned lizard								X	X	X	X	X	X	X		X				
blue whale																				X
blunt-nosed leopard lizard									X	X										
Brandt's cormorant	X							X					X							X
brant	X							X					X							X
brown-crested flycatcher												X		X		X	X	X		
Bryant's savannah sparrow	X							X												

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Common Name	North Coast and Klamath				Cascades and Modoc Plateau			Bay Delta and Central Coast		Central Valley and Sierra Nevada			South Coast		Desert					Marine
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Buena Vista Lake shrew										X										
burrowing owl	X	X	X		X	X	X	X	X	X			X	X	X	X	X	X	X	
California black rail	X							X		X	X		X				X	X		
California brown pelican	X							X					X					X		X
California condor								X	X		X	X	X	X		X				
California giant salamander	X	X						X												
California glossy snake									X	X			X	X						
California leaf-nosed bat													X	X		X	X	X		
California least tern								X		X			X					X		
California legless lizard								X	X	X	X	X	X	X						
California newt (Monterey County and South)								X	X				X	X						
California red-legged frog	X	X	X					X	X	X	X	X	X	X						
California red-sided gartersnake (Ventura County and South)													X	X						
California Ridgway's rail								X		X										
California spotted owl					X			X	X		X	X	X	X						
California tiger salamander	X		X					X	X	X	X		X							
California wolverine			X	X		X	X					X							X	
Cascades frog				X	X															
Cassin's auklet	X							X					X							X
Catalina California quail													X							X
Catalina Hutton's vireo													X							X
cave myotis																X	X	X		
Channel Island song sparrow													X							X
Channel Islands spotted skunk													X							X
Clark's marsh wren													X	X						
Coachella Valley fringe-toed lizard																		X		
coast patch-nosed snake								X	X				X	X						
coastal cactus wren (San Diego and Orange Counties)													X	X						
coastal California gnatcatcher													X	X						
coastal tailed frog	X	X		X	X															
Colorado Desert fringe-toed lizard																	X	X		
Columbian sharp-tailed grouse					X	X	X													
common loon					X															
common murre	X							X					X							X
Cope's leopard lizard														X						

Table C-8 Species of Greatest Conservation Need by Province and Ecoregion

Common Name	North Coast and Klamath				Cascades and Modoc Plateau			Bay Delta and Central Coast		Central Valley and Sierra Nevada			South Coast		Desert					Marine
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Couch's spadefoot																X	X	X		
Craveri's murrelet								X					X							X
Crissal thrasher																X	X	X		
desert bighorn sheep															X	X	X	X		
desert slender salamander														X						
Dulzura kangaroo rat											X		X	X						
Dunn's salamander	X			X																
Earthquake Merriam's kangaroo rat														X						
elegant tern													X							X
elf owl																X	X			
fin whale																				X
fisher - West Coast DPS	X	X		X	X	X						X								
flat-tailed horned lizard																		X		
foothill yellow-legged frog	X	X	X	X	X			X	X		X	X	X	X						
forest sharp-tailed snake	X	X		X				X												
fork-tailed storm-petrel	X																			X
Fresno kangaroo rat										X	X									
fringed myotis	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	
fulvous whistling-duck										X			X	X				X		
giant gartersnake										X										
giant kangaroo rat									X	X										
Gila monster																X	X			
gila woodpecker																X	X	X		
gilded flicker																X	X			
grasshopper sparrow	X	X	X	X	X			X	X	X	X		X	X						
gray vireo														X		X		X	X	
gray wolf			X	X	X	X	X					X		X		X			X	
Gray-crowned Rosy-Finch					X							X			X					
great gray owl					X						X	X								
greater sage-grouse						X	X								X					
greater sandhill crane					X	X	X			X		X			X			X		
green sea turtle	X							X					X							X
grizzly bear	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Guadalupe fur-seal													X							X
Guadalupe murrelet	X							X					X							X
gull-billed tern													X					X		
harlequin duck					X							X								

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Heermann's kangaroo rat								X	X	X	X		X	X						
Humboldt mountain beaver	X																			
humpback whale																				X
Inyo California towhee																X			X	
Inyo long-tailed weasel																			X	
Inyo Mountains salamander																			X	
island night lizard													X							
Jacumba pocket mouse														X						
jaguar														X		X	X			
Kern Canyon slender salamander											X	X								
Kern red-winged blackbird											X	X								
killer whale (southern resident DPS)																				X
large-billed savannah sparrow								X					X					X		
Le Conte's thrasher (San Joaquin population)									X	X										
least Bell's vireo									X	X	X		X	X		X				
least bittern	X	X		X	X	X	X	X		X		X	X	X	X	X	X	X	X	
leatherback sea turtle	X							X					X							X
lesser long-nosed bat													X	X						
lesser sandhill crane									X	X								X		
lesser slender salamander								X	X											
Light-footed Ridgway's rail													X							
limestone salamander											X	X								
lodgepole chipmunk					X	X	X					X		X						
loggerhead sea turtle (North Pacific)	X							X					X							X
loggerhead shrike	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Lompoc kangaroo rat								X					X							
long-eared myotis	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X			X	
long-eared owl	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
long-legged myotis	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	
Los Angeles pocket mouse																X				
lowland leopard frog																	X	X		
Lucy's warbler																X	X	X	X	
marbled murrelet	X	X		X				X					X							X
marsh vole								X												
Marysville California kangaroo rat										X										
Merced kangaroo rat										X										

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Mexican long-tongued bat													X	X			X	X		
Mohave Desert tortoise														X		X	X	X	X	
Mohave fringe-toed lizard																X	X			
Mohave ground squirrel																X			X	
Mohave river vole																X				
Monterey shrew, Salinas ornate shrew								X												
Monterey vagrant shrew								X												
Monterey vole								X												
Morro Bay kangaroo rat								X												
Mount Lyell salamander												X								
Mount Pinos lodgepole chipmunk														X						
Mount Pinos sooty grouse											X	X		X						
mountain plover	X							X	X	X			X	X		X	X	X		
narrow-faced kangaroo rat								X	X											
Nelson’s antelope squirrel									X	X										
North Pacific right whale																				X
northern goshawk	X	X	X	X	X	X						X		X	X				X	
northern harrier	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X			X	
northern leopard frog						X	X					x			X					
northern red-legged frog	X			X																
northern spotted owl	X	X		X	X															
northern western pond turtle	X	X	X	X	X	X				X	X	X								
olive ridley sea turtle	X							X					X							X
olive-sided flycatcher	X	X		X	X	X		X	X			X	X	X	X					
orange-throated whiptail													X	X						
Oregon snowshoe hare				X	X	X	X													
Oregon spotted frog						X	X													
Oregon vesper sparrow			X						X	X	X		X	X						
Pacific marten	X	X	X	X	X	X	X				X	X			X					
Pacific pocket mouse													X							
pallid bat	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Palm Springs pocket mouse														X			X	X		
Palm Springs round-tailed ground squirrel														X				X		
Palo Verde Mountains ringtail																	X	X		
Panamint alligator lizard															X				X	
pelagic cormorant	X							X					X							X

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	Northern California Coast	Northern California Coast Ranges	Northern California Interior Coast Ranges	Klamath	Southern Cascades	Modoc Plateau	Northwest Basin and Range	Central California Coast	Central California Coast Ranges	Great Valley	Sierra Nevada Foothills	Sierra Nevada	Southern California Coast	Southern California Mountain and Valleys	Mono	Mojave Desert	Sonoran Desert	Colorado Desert	Southeastern Great Basin	Marine and Offshore Islands
Peninsular bighorn sheep DPS														X			X			
pigeon guillemot	X							X					X							X
pigmy rabbit																			X	
Piute ground squirrel							X												X	
Point Arena mountain beaver	X																			
Point Reyes jumping mouse	X																			
Point Reyes mountain beaver	X																			
porcupine	X	X	X	X	X	X	X	X	X	X	X	X		X	X					
pronghorn		X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	
purple martin	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
pygmy rabbit						X	X								X					
red diamond rattlesnake													X	X				X		
red knot	X							X		X			X					X		
red-bellied newt	X	X																		
redhead					X	X	X			X		X	X	X	X	X		X		
regal ring-necked snake																X			X	
relictual slender salmander											X	X								
rhinoceros auklet	X							X					X							X
riparian (=San Joaquin Valley) woodrat										X										
riparian brush rabbit										X										
royal tern								X					X							X
ruddy turnstone	X							X					X					X		X
Sacramento Valley red fox										X										
Salinas harvest mouse								X												
Salinas kangaroo rat								X	X											
salt marsh wandering shrew								X												
saltmarsh common yellowthroat/San Francisco common yellowthroat	X							X												
salt-marsh harvest mouse	X							X		X										
San Bernardino flying squirrel														X						
San Bernardino golden-mantled ground squirrel														X						
San Bernardino kangaroo rat														X						
San Bernardino Mountains long-tailed vole														X						
San Clemente Bell's sparrow													X							X
San Clemente Bewick's wren													X							X

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Common Name	North Coast and Klamath				Cascades and Modoc Plateau			Bay Delta and Central Coast		Central Valley and Sierra Nevada			South Coast		Desert					Marine
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San Clemente Island fox													X							
San Clemente loggerhead shrike													X							X
San Clemente spotted towhee													X							X
San Diegan tiger whiptail													X	X						
San Diego banded gecko													X	X						
San Francisco gartersnake								X												
San Jacinto kit fox													X							
San Joaquin coachwhip									X	X										
San Joaquin kangaroo rat									X	X										
San Joaquin kit fox								X	X	X	X									
San Joaquin long-tailed weasel										X	X									
San Joaquin pocket mouse								X	X	X	X	X		X		X				
San Miguel Island fox													X							
San Nicolas Island fox													X							
San Pablo (= Samuels) song sparrow	X																			
San Pablo vole								X												
San Simeon slender salamander								X												
sanderling	X							X					X					X		X
sandstone night lizard																		X		
Santa Catalina Island fox													X							
Santa Catalina Island shrew													X							
Santa Cruz black salamander								X												
Santa Cruz Island fox													X							
Santa Cruz Island rufous-crowned sparrow													X							X
Santa Cruz long-toed salamander								X												
Santa Lucia Mountains slender salamander								X	X											
Santa Rosa Island fox													X							
Scott Bar salamander				X																
Scott's Oriole									X			X		X	X	X		X	X	
Scripps's murrelet	X							X					X							X
sei whale																				X
Shasta salamander				X																
short-eared owl	X				X	X	X	X	X	X		X	X		X	X				
short-tailed albatross																				X
Sierra Nevada bighorn sheep												X				X			X	
Sierra Nevada mountain beaver				X								X			X					

Table C-8 Species of Greatest Conservation Need by Province and Ecoregion

Common Name	North Coast and Klamath				Cascades and Modoc Plateau			Bay Delta and Central Coast		Central Valley and Sierra Nevada			South Coast		Desert					Marine
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Sierra Nevada red fox					X							X								
Sierra Nevada snowshoe hare												X								
Sierra Nevada yellow-legged frog												X			X					
Sierra night lizard										X	X									
Siskiyou Mountains salamander				X																
snowy plover (interior population)						X	X		X	X				X	X	X		X	X	
song sparrow (“Modesto” population)										X										
Sonoma tree vole	X	X																		
Sonora beaver																X	X	X		
Sonora mud turtle																X	X	X		
Sonoran Desert toad																X	X	X		
Sonoran pronghorn																	X			
southern California legless lizard												X	X	X				X		
southern California ringtail													X	X						
southern California salt marsh shrew													X							
southern grasshopper mouse				X					X			X	X	X	X	X	X		X	
southern long-toed salamander				X	X	X						X								
southern marsh harvest mouse													X							
southern mountain yellow-legged frog											X	X		X						
southern rubber boa											X	X		X						
southern sea otter																				X
southern Sierra legless lizard												X								
southern torrent salamander	X	X		X																
southern western pond turtle								X	X				X	X		X				
southwestern river otter																X	X	X		
southwestern willow flycatcher											X	X	X	X	X	X	X			
sperm whale																				X
steller (=northern) sea-lion	X							X					X							X
Stephens’ California vole													X							
Stephens’ kangaroo rat													X	X						
Suisun shrew								X		X										
Suisun song sparrow								X		X										
summer tanager											X			X		X	X	X	X	
surfbird	X							X					X							X
Swainson’s hawk					X	X	X	X		X	X				X	X			X	
Switak’s banded gecko														X						

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Tehachapi pocket mouse											X	X		X		X				
Tehachapi slender salamander											X	X								
Temblor legless lizard									X	X										
Tipton kangaroo rat										X										
Townsend’s big-eared bat	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
tricolored blackbird	X	X	X		X	X	X	X	X	X	X		X	X		X				
tufted puffin	X							X					X							X
Tulare grasshopper mouse									X	X										
tule elk		X	X					X	X											
tule greater white-fronted goose	X	X	X					X		X										
two-striped gartersnake								X	X		X		X	X						
Valle de la Trinidad kangaroo rat																		X		
Vaux’s swift	X	X		X	X	X		X				X								
vermilion flycatcher									X			X	X	X		X	X	X		
wandering tattler	X							X					X							X
western snowy plover (coastal population)	X							X					X							X
western spadefoot			X					X	X	X	X		X	X						
western yellow-billed cuckoo	X							X		X	X	X		X	X	X	X	X		
white-eared pocket mouse											X	X		X						
willow flycatcher				X	X					X	X	X	X	X	X	X	X			
wood stork													X	X		X	X	X		
yellow rail	X				X	X	X	X					X		X					
yellow warbler	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
yellow-breasted chat	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	
yellow-eared pocket mouse												X				X				
yellow-headed blackbird		X			X	X	X	X		X			X	X	X	X	X	X	X	
Yosemite toad												X								
Yuma Ridgway’s rail																X	X	X		
Yuma ringtail																	X	X		
Total (Conservation Target)	79	39	31	43	55	46	42	111	64	75	58	76	128	96	44	72	55	68	40	50

North Coast and Klamath Province

Table C-9 Northern California Coast Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																Total (SGCN)
		California Annual and Perennial Grassland	California Chaparral	California Coastal Scrub	California Forest and Woodland	Californian–Vancouverian Montane and Foothill Forest	Introduced North American Mediterranean Woodland and Forest	North American Pacific Coastal Salt Marsh	Vancouverian Coastal Dune and Bluff	Vancouverian Lowland Grassland and Shrubland	Vancouverian Rainforest	Vancouverian Flooded and Swamp Forest	Warm Southwest Riparian Forest	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Aquatic Vegetation	Western North American Freshwater Marsh	Western North American Temperate Grassland and Meadow	
American badger	*Taxidea taxus*		X		X	X				X							X	5
Bald eagle	*Haliaeetus leucocephalus*					X												1
Bank swallow	*Riparia riparia*	X		X		X			X	X		X	X		X	X	X	10
Black oystercatcher	*Haematopus bachmani*								X									1
Black turnstone	*Arenaria melanocephala*								X									1
Brandt's cormorant	*Phalacrocorax penicillatus*								X									1
Brant	*Branta bernicla*	X						X		X							X	4
Bryant's savannah sparrow	*Passerculus sandwichensis alaudinus*	X		X	X			X	X	X				X			X	8
Burrowing owl	*Athene cunicularia*	X							X	X							X	4
California black rail	*Laterallus jamaicensis coturniculus*							X							X	X		3
California brown pelican	*Pelecanus occidentalis californicus*								X									1
California giant salamander	*Dicamptodon ensatus*					X					X	X	X					4
California red-legged frog	*Rana draytonii*			X	X							X			X	X		5
California tiger salamander	*Ambystoma californiense*	X			X													2
Coastal tailed frog	*Ascaphus truei*					X					X	X	X					4
Dunn's salamander	*Plethodon dunni*				X	X						X	X					4
Fisher - West Coast DPS	*Pekania (=martes) pennanti*				X	X					X	X	X					5
Foothill yellow-legged frog	*Rana boylii*				X	X						X	X					4
Forest sharp-tailed snake	*Contia longicauda*				X	X						X	X	X				5
Fringed myotis	*Myotis thysanodes*				X							X						2
Grasshopper sparrow	*Ammodramus savannarum*									X							X	2
Grizzly bear	*Ursus arctos*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	16
Humboldt mountain beaver	*Aplodontia rufa humboldtiana*				X	X					X	X	X	X				6
Least bittern	*Ixobrychus exilis*							X							X	X		3
Loggerhead shrike	*Lanius ludovicianus*				X					X							X	3
Long-eared myotis	*Myotis volans*				X	X					X	X	X					5

Table C-9 Northern California Coast Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																Total (SGCN)
		California Annual and Perennial Grassland	California Chaparral	California Coastal Scrub	California Forest and Woodland	Californian–Vancouverian Montane and Foothill Forest	Introduced North American Mediterranean Woodland and Forest	North American Pacific Coastal Salt Marsh	Vancouverian Coastal Dune and Bluff	Vancouverian Lowland Grassland and Shrubland	Vancouverian Rainforest	Vancouverian Flooded and Swamp Forest	Warm Southwest Riparian Forest	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Aquatic Vegetation	Western North American Freshwater Marsh	Western North American Temperate Grassland and Meadow	
Long-eared owl	*Asio otus*		X		X	X				X		X	X	X			X	8
Long-legged myotis	*Myotis volans*				X	X						X						3
Marbled murrelet	*Brachyramphus marmoratus*					X					X							2
Mountain plover	*Charadrius montanus*									X							X	2
Northern goshawk	*Accipiter gentilis*				X	X					X	X	X					5
Northern harrier	*Circus cyaneus*							X		X				X	X	X	X	6
Northern red-legged frog	*Rana aurora*	X			X					X					X	X		5
Northern spotted owl	*Strix occidentalis caurina*					X					X	X	X					4
Northern western pond turtle	*Actinemys marmorata*				X							X			X	X		4
Olive-sided flycatcher	*Contopus cooperi*				X	X					X							3
Pacific marten	*Martes caurina (=americana)*				X	X					X	X	X	X				6
Pallid bat	*Antrozous pallidus*				X													1
Point Arena mountain beaver	*Aplodontia rufa nigra*				X	X					X	X	X	X				6
Point Reyes jumping mouse	*Zapus trinotatus orarius*				X	X					X	X		X				5
Point Reyes mountain beaver	*Aplodontia rufa phaea*				X	X					X	X	X	X				6
Porcupine	*Erethizon dorsatum*					X								X		X		3
Purple martin	*Progne subis*				X	X				X	X	X	X	X	X	X	X	10
Red knot	*Calidris canutus*							X	X									2
Red-bellied newt	*Taricha rivularis*				X	X					X	X	X					5
Rhinoceros auklet	*Cerorhinca monocerata*								X									1
Ruddy turnstone	*Arenaria interpres*							X	X									2
Saltmarsh common yellowthroat/San Francisco common yellowthroat	*Geothlypis trichas sinuosa*					X		X		X		X	X	X	X	X	X	9
Salt-marsh harvest mouse	*Reithrodontomys raviventris*							X						X				2
San Pablo (= samuels) song sparrow	*Melospiza melodia samuelis*													X				1
Sanderling	*Calidris alba*							X	X									2
Short-eared owl	*Asio flammeus*							X		X				X	X	X	X	6
Sonoma tree vole	*Arborimus pomo*					X					X							2
Southern torrent	*Rhyacotriton variegatus*				X	X					X	X	X					5

Table C-9 Northern California Coast Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																Total (SGCN)
		California Annual and Perennial Grassland	California Chaparral	California Coastal Scrub	California Forest and Woodland	Californian–Vancouverian Montane and Foothill Forest	Introduced North American Mediterranean Woodland and Forest	North American Pacific Coastal Salt Marsh	Vancouverian Coastal Dune and Bluff	Vancouverian Lowland Grassland and Shrubland	Vancouverian Rainforest	Vancouverian Flooded and Swamp Forest	Warm Southwest Riparian Forest	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Aquatic Vegetation	Western North American Freshwater Marsh	Western North American Temperate Grassland and Meadow	
salamander																		
Surfbird	*Calidris virgata*							X	X									2
Townsend's big-eared bat	*Corynorhinus townsendii*		X	X	X	X	X				X	X	X	X		X		10
Tricolored blackbird	*Agelaius tricolor*											X			X	X		3
Tule greater white-fronted goose	*Anser albifrons elgasi*	X								X				X		X	X	5
Vaux's swift	*Chaetura vauxi*					X					X							2
Wandering tattler	*Tringa incana*								X									1
Western snowy plover (coastal population)	*Charadrius nivosus*								X									1
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*				X								X					2
Yellow rail	*Coturnicops noveboracensis*													X				1
Yellow warbler	*Setophaga petechia*		X			X							X					3
Yellow-breasted chat	*Icteria virens*											X	X					2
	Total (Macrogroup)	8	5	5	29	31	2	13	15	16	20	28	24	19	12	15	15	

Table C-10 Northern California Coast Ranges Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																				Total (SGCN)
		California Annual and Perennial Grassland	California Chaparral	California Cliff, Scree, and Other Rock Vegetation	California Coastal Scrub	California Forest and Woodland	Californian–Vancouverian Montane and Foothill Forest	Cool Interior Chaparral	Inter-Mountain Dry Shrubland and Grassland	Temperate Pacific Intertidal Shore	Vancouverian Rainforest	Vancouverian Subalpine Forest	Vancouverian Flooded and Swamp Forest	Warm Southwest Riparian Forest	Western Cordilleran Montane Shrubland and Grassland	Western North America Dwarf Sage Shrubland and Steppe	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Aquatic Vegetation	Western North American Freshwater Marsh	Western North American Montane-Subalpine Wet Shrubland and Wet Meadow	Western North American Temperate Grassland and Meadow	
American badger	*Taxidea taxus*	X	X			X	X	X	X		X				X	X					X	10
Bald eagle	*Haliaeetus leucocephalus*										X											1
Burrowing owl	*Athene cunicularia*	X		X	X	X			X							X					X	7
California giant salamander	*Dicamptodon ensatus*					X	X				X		X	X								5
California red-legged frog	*Rana draytonii*					X												X	X			3
Coastal tailed frog	*Ascaphus truei*						X				X	X	X									4
Fisher - West Coast DPS	*Pekania (=martes) pennanti*					X	X				X	X	X	X								6
Foothill yellow-legged frog	*Rana boylii*					X							X	X								3
Forest sharp-tailed snake	*Contia longicauda*					X	X						X	X			X			X	X	7
Fringed myotis	*Myotis thysanodes*			X		X								X								3
Grasshopper sparrow	*Ammodramus savannarum*	X																			X	2
Grizzly bear	*Ursus arctos*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	20
Least bittern	*Ixobrychus exilis*			X						X								X	X			4
Loggerhead shrike	*Lanius ludovicianus*	X				X															X	3
Long-eared myotis	*Myotis evotis*					X	X						X	X						X		5
Long-eared owl	*Asio otus*	X	X			X		X	X				X	X	X		X			X	X	11
Long-legged myotis	*Myotis volans*					X	X				X		X	X								5
Marbled murrelet	*Brachyramphus marmoratus*						X				X											2
Northern goshawk	*Accipiter gentilis*					X	X				X	X	X	X								6
Northern harrier	*Circus cyaneus*	X								X							X	X	X	X	X	7
Northern spotted owl	*Strix occidentalis caurina*					X	X				X			X								4
Northern western pond turtle	*Actinemys marmorata*												X	X				X	X			4
Olive-sided flycatcher	*Contopus cooperi*					X	X				X											3
Pacific marten	*Martes caurina (=americana)*					X	X				X	X	X	X			X			X	X	9
Pallid bat	*Antrozous pallidus*	X		X		X																3
Porcupine	*Erethizon dorsatum*						X					X										2
Pronghorn	*Antilocapra americana*	X							X												X	3
Purple martin	*Progne subis*	X				X	X			X	X		X	X			X	X	X	X	X	12

Table C-10 Northern California Coast Ranges Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																				Total (SGCN)
		California Annual and Perennial Grassland	California Chaparral	California Cliff, Scree, and Other Rock Vegetation	California Coastal Scrub	California Forest and Woodland	Californian–Vancouverian Montane and Foothill Forest	Cool Interior Chaparral	Inter-Mountain Dry Shrubland and Grassland	Temperate Pacific Intertidal Shore	Vancouverian Rainforest	Vancouverian Subalpine Forest	Vancouverian Flooded and Swamp Forest	Warm Southwest Riparian Forest	Western Cordilleran Montane Shrubland and Grassland	Western North America Dwarf Sage Shrubland and Steppe	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Aquatic Vegetation	Western North American Freshwater Marsh	Western North American Montane-Subalpine Wet Shrubland and Wet Meadow	Western North American Temperate Grassland and Meadow	
Red-bellied newt	*Taricha rivularis*					X	X				X		X	X								5
Sonoma tree vole	*Arborimus pomo*						X				X											2
Southern torrent salamander	*Rhyacotriton variegatus*				X		X				X		X	X								5
Townsend's big-eared bat	*Corynorhinus townsendii*	X							X				X	X							X	5
Tricolored blackbird	*Agelaius tricolor*	X								X				X				X	X			5
Tule elk	*Cervus elaphus nannodes*		X		X		X															3
Vaux's swift	*Chaetura vauxi*						X				X											2
Yellow warbler	*Setophaga petechia*						X	X			X		X		X							5
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*									X								X		X	X	4
Yellow-breasted chat	*Icteria virens*												X	X								2
	Total (Macrogroup)	12	4	5	4	20	21	4	6	6	18	6	18	19	4	3	6	8	7	8	13	

Table C-11 Northern California Interior Coast Ranges Ecoregion

Common Name	Scientific Name	USNVC Macrogroup											Total (SGCN)
		California Annual and Perennial Grassland	California Chaparral	California Coastal Scrub	California Forest and Woodland	Californian–Vancouverian Montane and Foothill Forest	Vancouverian Flooded and Swamp Forest	Warm Southwest Riparian Forest	Western Cordilleran Montane Shrubland and Grassland	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Marsh	Western North American Temperate Grassland and Meadow	
American badger	*Taxidea taxus*	X	X		X				X			X	5
Bald eagle	*Haliaeetus leucocephalus*					X							1
Bank swallow	*Riparia riparia*			X			X	X			X	X	5
Burrowing owl	*Athene cunicularia*	X		X	X							X	4
California red-legged frog	*Rana draytonii*				X			X			X		3
California tiger salamander	*Ambystoma californiense*	X			X						X		3
California wolverine	*Gulo gulo*						X						1
Foothill yellow-legged frog	*Rana boylii*				X		X	X					3
Fringed myotis	*Myotis thysanodes*				X			X					2
Grasshopper sparrow	*Ammodramus savannarum*	X										X	2
Gray wolf	*Canis lupus*	X	X	X	X	X	X	X	X	X	X	X	11
Grizzly bear	*Ursus arctos*	X	X	X	X	X	X	X	X	X	X	X	11
Loggerhead shrike	*Lanius ludovicianus*	X			X							X	3
Long-eared myotis	*Myotis evotis*					X	X	X					3
Long-eared owl	*Asio otus*	X	X		X		X	X	X	X		X	8
Northern goshawk	*Accipiter gentilis*				X	X	X						3
Northern harrier	*Circus cyaneus*	X								X	X	X	4
Northern western pond turtle	*Actinemys marmorata*				X		X	X			X		4
Oregon vesper sparrow	*Pooecetes gramineus affines*	X										X	2
Pacific marten	*Martes caurina (=americana)*					X	X			X		X	4
Pallid bat	*Antrozous pallidus*	X			X								2
Porcupine	*Erethizon dorsatum*					X				X	X		3
Pronghorn	*Antilocapra americana*	X							X			X	3
Purple martin	*Progne subis*	X			X	X	X			X	X	X	7
Townsend's big-eared bat	*Corynorhinus townsendii*				X	X		X					3
Tricolored blackbird	*Agelaius tricolor*	X						X			X		3
Tule elk	*Cervus elaphus nannodes*	X	X	X	X		X	X				X	7
Tule greater white-fronted goose	*Anser albirfons elgasi*	X							X	X	X	X	5
Western spadefoot	*Spea hammondii*	X											1
Yellow warbler	*Setophaga petechia*				X		X	X	X				4
Yellow-breasted chat	*Icteria virens*							X					1
	Total (Macrogroup)	17	5	5	17	9	13	14	7	8	11	15	

Table C-12 Klamath Mountains Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																						Total (SGCN)
		California Annual and Perennial Grassland	California Cliff, Scree, and Other Rock Vegetation	California Coastal Scrub	Californian–Vancouverian Montane and Foothill Forest	Cool Interior Chaparral	Inter-Mountain Dry Shrubland and Grassland	North American Pacific Coastal Salt Marsh	Rocky Mountain Subalpine and High Montane Conifer Forest	Vancouverian Alpine Scrub, Forb Meadow, and Grassland	Vancouverian Flooded and Swamp Forest	Vancouverian Rainforest	Vancouverian Subalpine Forest	Warm Southwest Riparian Forest	Western Cordilleran Montane Shrubland and Grassland	Western North American Montane-Subalpine Wet Shrubland and Wet Meadow	Western North America Dwarf Sage Shrubland and Steppe	Western North America Tall Sage Shrubland and Steppe	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Aquatic Vegetation	Western North American Freshwater Marsh	Western North American Montane/Boreal Peatland	Western North American Temperate Grassland and Meadow	
American badger	*Taxidea taxus*	X			X	X	X					X			X		X	X	X				X	10
Bald eagle	*Haliaeetus leucocephalus*				X							X												2
Bank swallow	*Riparia riparia*	X	X	X			X				X			X						X	X	X	X	10
Black swift	*Cypseloides niger*		X		X	X					X	X		X	X									7
California wolverine	*Gulo gulo*								X	X			X											3
Cascades frog	*Rana cascadae*													X		X			X			X	X	5
Coastal tailed frog	*Ascaphus truei*				X				X		X		X	X										5
Dunn's salamander	*Plethodon dunni*								X		X	X												3
Fisher - West Coast DPS	*Pekania [=martes] pennanti*				X				X		X	X	X	X										6
Foothill yellow-legged frog	*Rana boylii*				X				X		X	X		X										5
Forest sharp-tailed snake	*Contia longicauda*				X						X					X			X			X		5
Fringed myotis	*Myotis thysanodes*		X																					1
Grasshopper sparrow	*Ammodramus savannarum*	X					X																X	3
Gray wolf	*Canis lupus*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	22
Grizzly bear	*Ursus arctos*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	22
Least bittern	*Ixobrychus exilis*							X													X	X		3
Long-eared myotis	*Myotis evotis*				X						X	X		X										4
Long-eared owl	*Asio otus*	X				X	X				X			X	X	X		X	X			X	X	11
Long-legged myotis	*Myotis volans*		X		X						X					X								4
Marbled murrelet	*Brachyramphus marmoratus*											X												1
Northern goshawk	*Accipiter gentilis*				X				X	X	X	X	X	X										7
Northern red-legged frog	*Rana aurora*				X									X						X	X			4
Northern spotted owl	*Strix occidentalis caurina*				X						X	X		X										4
Northern western pond turtle	*Actinemys marmorata*	X			X									X						X	X			5
Olive-sided	*Contopus cooperi*				X							X												2

Table C-12 Klamath Mountains Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																						Total (SGCN)
		California Annual and Perennial Grassland	California Cliff, Scree, and Other Rock Vegetation	California Coastal Scrub	Californian–Vancouverian Montane and Foothill Forest	Cool Interior Chaparral	Inter-Mountain Dry Shrubland and Grassland	North American Pacific Coastal Salt Marsh	Rocky Mountain Subalpine and High Montane Conifer Forest	Vancouverian Alpine Scrub, Forb Meadow, and Grassland	Vancouverian Flooded and Swamp Forest	Vancouverian Rainforest	Vancouverian Subalpine Forest	Warm Southwest Riparian Forest	Western Cordilleran Montane Shrubland and Grassland	Western North American Montane-Subalpine Wet Shrubland and Wet Meadow	Western North America Dwarf Sage Shrubland and Steppe	Western North America Tall Sage Shrubland and Steppe	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Aquatic Vegetation	Western North American Freshwater Marsh	Western North American Montane/Boreal Peatland	Western North American Temperate Grassland and Meadow	
flycatcher																								
Oregon snowshoe hare	*Lepus americanus klamathensis*										X	X		X										3
Pacific marten	*Martes caurina (=americana)*								X		X	X	X	X		X						X	X	8
Pallid bat	*Antrozous pallidus*	X	X																					2
Porcupine	*Erethizon dorsatum*				X				X												X	X		4
Pronghorn	*Antilocapra americana*	X					X																	2
Purple martin	*Progne subis*	X					X				X	X		X		X			X	X	X	X	X	11
Scott bar salamander	*Plethodon asupak*				X							X												2
Shasta salamander	*Hydromantes shastae*				X							X												2
Sierra Nevada mountain beaver	*Aplodontia rufa californica*				X				X		X	X	X			X			X			X		8
Siskiyou Mountains salamander	*Plethodon stormi*				X							X												2
Southern grasshopper mouse	*Onychomys torridus ramona*			X		X	X		X	X					X			X						7
Southern long-toed salamander	*Ambystoma macrodactylum sigillatum*				X									X		X			X		X			5
Southern torrent salamander	*Rhyacotriton variegatus*				X						X	X		X										4
Townsend's big-eared bat	*Corynorhinus townsendii*		X	X	X	X	X		X		X	X	X	X	X		X	X	X	X	X			16
Vaux's swift	*Chaetura vauxi*											X												1
Willow flycatcher	*Empidonax traillii*										X			X		X						X	X	5
Yellow warbler	*Setophaga petechia*					X					X	X		X	X									5
Yellow-breasted chat	*Icteria virens*										X			X										2
	Total (Macrogroup)	10	8	5	24	8	10	3	13	5	23	24	9	23	8	11	4	6	10	7	10	12	10	

Cascades and Modoc Plateau Province

Table C-13 Southern Cascades Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																						
		California Chaparral	California Coastal Scrub	California Forest and Woodland	Californian–Vancouverian Montane and Foothill Forest	Cool Interior Chaparral	Cool Semi-Desert Wash and Disturbance Scrub	Inter-Mountain Dry Shrubland and Grassland	Rocky Mountain Subalpine and High Montane Conifer Forest	Vancouverian Alpine Scrub, Forb Meadow, and Grassland	Vancouverian Flooded and Swamp Forest	Vancouverian Lowland Grassland and Shrubland	Vancouverian Subalpine Forest	Warm Southwest Riparian Forest	Western Cordilleran Montane Shrubland and Grassland	Western North America Dwarf Sage Shrubland and Steppe	Western North America Tall Sage Shrubland and Steppe	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Aquatic Vegetation	Western North American Freshwater Marsh	Western North American Montane/Boreal Peatland	Western North American Montane-Subalpine Wet Shrubland and Wet Meadow	Western North American Temperate Grassland and Meadow	Total (SGCN)
American badger	*Taxidea taxus*	X		X	X	X	X	X				X			X	X	X						X	11
American pika	*Ochotona princeps*													X								X		2
American white pelican	*Pelecanus erythrorhynchos*																		X	X				2
Bald eagle	*Haliaeetus leucocephalus*				X																			1
Bank swallow	*Riparia riparia*		X								X	X		X					X	X	X		X	8
Barrow's goldeneye	*Bucephala islandica*																		X	X				2
Bighorn sheep	*Ovis canadensis*	X	X			X	X	X		X	X	X			X	X	X	X				X	X	14
Black swift	*Cypseloides niger*			X	X	X					X		X		X									6
Black tern	*Chlidonias niger*																		X	X	X			3
Burrowing owl	*Athene cunicularia*		X	X			X	X				X				X	X						X	8
California spotted owl	*Strix occidentalis occidentalis*			X	X									X										3
Cascades frog	*Rana cascadae*										X							X			X	X	X	5
Coastal tailed frog	*Ascaphus truei*			X	X				X		X		X											5
Columbian sharp-tailed grouse	*Tympanuchus phasianellus columbianus*							X				X				X								3
Common loon	*Gavia immer*																		X	X				2
Fisher - West Coast DPS	*Pekania (=martes) pennanti*			X	X				X		X		X											5
Foothill yellow-legged frog	*Rana boylii*			X							X			X										3
Fringed myotis	*Myotis thysanodes*			X										X										2
Grasshopper sparrow	*Ammodramus savannarum*											X											X	2
Gray wolf	*Canis lupus*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	22
Gray-crowned	*Leucosticte tephrocotis*								X	X			X									X		4

Table C-13 Southern Cascades Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																						Total (SGCN)
		California Chaparral	California Coastal Scrub	California Forest and Woodland	Californian–Vancouverian Montane and Foothill Forest	Cool Interior Chaparral	Cool Semi-Desert Wash and Disturbance Scrub	Inter-Mountain Dry Shrubland and Grassland	Rocky Mountain Subalpine and High Montane Conifer Forest	Vancouverian Alpine Scrub, Forb Meadow, and Grassland	Vancouverian Flooded and Swamp Forest	Vancouverian Lowland Grassland and Shrubland	Vancouverian Subalpine Forest	Warm Southwest Riparian Forest	Western Cordilleran Montane Shrubland and Grassland	Western North America Dwarf Sage Shrubland and Steppe	Western North America Tall Sage Shrubland and Steppe	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Aquatic Vegetation	Western North American Freshwater Marsh	Western North American Montane/Boreal Peatland	Western North American Montane-Subalpine Wet Shrubland and Wet Meadow	Western North American Temperate Grassland and Meadow	
rosy-finch																								
Great gray owl	*Strix nebulosa*			X	X			X				X		X								X		6
Greater sandhill crane	*Grus canadensis tabida*																		X	X	X			3
Grizzly bear	*Ursus arctos*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	22
Harlequin duck	*Histrionicus histrionicus*																			X	X			2
Least bittern	*Ixobrychus exilis*																		X	X	X			3
Lodgepole chipmunk	*Tamias speciosus speciosus*						X	X	X				X	X			X							6
Loggerhead shrike	*Lanius ludovicianus*			X								X											X	3
Long-eared myotis	*Myotis evotis*			X	X						X			X										4
Long-eared owl	*Asio otus*	X		X		X	X	X			X	X		X	X		X	X			X	X	X	14
Long-legged myotis	*Myotis volans*			X	X						X				X									4
Northern goshawk	*Accipiter gentilis*			X	X				X	X	X		X											6
Northern harrier	*Circus cyaneus*											X						X	X	X	X	X	X	7
Northern spotted owl	*Strix occidentalis caurina*				X						X											X		3
Northern western pond turtle	*Actinemys marmorata*			X							X			X					X	X				5
Olive-sided flycatcher	*Contopus cooperi*			X	X								X											3
Oregon snowshoe hare	*Lepus americanus klamathensis*										X											X		2
Pacific marten	*Martes caurina (=americana)*			X	X				X		X		X					X			X	X	X	9
Pallid bat	*Antrozous pallidus*			X																				1
Porcupine	*Erethizon dorsatum*				X				X				X					X		X		X		6
Pronghorn	*Antilocapra americana*							X				X			X	X	X	X					X	7
Purple martin	*Progne subis*			X	X						X	X						X	X	X	X	X	X	10

Table C-13 Southern Cascades Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																						Total (SGCN)
		California Chaparral	California Coastal Scrub	California Forest and Woodland	Californian–Vancouverian Montane and Foothill Forest	Cool Interior Chaparral	Cool Semi-Desert Wash and Disturbance Scrub	Inter-Mountain Dry Shrubland and Grassland	Rocky Mountain Subalpine and High Montane Conifer Forest	Vancouverian Alpine Scrub, Forb Meadow, and Grassland	Vancouverian Flooded and Swamp Forest	Vancouverian Lowland Grassland and Shrubland	Vancouverian Subalpine Forest	Warm Southwest Riparian Forest	Western Cordilleran Montane Shrubland and Grassland	Western North America Dwarf Sage Shrubland and Steppe	Western North America Tall Sage Shrubland and Steppe	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Aquatic Vegetation	Western North American Freshwater Marsh	Western North American Montane/Boreal Peatland	Western North American Montane-Subalpine Wet Shrubland and Wet Meadow	Western North American Temperate Grassland and Meadow	
Redhead	*Aythya americana*																		X	X	X			3
Short-eared owl	*Asio flammeus*							X				X						X	X	X			X	6
Sierra Nevada red fox	*Vulpes vulpes necator*								X	X	X							X			X	X	X	7
Southern long-toed salamander	*Ambystoma macrodactylum sigillatum*				X													X			X	X		4
Swainson's hawk	*Buteo swainsoni*			X										X										2
Townsend's big-eared bat	*Corynorhinus townsendii*			X	X		X		X					X				X	X	X	X	X	X	11
Tricolored blackbird	*Agelaius tricolor*							X				X								X			X	4
Vaux's swift	*Chaetura vauxi*				X																			1
Willow flycatcher	*Empidonax traillii*										X			X				X			X	X	X	6
Yellow rail	*Coturnicops noveboracensis*																	X		X			X	3
Yellow warbler	*Setophaga petechia*			X	X	X					X			X	X									6
Yellow-breasted chat	*Icteria virens*													X										1
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*																	X	X	X	X	X	X	6
	Total (Macrogroup)	5	5	24	21	7	8	12	11	6	21	16	11	17	9	7	8	17	16	20	18	19	21	

Table C-14 Modoc Plateau Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																			Total (SGCN)
		California Annual and Perennial Grassland	California Forest and Woodland	Californian–Vancouverian Montane and Foothill Forest	Cool Interior Chaparral	Cool Semi-Desert Wash and Disturbance Scrub	Inter-Mountain Dry Shrubland and Grassland	Rocky Mountain Subalpine and High Montane Conifer Forest	Vancouverian Flooded and Swamp Forest	Vancouverian Subalpine Forest	Warm Southwest Riparian Forest	Western Cordilleran Montane Shrubland and Grassland	Western North America Dwarf Sage Shrubland and Steppe	Western North America Tall Sage Shrubland and Steppe	Western North America Vernal Pool	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Aquatic Vegetation	Western North American Freshwater Marsh	Western North American Montane-Subalpine Wet Shrubland and Wet Meadow	Western North American Temperate Grassland and Meadow	
American badger	*Taxidea taxus*	X	X	X	X	X	X					X	X	X	X					X	11
American pika	*Ochotona princeps*															X			X		2
American white pelican	*Pelecanus erythrorhynchos*																X	X			2
Bald eagle	*Haliaeetus leucocephalus*			X																	1
Bank swallow	*Riparia riparia*	X							X		X				X		X	X		X	7
Bighorn sheep	*Ovis canadensis*					X		X													2
Black tern	*Chlidonias niger*																X	X			2
Burrowing owl	*Athene cunicularia*	X	X			X	X						X	X	X					X	8
California wolverine	*Gulo gulo*							X		X											2
Columbian sharp-tailed grouse	*Tympanuchus phasianellus columbianus*	X					X					X	X								4
Fisher - West Coast DPS	*Pekania (=martes) pennanti*		X	X					X		X										4
Fringed myotis	*Myotis thysanodes*		X																		1
Gray wolf	*Canis lupus*	X	X	X	X	X	X	X	X	X	X	X	X	X		X		X	X	X	17
Greater sage-grouse	*Centrocercus urophsianus*					X	X							X	X	X			X	X	7
Greater sandhill crane	*Grus canadensis tabida*														X	X	X	X	X	X	6
Grizzly bear	*Ursus arctos*	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	18
Least bittern	*Ixobrychus exilis*																X	X			2
Lodgepole chipmunk	*Tamias speciosus*		X	X		X		X		X		X	X	X							9
Loggerhead shrike	*Lanius ludovicianus*	X	X												X					X	4
Long-eared myotis	*Myotis evotis*		X	X					X		X										4
Long-eared owl	*Asio otus*	X	X		X	X	X		X		X	X		X	X	X			X	X	13
Long-legged myotis	*Myotis volans*		X	X					X										X		4
Northern goshawk	*Accipiter gentilis*		X	X				X	X	X	X										6
Northern harrier	*Circus cyaneus*	X													X	X	X	X	X	X	7
Northern leopard frog	*Lithobates pipiens*																X	X	X		3
Northern western pond turtle	*Actinemys marmorata*		X						X								X	X			4
Olive-sided flycatcher	*Contopus cooperi*		X	X																	2

Table C-14 Modoc Plateau Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																			
		California Annual and Perennial Grassland	California Forest and Woodland	Californian–Vancouverian Montane and Foothill Forest	Cool Interior Chaparral	Cool Semi-Desert Wash and Disturbance Scrub	Inter-Mountain Dry Shrubland and Grassland	Rocky Mountain Subalpine and High Montane Conifer Forest	Vancouverian Flooded and Swamp Forest	Vancouverian Subalpine Forest	Warm Southwest Riparian Forest	Western Cordilleran Montane Shrubland and Grassland	Western North America Dwarf Sage Shrubland and Steppe	Western North America Tall Sage Shrubland and Steppe	Western North America Vernal Pool	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Aquatic Vegetation	Western North American Freshwater Marsh	Western North American Montane-Subalpine Wet Shrubland and Wet Meadow	Western North American Temperate Grassland and Meadow	Total (SGCN)
Oregon snowshoe hare	*Lepus americanus klamathensis*								X		X										2
Oregon spotted frog	*Rana pretiosa*																X	X	X		3
Pacific marten	*Martes caurina (=americana)*		X					X	X	X	X				X	X			X	X	9
Pallid bat	*Antrozous pallidus*	X													X						2
Porcupine	*Erethizon dorsatum*			X				X		X					X	X		X	X		7
Pronghorn	*Antilocapra americana*					X	X						X	X	X					X	6
Purple martin	*Progne subis*								X						X	X	X	X	X	X	7
Pygmy rabbit	*Brachylagus idahoensis*	X	X	X		X					X			X							6
Redhead	*Aythya americana*																X	X			2
Short-eared owl	*Asio flammeus*	X													X	X	X	X	X	X	7
Snowy plover (interior population)	*Chadarius nivosus*																	X			1
Southern long-toed salamander	*Ambystoma macrodactylum sigillatum*			X												X			X		3
Swainson's hawk	*Buteo swansoni*	X	X												X						3
Townsend's big-eared bat	*Corynorhinus townsendii*		X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	17
Tricolored blackbird	*Agelaius tricolor*	X													X		X	X			4
Vaux's swift	*Chaetura vauxi*			X																	1
Yellow rail	*Coturnicops noveboracensis*															X		X	X	X	4
Yellow warbler	*Setophaga petechia*		X	X	X				X	X		X									6
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*														X	X	X	X	X		5
	Total (Macrogroup)	14	19	16	6	11	9	9	14	9	11	8	8	10	18	15	15	20	18	16	

Table C-15 Northwest Basin and Range Ecoregion

Common Name	Scientific Name	USNVC Macrogroup Californian–Vancouverian Montane and Foothill Forest	Cool Interior Chaparral	Cool Semi-Desert Alkali-Saline Wetlands	Cool Semi-Desert Wash and Disturbance Scrub	Great Basin Saltbush Scrub	Inter-Mountain Dry Shrubland and Grassland	North American Pacific Coastal Salt Marsh	Rocky Mountain Subalpine and High Montane Conifer Forest	Warm Semi-Desert/Mediterranean Alkali-Saline Wetland	Warm Southwest Riparian Forest	Western Cordilleran Montane Shrubland and Grassland	Western North America Dwarf Sage Shrubland and Steppe	Western North America Tall Sage Shrubland and Steppe	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Marsh	Western North American Temperate Grassland and Meadow	Total (SGCN)
American badger	*Taxadea taxus*	X	X	X	X	X	X			X	X	X	X	X				11
American pika	*Ochotona princeps*								X						X			2
American white pelican	*Pelecanus erythrorhynchos*			X						X						X		3
Bald eagle	*Haliaeetus leucocephalus*	X																1
Bank swallow	*Riparia riparia*						X				X					X		3
Bighorn sheep	*Ovis canadensis*					X												1
Black tern	*Chlidonias niger*															X		1
Burrowing owl	*Athene cunicularia*			X	X	X	X			X	X	X	X	X				9
California wolverine	*Gulo gulo*								X									1
Columbian sharp-tailed grouse	*Tympanuchus phasianellus columbianus*						X					X	X				X	4
Fringed myotis	*Myothis thysanodes*	X	X		X	X	X		X		X	X	X	X	X	X	X	13
Gray wolf	*Canis lupus*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	16
Greater sage-grouse	*Centrocercus urophasianus*				X		X					X		X	X		X	6
Greater sandhill crane	*Grus canadensis tabida*											X			X	X	X	4
Grizzly bear	*Ursus arctos*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	16
Least bittern	*Ixobrychus exilis*							X								X		2
Lodgepole chipmunk	*Tamius speciosus*				X		X		X		X			X				5
Loggerhead shrike	*Lanius ludovicianus*						X				X							2
Long-eared myotis	*Myotis evotis*										X							1
Long-eared owl	*Asio otus*		X		X		X				X	X		X	X		X	8
Long-legged myotis	*Myotis volans*	X																1
Northern harrier	*Circus cyaneus*						X	X				X			X	X	X	6
Northern leopard frog	*Lithobates pipiens*														X	X	X	3
Oregon snowshoe hare	*Lepus americanus klamathensis*										X							1
Oregon spotted frog	*Rana pretiosa*														X	X	X	3
Pacific marten	*Martes caurina (=americana)*								X		X	X			X		X	5
Pallid bat	*Antrozous pallidus*						X											1
Piute ground squirrel	*Urocitellus mollis*					X	X					X	X	X				5
Porcupine	*Erethizon dorsatum*	X							X						X	X		4
Pronghorn	*Antilocapra americana*				X		X						X	X			X	5
Purple martin	*Progne subis*						X				X	X			X	X	X	6

Table C-15 Northwest Basin and Range Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																
		Californian–Vancouverian Montane and Foothill Forest	Cool Interior Chaparral	Cool Semi-Desert Alkali-Saline Wetlands	Cool Semi-Desert Wash and Disturbance Scrub	Great Basin Saltbush Scrub	Inter-Mountain Dry Shrubland and Grassland	North American Pacific Coastal Salt Marsh	Rocky Mountain Subalpine and High Montane Conifer Forest	Warm Semi-Desert/Mediterranean Alkali-Saline Wetland	Warm Southwest Riparian Forest	Western Cordilleran Montane Shrubland and Grassland	Western North America Dwarf Sage Shrubland and Steppe	Western North America Tall Sage Shrubland and Steppe	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Marsh	Western North American Temperate Grassland and Meadow	Total (SGCN)
Pygmy rabbit	*Brachylagus idahoensis*				X		X					X		X				4
Redhead	*Aythya americana*															X		1
Short-eared owl	*Asio flammeus*						X	X				X		X	X	X	X	7
Snowy plover (interior population)	*Charadrius nivosus*			X						X						X		3
Swainson’s hawk	*Buteo swansoni*						X											1
Townsend’s big-eared bat	*Corynorhinus townsendi*	X	X		X	X	X		X		X	X	X	X	X	X		12
Tricolored blackbird	*Agelaius tricolor*						X									X		2
Yellow rail	*Coturnicops noveboracensis*														X	X	X	3
Yellow warbler	*Setophaga petechia*		X								X							2
Yellow-breasted chat	*Icteria virens*										X							1
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*											X			X	X	X	4
	Total (Macrogroup)	8	7	6	11	8	21	5	9	6	16	17	9	13	17	20	16	

Bay Delta and Central Coast Province

Table C-16 Central California Coast Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																	Total (SGCN)
		California Annual and Perennial Grassland	California Chaparral	California Cliff, Scree, and Other Rock Vegetation	California Coastal Scrub	California Forest and Woodland	Californian–Vancouverian Montane and Foothill Forest	Introduced North American Mediterranean Woodland and Forest	North American Pacific Coastal Salt Marsh	Vancouverian Coastal Dune and Bluff	Vancouverian Lowland Grassland and Shrubland	Vancouverian Rainforest	Warm Semi-desert/Mediterranean Alkali-Saline Wetland	Warm Southwest Riparian Forest	Western North America Vernal Pool	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Marsh	Western North American Temperate Grassland and Meadow	
Agile (=pacific) kangaroo rat	*Dipodomys agilis*	X	X		X					X	X				X			X	7
Alameda island mole	*Scapanus latimanus parvus*	X				X					X			X					4
Alameda song sparrow	*Melospiza melodia pusillula*								X				X						2
Alameda striped racer (whipsnake)	*Coluber (=masticophis) lateralis euryxanthus*		X																1
American badger	*Taxidea taxus*	X	X			X	X						X		X			X	7
Bald eagle	*Haliaeetus leucocephalus*						X												1
Bank swallow	*Riparia riparia*	X		X	X	X				X	X			X	X		X	X	10
Belding's savannah sparrow	*Passerculus sandwichensis beldingi*	X			X	X			X	X	X				X	X		X	9
Berkeley kangaroo rat	*Dipodomys heermanni berkeleyensis*	X			X					X						X		X	5
Big free-tailed bat	*Nyctinomops macrotis*		X	X	X	X	X	X				X		X	X				9
Black oystercatcher	*Haematopus bachmani*			X															1
Black skimmer	*Rynchops niger*								X										1
Black swift	*Cypseloides niger*			X		X	X												3
Black turnstone	*Arenaria melanocephala*			X															1
Blainville's horned lizard	*Phrynosoma blainvillii*		X		X					X	X								4
Brandt's cormorant	*Phalacrocorax penicillatus*								X										1
Brant	*Branta bernicla*	X							X		X		X		X			X	6
Bryant's savannah sparrow	*Passerculus sandwichensis alaudinus*	X				X			X		X		X			X		X	7
Burrowing owl	*Athene cunicularia*	X		X						X	X							X	5
California black rail	*Laterallus jamaicensis coturnsis*								X				X		X		X		4
California brown pelican	*Pelecanus occidentalis californicus*								X										1
California condor	*Gymnogyps californianus*	X	X	X	X	X	X			X	X				X			X	10
California giant salamander	*Dicamptodon ensatus*					X	X					X		X					4
California least tern	*Sternula antillarum browni*								X										1

Table C-16 Central California Coast Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																	Total (SGCN)
		California Annual and Perennial Grassland	California Chaparral	California Cliff, Scree, and Other Rock Vegetation	California Coastal Scrub	California Forest and Woodland	Californian–Vancouverian Montane and Foothill Forest	Introduced North American Mediterranean Woodland and Forest	North American Pacific Coastal Salt Marsh	Vancouverian Coastal Dune and Bluff	Vancouverian Lowland Grassland and Shrubland	Vancouverian Rainforest	Warm Semi-desert/Mediterranean Alkali-Saline Wetland	Warm Southwest Riparian Forest	Western North America Vernal Pool	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Marsh	Western North American Temperate Grassland and Meadow	
California legless lizard	*Anniella pulchra*		X		X	X				X	X								5
California newt	*Taricha torosa*		X		X	X				X	X					X	X		7
California red-legged frog	*Rana draytonii*				X	X					X			X			X		5
California ridgway's rail	*Rallus obsoletus*								X				X				X		3
California spotted owl	*Strix occidentalis occidentalis*					X	X					X							3
California tiger salamander	*Ambystoma californiense*	X													X				2
Coast patch-nosed snake	*Salvadora hexalepis virgultea*		X		X					X	X								4
Foothill yellow-legged frog	*Rana boylii*					X								X					2
Forest sharp-tailed snake	*Contia longicauda*					X	X					X		X					4
Fringed myotis	*Myotis thysanodes*			X		X								X					3
Grasshopper sparrow	*Ammodramus savannarum*	X													X			X	3
Grizzly bear	*Ursus arctos*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	17
Heermann's kangaroo	*Dipodomys heermanni heermanni*		X													X			2
Large-billed savannah sparrow	*Passerculus sandwichensis rostratus*								X								X		2
Least bittern	*Ixobrychus exilis*								X								X		2
Lesser slender salamander	*Batrachoseps minor*					X	X							X					3
Loggerhead shrike	*Lanius ludovicianus*	X				X									X			X	4
Lompoc kangaroo rat	*Dipodomys heermanni arenae*		X													X			2
Long-eared myotis	*Myotis evotis*					X	X							X					3
Long-eared owl	*Asio otus*	X	X			X								X	X	X		X	7
Long-legged myotis	*Myotis volans*			X		X	X												3
Marbled murrelet	*Brachyramphus marmoratus*											X							1
Marsh vole	*Microtus californicus paludicola*	X									X					X		X	4
Monterey shrew, salinas ornate shrew	*Sorex ornatus salarius*													X					1
Monterey vagrant shrew	*Sorex vagrans paludivagus*	X				X			X		X		X	X		X		X	8
Monterey vole	*Microtus californicus halophilus*	X									X					X		X	4

Table C-16 Central California Coast Ecoregion

Common Name	Scientific Name	USNVC Macrogroup: California Annual and Perennial Grassland	California Chaparral	California Cliff, Scree, and Other Rock Vegetation	California Coastal Scrub	California Forest and Woodland	Californian–Vancouverian Montane and Foothill Forest	Introduced North American Mediterranean Woodland and Forest	North American Pacific Coastal Salt Marsh	Vancouverian Coastal Dune and Bluff	Vancouverian Lowland Grassland and Shrubland	Vancouverian Rainforest	Warm Semi-desert/Mediterranean Alkali-Saline Wetland	Warm Southwest Riparian Forest	Western North America Vernal Pool	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Marsh	Western North American Temperate Grassland and Meadow	Total (SGCN)
Morro bay kangaroo rat	*Dipodomys heermanni morroensis*		X													X			2
Mountain plover	*Charadrius montanus*	X		X											X			X	4
Narrow-faced kangaroo rat	*Dipodomys venustus*	X	X												X				3
Northern harrier	*Circus cyaneus*	X							X						X	X	X	X	6
Olive-sided flycatcher	*Contopus cooperi*					X	X					X							3
Pallid bat	*Antrozous pallidus*	X		X		X									X				4
Porcupine	*Erethizon dorsatum*														X		X		2
Pronghorn	*Antilocapra americana*	X																	1
Purple martin	*Progne subis*	X				X	X								X	X	X	X	7
Red knot	*Calidris canutus*								X										1
Royal tern	*Thalasseus maximus*								X										1
Ruddy turnstone	*Arenaria interpres*								X										1
Salinas harvest mouse	*Reithrodontomys megalotis distichlis*					X								X		X			3
Salinas kangaroo rat	*Dipodomys heermanni goldmani*		X													X			2
Saltmarsh common yellowthroat/San Francisco common yellowthroat	*Geothlypis trichas sinuosa*	X				X			X		X		X	X	X	X	X	X	10
Salt-marsh harvest mouse	*Reithrodontomys raviventris*								X										1
Salt-marsh wandering shrew	*Sorex vagrans halicoetes*								X										1
San Francisco garternsake	*Thamnophis sirtalis tetrataenia*	X				X										X	X		4
San Joaquin kit fox	*Vulpes macrotis mutica*	X											X		X			X	4
San Joaquin pocket mouse	*Perognathus inornatus*	X				X									X			X	4
San Pablo vole	*Microtus californicus sanpabloensis*	X									X					X		X	4
San Simeon slender salamander	*Batrachoseps incognitus*					X	X					X		X					4
Sanderling	*Calidris alba*								X										1
Santa Cruz black salamander	*Aneides flavipunctatus niger*	X				X	X					X		X					5

Table C-16 Central California Coast Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																	Total (SGCN)
		California Annual and Perennial Grassland	California Chaparral	California Cliff, Scree, and Other Rock Vegetation	California Coastal Scrub	California Forest and Woodland	Californian–Vancouverian Montane and Foothill Forest	Introduced North American Mediterranean Woodland and Forest	North American Pacific Coastal Salt Marsh	Vancouverian Coastal Dune and Bluff	Vancouverian Lowland Grassland and Shrubland	Vancouverian Rainforest	Warm Semi-desert/Mediterranean Alkali-Saline Wetland	Warm Southwest Riparian Forest	Western North America Vernal Pool	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Marsh	Western North American Temperate Grassland and Meadow	
Santa Cruz long-toed salamander	*Ambystoma macrodactylum croceum*					X	X							X			X		4
Santa Lucia mountains slender salamander	*Batrachoseps luciae*					X	X					X		X					4
Short-eared owl	*Asio flammeus*	X							X						X	X	X	X	6
Southern western pond turtle	*Actinemys pallida*					X								X			X		3
Suisun shrew	*Sorex ornatus sinuosus*													X					1
Suisun song sparrow	*Melospiza melodia maxillaris*								X					X		X	X		4
Surfbird	*Aphriza virgata*								X										1
Swainson's hawk	*Buteo swainsoni*	X		X		X								X	X				5
Townsend's big-eared bat	*Corynorhinus townsendii*		X		X	X	X	X			X	X		X	X	X	X		11
Tricolored blackbird	*Agelaius tricolor*	X												X	X		X		4
Tule elk	*Cervus elaphus nannodes*															X			1
Tule greater white-fronted goose	*Anser albifrons elgasi*	X									X				X		X	X	5
Two-striped gartersnake	*Thamnophis hammondii*				X	X								X		X	X		5
Vaux's swift	*Chaetura vauxi*						X					X							2
Western snowy plover (coastal population)	*Charadrius nivosus*								X	X									2
Western spadefoot	*Spea hammondii*	X													X				2
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*					X													1
Yellow rail	*Coturnicops novevoracensis*								X							X	X		3
Yellow warbler	*Setophaga petechia*					X								X					2
Yellow-breasted chat	*Icteria virens*													X					1
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*															X	X		2
	Total (Macrogroup)	35	17	13	14	40	20	3	27	12	21	12	10	29	28	26	23	25	

Table C-17 Central California Coast Ranges Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																	Total (SGCN)
		California Annual & Perennial Grassland	California Chaparral	California Cliff, Scree, and other Rock Vegetation	California Coastal Scrub	California Forest and Woodland	Cool Semi-Desert Wash and Disturbance Scrub	Great Basin Saltbush Scrub	North American Warm-Desert Xero-Riparian	Vancouverian Coastal Dune and Bluff	Vancouverian Flooded and Swamp Forest	Warm Interior Chaparral	Warm Semi-Desert/Mediterranean Alkali-Saline Wetland	Warm Southwest Riparian Forest	Western Cordilleran Montane Shrubland and Grassland	Western North America Tall Sage Shrubland and Steppe	Western North America Vernal Pool	Western North American Temperate Grassland and Meadow	
Agile (=pacific) kangaroo rat	*Dipodomys agilis*	X	X		X					X	X	X			X		X	X	9
Alameda striped racer (whipsnake)	*Coluber (=masticophis) lateralis euryxanthus*		X									X							2
American badger	*Taxidea taxus*	X	X			X	X	X	X			X			X	X	X		10
Arroyo toad	*Anayxrus californicus*		X						X					X					3
Bakersfield legless lizard	*Anniella grinnelli*						X	X				X							3
Bald eagle	*Haliaeetus leucocephalus*												X	X					2
Bank swallow	*Riparia riparia*	X		X	X					X	X			X			X	X	8
Berkeley kangaroo rat	*Dipodomys heermanni berkeleyensis*	X			X		X			X								X	5
Blainville's horned lizard	*Phrynosoma blainvillii*		X		X			X	X	X		X							6
Blunt-nosed leopard lizard	*Gambelia sila*	X						X	X										3
Burrowing owl	*Athene cunicularia*	X																	1
California condor	*Gymnogyps californianus*	X	X	X	X	X				X		X					X		8
California glossy snake	*Arizona elegans occidentalis*	X					X	X	X										4
California legless lizard	*Anniella pulchra*				X	X				X									3
California newt	*Taricha torosa*		X		X	X				X		X						X	6
California red-legged frog	*Rana draytonii*					X								X				X	3
California spotted owl	*Strix occidentalis occidentalis*					X								X					2
California tiger salamander	*Ambystoma californiense*	X				X											X		3
Coast patch-nosed snake	*Salvadora hexalepis virgultea*		X		X					X									3
Foothill yellow-legged frog	*Rana boylii*					X								X					2
Fringed myotis	*Myotis thysanodes*			X		X								X					3
Giant kangaroo rat	*Dipodomys ingens*	X															X		2
Grasshopper sparrow	*Ammodramus savannarum*	X															X		2
Grizzly bear	*Ursus arctos*		X			X				X	X			X	X			X	7
Heermann's kangaroo rat	*Dipodomys heermanni heermanni*		X									X							2
Le conte's thrasher	*Toxostoma lecontei*							X	X										2

Table C-17 Central California Coast Ranges Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																	Total (SGCN)
		California Annual & Perennial Grassland	California Chaparral	California Cliff, Scree, and other Rock Vegetation	California Coastal Scrub	California Forest and Woodland	Cool Semi-Desert Wash and Disturbance Scrub	Great Basin Saltbush Scrub	North American Warm-Desert Xero-Riparian	Vancouverian Coastal Dune and Bluff	Vancouverian Flooded and Swamp Forest	Warm Interior Chaparral	Warm Semi-Desert/Mediterranean Alkali-Saline Wetland	Warm Southwest Riparian Forest	Western Cordilleran Montane Shrubland and Grassland	Western North America Tall Sage Shrubland and Steppe	Western North America Vernal Pool	Western North American Temperate Grassland and Meadow	
Least bell's vireo	*Vireo bellii pusillus*								X					X					2
Lesser sandhill crane	*Grus canadensis canadensis*	X															X	X	3
Lesser slender salamander	*Batrachoseps minor*					X					X			X					3
Loggerhead shrike	*Lanius ludovicianus*	X				X											X		3
Long-eared myotis	*Myotis evotis*					X					X			X					3
Long-eared owl	*Asio otus*	X	X			X	X				X	X		X	X	X	X		10
Long-legged myotis	*Myotis volans*			X															1
Mountain plover	*Charadrius montanus*	X		X													X		3
Narrow-faced kangaroo rat	*Dipodomys venustus*	X	X									X			X		X		5
Nelson's antelope squirrel	*Ammospermophilus nelsoni*	X															X		2
Northern harrier	*Circus cyaneus*	X											X				X	X	4
Olive-sided flycatcher	*Contopus cooperi*					X													1
Oregon vesper sparrow	*Pooecetes gramineus affinis*	X					X									X	X		4
Pallid bat	*Antrozous pallidus*	X		X		X											X		4
Porcupine	*Erethizon dorsatum*					X					X								2
Pronghorn	*Antilocapra americana*	X														X		X	3
Purple martin	*Progne subis*	X				X					X						X	X	5
Salinas kangaroo rat	*Dipodomys heermanni goldmani*		X									X							2
San Joaquin coachwhip	*Coluber (= masticophis) flagellum ruddocki*	X					X	X							X				4
San Joaquin kangaroo rat	*Dipodomys nitratoides*																X	X	2
San Joaquin kit fox	*Vulpes macrotis mutica*	X															X	X	3
San Joaquin pocket mouse	*Perognathus inornatus*	X				X											X		3
Santa Lucia mountains slender salamander	*Batrachoseps luciae*					X					X			X					3
Scott's oriole	*Icterus parisorum*							X											1
Short-eared owl	*Asio flammeus*	X											X				X	X	4
Snowy plover (interior population)	*Charadrius nivosus*												X						1

Table C-17 Central California Coast Ranges Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																	Total (SGCN)
		California Annual & Perennial Grassland	California Chaparral	California Cliff, Scree, and other Rock Vegetation	California Coastal Scrub	California Forest and Woodland	Cool Semi-Desert Wash and Disturbance Scrub	Great Basin Saltbush Scrub	North American Warm-Desert Xero-Riparian	Vancouverian Coastal Dune and Bluff	Vancouverian Flooded and Swamp Forest	Warm Interior Chaparral	Warm Semi-Desert/Mediterranean Alkali-Saline Wetland	Warm Southwest Riparian Forest	Western Cordilleran Montane Shrubland and Grassland	Western North America Tall Sage Shrubland and Steppe	Western North America Vernal Pool	Western North American Temperate Grassland and Meadow	
Southern grasshopper mouse	*Onychomys torridus ramona*							X											1
Southern western pond turtle	*Actinemys pallida*					X								X				X	3
Temblor legless lizard	*Anniella alexanderae*						X	X											2
Townsend's big-eared bat	*Corynorhinus townsendii*				X						X								2
Tricolored blackbird	*Agelaius tricolor*	X												X			X	X	4
Tulare grasshopper mouse	*Onychomys torridus tularensis*							X											1
Tule elk	*Cervuselaphus nannodes*	X																X	2
Two-striped gartersnake	*Thamnophis hammondii*					X								X				X	3
Vermillion flycatcher	*Pyrocephalus rubinus*								X					X					2
Western spadefoot	*Spea hammondii*	X															X	X	3
Yellow warbler	*Setophaga petechia*					X					X			X	X				4
Yellow-breasted chat	*Icteria virens*													X					1
	Total (Macrogroup)	29	13	6	9	23	8	11	8	9	11	11	4	19	7	4	23	18	

Central Valley and Sierra Nevada Province

Table C-18 Great Valley Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																	Total (SGCN)
		California Annual and Perennial Grassland	California Coastal Scrub	California Forest and Woodland	Introduced North American Mediterranean Woodland and Forest	Mojavean–Sonoran Desert Scrub	North American Pacific Coastal Salt Marsh	North American Warm-Desert Xero-Riparian	Vancouverian Coastal Dune and Bluff	Vancouverian Flooded and Swamp Forest	Vancouverian Lowland Grassland and Shrubland	Warm Semi-Desert/Mediterranean Alkali-Saline Wetland	Warm Southwest Riparian Forest	Western North America Vernal Pool	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Aquatic Vegetation	Western North American Freshwater Marsh	Western North American Temperate Grassland and Meadow	
Agile (=Pacific) kangaroo rat	*Dipodomys agilis*	X	X						X		X							X	5
American badger	*Taxadea taxus*	X		X		X		X				X		X				X	7
American white pelican	*Pelicanus erythrorhynchos*											X				X	X		3
Bakersfield legless lizard	*Anniella grinnelli*		X			X													2
Bald eagle	*Haliaeetus leucocephalus*											X	X			X	X		4
Bank swallow	*Riparia riparia*												X						1
Black skimmer	*Rychops niger*											X				X			2
Black tern	*Chlidonias niger*															X	X		2
Blainville's horned lizard	*Phrynosoma blainvillii*		X			X		X	X										4
Blunt-nosed leopard lizard	*Gambelia sila*	X				X		X											3
Buena Vista lake shrew	*Sorex ornatus relictus*			X									X						2
Burrowing owl	*Athene cunicularia*	X				X			X		X							X	5
Californai legless lizard	*Anniella pulchra*		X	X		X		X			X								5
California black rail	*Laterallus jamaicensis coturnsis*						X									X	X		3
California glossy snake	*Arizona elegans occidentalis*					X													1
California least tern	*Sternula antillarum browni*											X				X	X		3
California red-legged frog	*Rana draytonii*			X												X	X		3
California ridgway's rail	*Rallus obsoletus obsoletus*						X									X	X		3
California tiger salamander	*Ambystoma californiense*	X		X										X					3
Fresno kangaroo rat	*Dipodomys nitratoides exilis*	X												X				X	3
Fulvous whistling-duck	*Dendrocygna bicolor*															X	X		2
Giant gartersnake	*Thamnophis gigas*										X		X			X	X		4
Giant kangaroo rat	*Dipodomys ingens*	X												X					2
Grasshopper sparrow	*Ammodramus savannarum*	X												X				X	3
Greater sandhill crane	*Grus canadensis tabida*														X	X	X	X	4
Grizzly bear	*Ursus arctos*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	17
Heermann's kangaroo rat	*Dipodomys heermanni*														X				1

Table C-18 Great Valley Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																	
		California Annual and Perennial Grassland	California Coastal Scrub	California Forest and Woodland	Introduced North American Mediterranean Woodland and Forest	Mojavean–Sonoran Desert Scrub	North American Pacific Coastal Salt Marsh	North American Warm-Desert Xero-Riparian	Vancouverian Coastal Dune and Bluff	Vancouverian Flooded and Swamp Forest	Vancouverian Lowland Grassland and Shrubland	Warm Semi-Desert/Mediterranean Alkali-Saline Wetland	Warm Southwest Riparian Forest	Western North America Vernal Pool	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Aquatic Vegetation	Western North American Freshwater Marsh	Western North American Temperate Grassland and Meadow	Total (SGCN)
	heermanni																		
Le Conte's thrasher (San Joaquin population)	*Toxostoma lecontei*					X		X				X							3
Least bell's vireo	*Vireo bellii pusillus*							X					X						2
Least bittern	*Ixobrychus exilis*						X									X	X		3
Lesser sandhill crane	*Grus canadensis canadensis*													X	X	X	X		4
Loggerhead shrike	*Lanius ludovicianus*	X		X										X				X	4
Long-eared owl	*Asio flammeus*	X		X						X	X		X	X	X			X	8
Marysville california kangaroo rat	*Dipodomys californicus eximius*	X												X				X	3
Merced kangaroo rat	*Dipodomys heermanni dixoni*	X												X	X			X	4
Mountain plover	*Charadrius montanus*	X												X				X	3
Nelson's antelope squirrel	*Ammospermophilus nelsoni*	X												X				X	3
Northern harrier	*Circus cyaneus*	X					X							X	X	X	X	X	7
Northern western pond turtle	*Actinemys marmorata*			X						X			X			X	X		5
Oregon vesper sparrow	*Pooecetes gramineus affines*	X									X							X	3
Pallid bat	*Antrozous pallidus*	X		X										X					3
Porcupine	*Erethizon dorsatum*													X	X		X		3
Pronghorn	*Antilocapra americana*	X									X			X				X	4
Purple martin	*Progne subis*	X		X										X	X	X	X	X	7
Red knot	*Calidris canutus*						X					X		X	X		X		5
Redhead	*Aythya americana*															X	X		2
Riparian (=San Joaquin valley) woodrat	*Neotoma fuscipes riparia*		X	X					X		X								4
Riparian brush rabbit	*Sylvilagus bachmani riparius*	X	X	X					X		X		X	X				X	8
Sacramento valley red fox	*Vulpes vulpes patwin*	X									X				X			X	4
Salt-marsh harvest mouse	*Reithrodontomys raviventris*						X												1
San Joaquin coachwhip	*Coluber (= masticophis) flagellum ruddocki*	X	X								X								3
San Joaquin kangaroo rat	*Dipodomys nitratoides*	X												X				X	3

Table C-18 Great Valley Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																	Total (SGCN)
		California Annual and Perennial Grassland	California Coastal Scrub	California Forest and Woodland	Introduced North American Mediterranean Woodland and Forest	Mojavean–Sonoran Desert Scrub	North American Pacific Coastal Salt Marsh	North American Warm-Desert Xero-Riparian	Vancouverian Coastal Dune and Bluff	Vancouverian Flooded and Swamp Forest	Vancouverian Lowland Grassland and Shrubland	Warm Semi-Desert/Mediterranean Alkali-Saline Wetland	Warm Southwest Riparian Forest	Western North America Vernal Pool	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Aquatic Vegetation	Western North American Freshwater Marsh	Western North American Temperate Grassland and Meadow	
San Joaquin kit fox	*Vulpes macrotis mutica*	X				X					X	X		X				X	6
San Joaquin long-tailed weasel	*Mustela frenata xanthogenys*	X	X	X					X		X		X		X				7
San Joaquin pocket mouse	*Perognathus inornatus*	X		X										X				X	4
Short-eared owl	*Asio otus*	X					X							X	X	X	X	X	7
Sierra night lizard	*Xantusia sierrae*	X		X		X													3
Snowy plover (interior population)	*Charadrius nivosus*											X					X		2
Song sparrow ("Modesto" population)	*Melospiza melodia maillardi*						X			X	X		X		X	X	X		7
Suisun shrew	*Sorex ornatus sinuosus*			X									X						2
Suisun song sparrow	*Melospiza melodia maxillarus*						X			X	X		X		X	X	X		7
Swainson's hawk	*Buteo swainsoni*	X		X						X	X		X	X					6
Temblor legless lizard	*Anniella alexanderae*		X			X													2
Tipton kangaroo rat	*Dipodomys nitratoides nitratoides*	X												X				X	3
Townsend's big-eared bat	*Corynorhinus townsendii*		X	X	X	X		X		X			X	X			X		9
Tricolored blackbird	*Agelaius tricolor*	X								X	X		X	X		X	X		7
Tulare grasshopper mouse	*Onychomys torridus tularensis*											X							1
Tule greater white-fronted goose	*Anser albirfons elgasi*	X									X			X	X		X	X	6
Western spadefoot	*Spea hammondii*	X												X					2
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*									X	X		X						3
Willow flycatcher	*Empidonax traillii*							X					X						2
Yellow warbler	*Setophaga petechia*			X						X	X		X						4
Yellow-breasted chat	*Icteria virens*									X	X		X						3
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*														X	X	X		3
	Total (Macrogroup)	34	11	20	2	13	10	9	7	11	22	11	20	30	17	23	27	25	

Table C-19 Sierra Nevada Foothills Ecoregion

Common Name	Scientific Name	USNVC Macrogroup															
		California Annual and Perennial Grassland	California Chaparral	California Coastal Scrub	California Forest and Woodland	Californian–Vancouverian Montane and Foothill Forest	Cool Interior Chaparral	Vancouverian Flooded and Swamp Forest	Vancouverian Lowland Grassland and Shrubland	Warm Interior Chaparral	Warm Southwest Riparian Forest	Western Cordilleran Montane Shrubland and Grassland	Western North America Vernal Pool	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Marsh	Western North American Temperate Grassland and Meadow	Total (SGCN)
Agile (=Pacific) kangaroo rat	*Dipodomys agilis*	X	X	X					X	X		X				X	7
American badger	*Taxidea taxus*	X	X		X	X	X		X	X		X	X			X	10
Bald eagle	*Haliaeetus leucocephalus*					X											1
Bank swallow	*Riparia riparia*	X		X				X	X		X		X		X	X	8
Black swift	*Cypseloides niger*				X	X	X	X				X					5
Blainville's horned lizard	*Phrynosoma blainvillii*		X	X					X	X		X					5
California black rail	*Laterallus jamaicensis coturniculus*													X	X		2
California condor	*Gymnogyps californianus*	X	X	X	X	X	X		X	X		X	X			X	11
California legless lizard	*Anniella pulchra*				X				X	X							3
California red-legged frog	*Rana draytonii*							X			X				X		3
California spotted owl	*Strix occidentalis occidentalis*				X	X		X									3
California tiger salamander	*Ambystoma californiense*	X			X								X				3
Dulzura kangaroo rat	*Dipodomys simulans*		X	X													2
Foothill yellow-legged frog	*Rana boylii*							X			X						2
Fresno kangaroo rat	*Dipodomys nitratoides exilis*	X											X				2
Fringed myotis	*Myotis thysanodes*				X						X						2
Grasshopper sparrow	*Ammodramus savannarum*	X							X				X			X	4
Great gray owl	*Strix nebulosa*													X		X	2
Grizzly bear	*Ursus arctos*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	15
Heermann's kangaroo rat	*Dipodomys heermanni heermanni*		X							X				X		X	4
Kern canyon slender salamander	*Batrachoseps simatus*				X			X			X						3
Kern red-winged blackbird	*Agelaius phoeniceus aciculatus*	X							X				X	X	X	X	6
Least bell's vireo	*Vireo bellii pusillus*							X			X						2
Limestone salamander	*Hydromantes brunus*		X					X		X	X						4
Loggerhead shrike	*Lanius ludovicianus*	X			X				X				X			X	5
Long-eared myotis	*Myotis evotis*				X	X		X			X						4
Long-eared owl	*Asio flammeus*	X	X		X		X	X	X	X	X	X	X	X		X	12
Long-legged myotis	*Myotis volans*				X			X									2
Mount Pinos sooty grouse	*Dendragapus fuliginosus howardi*					X											1
Northern harrier	*Circus cyaneus*	X							X				X	X	X	X	6

Table C-19 Sierra Nevada Foothills Ecoregion

Common Name	Scientific Name	USNVC Macrogroup															
		California Annual and Perennial Grassland	California Chaparral	California Coastal Scrub	California Forest and Woodland	Californian–Vancouverian Montane and Foothill Forest	Cool Interior Chaparral	Vancouverian Flooded and Swamp Forest	Vancouverian Lowland Grassland and Shrubland	Warm Interior Chaparral	Warm Southwest Riparian Forest	Western Cordilleran Montane Shrubland and Grassland	Western North America Vernal Pool	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Marsh	Western North American Temperate Grassland and Meadow	Total (SGCN)
Northern western pond turtle	*Actinemys marmorata*				X			X			X				X		4
Oregon vesper sparrow	*Pooecetes gramineus affinis*	X							X				X			X	4
Pacific marten	*Martes caurina (=americana)*				X	X		X						X		X	5
Pallid bat	*Antrozous pallidus*	X			X								X				3
Porcupine	*Erethizon dorsatum*	X				X							X	X			4
Pronghorn	*Antilocapra americana*	X															1
Purple martin	*Progne subis*	X			X	X		X	X				X	X	X	X	9
Relictual slender salamander	*Batrachoseps relictus*				X			X			X						3
San Joaquin kit fox	*Vulpes macrotis mutica*	X							X				X			X	4
San Joaquin long-tailed weasel	*Mustela frenata xanthogenys*	X	X		X	X		X	X	X	X		X	X		X	11
San Joaquin pocket mouse	*Perognathus inornatus*	X			X				X				X			X	5
Sierra night lizard	*Xantusia sierrae*	X			X								X			X	4
Southern mountain yellow-legged frog	*Rana muscosa*							X			X			X		X	4
Southern rubber boa	*Charina umbratica*				X	X											2
Southwestern willow flycatcher	*Empidonax traillii extimus*							X			X						2
Summer tanager	*Piranga rubra*							X			X						2
Swainson's hawk	*Buteo swainsoni*	X			X						X		X				4
Tehachapi pocket mouse	*Perognathus alticolus inexpectatus*	X											X			X	3
Tehachapi slender salamander	*Batrachoseps stebbinsi*				X			X			X						3
Townsend's big eared bat	*Corynorhinus townsendii*		X		X	X	X	X		X	X		X		X		9
Tricolored blackbird	*Agelaius tricolor*	X									X		X		X		4
Two-striped gartersnake	*Thamnophis hammondii*							X			X			X	X	X	5
Western spadefoot	*Spea hammondii*	X											X				2
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*										X						1
White-eared pocket mouse	*Perognathus alticolus alticolus*	X		X									X				3
Willow flycatcher	*Empidonax traillii*							X			X			X		X	4
Yellow warbler	*Setophaga petechia*				X	X	X	X			X	X					6
Yellow-breasted chat	*Icteria virens*										X						1
	Total (Macrogroup)	26	11	7	26	15	7	25	17	11	25	8	25	14	11	23	

Table C-20 Sierra Nevada Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																							Total (SGCN)
		California Coastal Scrub	Cool Interior Chaparral	Cool Semi-Desert Wash and Disturbance scrub	Great Basin Saltbush Scrub	Inter-Mountain Dry Shrubland and Grassland	Intermountain Singleleaf Pinyon–Western Juniper Woodland	Rocky Mountain Subalpine and High Montane Conifer Forest	Vancouverian Alpine Scrub, Forb Meadow, and Grassland	Rocky Mountain Alpine Scrub, Forb Meadow, and Grassland	Vancouverian Flooded and Swamp Forest	Vancouverian Lowland Grassland and Shrubland	Vancouverian Subalpine Forest	Warm Interior Chaparral	Warm Southwest Riparian Forest	Western Cordilleran Montane Shrubland and Grassland	Western North America Dwarf Sage Shrubland and Steppe	Western North America Tall Sage Shrubland and Steppe	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Aquatic Vegetation	Western North American Freshwater Marsh	Western North American Montane/Boreal Peatland	Western North American Montane-Subalpine Wet Shrubland and Wet Meadow	Western North American Temperate Grassland and Meadow	
Agile [=Pacific] kangaroo rat	*Dipodomys agilis*	X										X		X		X								X	5
Alpine chipmunk	*Neotamias (=tamius) alpinus*								X	X															2
American badger	*Taxidea taxus*		X	X	X	X	X					X		X		X	X	X						X	11
American pika	*Ochotona princeps*																		X			X	X		3
American white pelecan	*Pelecanus erythrorhynchos*																			X	X				2
Bald eagle	*Haliaeetos leucocephalus*														X					X	X				3
Bank swallow	*Riparia riparia*	X									X	X			X					X	X	X		X	8
Barrow's goldeneye	*Bucephala islandica*																			X	X				2
Bighorn sheep	*Ovis canadensis*				X																				1
Black swift	*Cypseloides niger*		X								X		X			X									4
Black tern	*Chlidonias niger*																			X	X	X			3
Blainville's horned lizard	*Phrynosoma blainvillii*	X			X									X			X	X							5
Brown-crested flycatcher	*Myiarchus tyrannulus*														X										1
California condor	*Gymnogyps californianus*	X	X									X	X	X		X								X	7
California legless lizard	*Anniella pulchra*							X				X		X											3
California red-legged frog	*Rana draytonii*										X				X					X	X				4
California spotted owl	*Strix occidentalis occidentalis*										X		X												2
California wolverine	*Gulo gulo*							X	X	X			X												4
Fisher - West Coast DPS	*Pekania (=martes) pennanti*							X			X		X												3
Foothill yellow-legged frog	*Rana boylii*										X				X										2
Fringed myotis	*Myotis thysanodes*						X								X										2
Gray wolf	*Canis lupus*	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X		X	X	X	X	21

Table C-20 Sierra Nevada Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																							Total (SGCN)
		California Coastal Scrub	Cool Interior Chaparral	Cool Semi-Desert Wash and Disturbance scrub	Great Basin Saltbush Scrub	Inter-Mountain Dry Shrubland and Grassland	Intermountain Singleleaf Pinyon–Western Juniper Woodland	Rocky Mountain Subalpine and High Montane Conifer Forest	Vancouverian Alpine Scrub, Forb Meadow, and Grassland	Rocky Mountain Alpine Scrub, Forb Meadow, and Grassland	Vancouverian Flooded and Swamp Forest	Vancouverian Lowland Grassland and Shrubland	Vancouverian Subalpine Forest	Warm Interior Chaparral	Warm Southwest Riparian Forest	Western Cordilleran Montane Shrubland and Grassland	Western North America Dwarf Sage Shrubland and Steppe	Western North America Tall Sage Shrubland and Steppe	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Aquatic Vegetation	Western North American Freshwater Marsh	Western North American Montane/Boreal Peatland	Western North American Montane-Subalpine Wet Shrubland and Wet Meadow	Western North American Temperate Grassland and Meadow	
Gray-crowned rosy-finch	*Leucosticte tephrocotis*								X	X									X			X	X		5
Great gray owl	*Strix nebulosa*												X						X			X	X	X	5
Greater sandhill crane	*Grus canadensis tabida*																		X	X	X	X	X	X	6
Grizzly bear	*Ursus arctos*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	23
Harlequin duck	*Histrionicus histrionicus*														X										1
Kern canyon slender salamander	*Batrachoseps simatus*										X				X								X		3
Kern red-wing blackbird	*Agelaus phoeniceus aciculatus*											X							X	X	X	X	X	X	7
Least bittern	*Ixobrychus exilis*																			X	X	X			3
Limestone salamander	*Hydromantes brunus*		X								X			X	X										4
Lodgepole chipmunk	*Tamias speciosus speciosus*			X		X		X					X		X			X							6
Loggerhead shrike	*Lanius ludovicianus*						X					X												X	3
Long-eared myotis	*Myotis evotis*						X				X														2
Long-eared owl	*Asio flammeus*		X	X		X					X	X		X	X	X		X	X			X	X	X	13
Long-legged myotis	*Myotis volans*						X				X												X		3
Mount lyell salamander	*Hydromantes platycephalus*							X					X										X	X	4
Mount Pinos sooty grouse	*Dendragapus fuliginosus howardi*												X												1
Northern goshawk	*Accipiter gentilis*							X	X	X	X		X												5
Northern harrier	*Circus cyaneus*											X							X	X	X	X	X	X	7
Northern leopard frog	*Lithobates pipiens*										X								X	X	X		X		5
Northern	*Actinemys*										X				X					X	X				4

Table C-20 Sierra Nevada Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																							
		California Coastal Scrub	Cool Interior Chaparral	Cool Semi-Desert Wash and Disturbance scrub	Great Basin Saltbush Scrub	Inter-Mountain Dry Shrubland and Grassland	Intermountain Singleleaf Pinyon–Western Juniper Woodland	Rocky Mountain Subalpine and High Montane Conifer Forest	Vancouverian Alpine Scrub, Forb Meadow, and Grassland	Rocky Mountain Alpine Scrub, Forb Meadow, and Grassland	Vancouverian Flooded and Swamp Forest	Vancouverian Lowland Grassland and Shrubland	Vancouverian Subalpine Forest	Warm Interior Chaparral	Warm Southwest Riparian Forest	Western Cordilleran Montane Shrubland and Grassland	Western North America Dwarf Sage Shrubland and Steppe	Western North America Tall Sage Shrubland and Steppe	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Aquatic Vegetation	Western North American Freshwater Marsh	Western North American Montane/Boreal Peatland	Western North American Montane-Subalpine Wet Shrubland and Wet Meadow	Western North American Temperate Grassland and Meadow	Total (SGCN)
western pond turtle	*marmorata*																								
Olive-sided flycatcher	*Contopus cooperi*												X												1
Pacific marten	*Martes caurina (=americana)*							X			X		X						X			X	X	X	7
Pallid bat	*Antrozous pallidus*																							X	1
Porcupine	*Erethizon dorsatum*							X		X			X						X		X	X	X		7
Purple martin	*Progne subis*										X	X							X	X	X	X	X	X	8
Redhead	*Aythya americana*																			X	X	X			3
Relictual slender salamander	*Batrachoseps relictus*										X				X										2
San Joaquin pocket mouse	*Perognathus inornatus*											X												X	2
Scott's oriole	*Icterus parisorum*						X																		1
Short-eared owl	*Asio otus*											X							X	X	X	X	X	X	7
Sierra Nevada bighorn sheep	*Ovis canadensis sierrae*				X																				1
Sierra Nevada mountain beaver	*Aplodontia rufa californica*							X			X		X						X			X	X		6
Sierra Nevada red fox	*Vulpes vulpes necator*								X	X	X								X			X	X	X	7
Sierra Nevada snowshoe hare	*Lepus americanus tahoensis*										X												X		2
Sierra Nevada yellow-legged frog	*Rana sierrae*										X				X				X				X	X	5
Southern California legless lizard	*Anniella stebbinsi*	X						X				X		X											4
Southern grasshopper mouse	*Onychomys torridus ramona*			X	X	X																			3
Southern long-toed salamander	*Ambystoma macrodactylum sigillatum*														X				X				X	X	4

Table C-20 Sierra Nevada Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																							Total (SGCN)
		California Coastal Scrub	Cool Interior Chaparral	Cool Semi-Desert Wash and Disturbance scrub	Great Basin Saltbush Scrub	Inter-Mountain Dry Shrubland and Grassland	Intermountain Singleleaf Pinyon–Western Juniper Woodland	Rocky Mountain Subalpine and High Montane Conifer Forest	Vancouverian Alpine Scrub, Forb Meadow, and Grassland	Rocky Mountain Alpine Scrub, Forb Meadow, and Grassland	Vancouverian Flooded and Swamp Forest	Vancouverian Lowland Grassland and Shrubland	Vancouverian Subalpine Forest	Warm Interior Chaparral	Warm Southwest Riparian Forest	Western Cordilleran Montane Shrubland and Grassland	Western North America Dwarf Sage Shrubland and Steppe	Western North America Tall Sage Shrubland and Steppe	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Aquatic Vegetation	Western North American Freshwater Marsh	Western North American Montane/Boreal Peatland	Western North American Montane-Subalpine Wet Shrubland and Wet Meadow	Western North American Temperate Grassland and Meadow	
Southern mountain yellow-legged frog	*Rana muscosa*										X				X				X				X	X	5
Southern rubber boa	*Charina umbratica*							X					X												2
Southern sierra legless lizard	*Anniella campi*										X								X						2
Southwestern willow flycatcher	*Empidonax traillii extimus*										X				X				X			X	X		5
Tehachapi pocket mouse	*Perognathus alticolus inexpectatus*											X												X	2
Tehachapi slender salamander	*Batrachoseps stebbinsi*										X			X	X										3
Townsend's big-eared bat	*Corynorhinus townsendii*		X	X			X	X			X		X	X	X			X			X		X		11
Vaux's swift	*Chaetura vauxi*							X							X										2
Vermillion flycatcher	*Pyrocephalus rubinus*														X										1
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*														X										1
White-eared pocket mouse	*Perognathus alitcolus alticolus*	X					X					X							X					X	5
Willow flycatcher	*Empidonax traillii*										X				X				X			X	X	X	6
Yellow warbler	*Setophaga petechia*		X								X				X	X									4
Yellow-breasted chat	*Icteria virens*														X										1
Yellow-eared pocket mouse	*Perognathus parvus xanthanotus*			X		X								X											3
Yosemite toad	*Anaxyrus canorus*																		X			X	X	X	4
	Total (Macrogroup)	8	9	8	7	7	10	15	7	8	30	17	17	13	27	8	4	7	24	16	19	22	27	26	

South Coast Province

Table C-21 Southern California Coast Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																			Total (SGCN)
		California Annual and Perennial Grassland	California Chaparral	California Cliff, Scree, and Other Rock Vegetation	California Coastal Scrub	California Forest and Woodland	Californian–Vancouverian Montane and Foothill Forest	Introduced North American Mediterranean Woodland and Forest	North American Pacific Coastal Salt Marsh	North American Warm-Desert Xero-Riparian	Vancouverian Coastal Dune and Bluff	Vancouverian Flooded and Swamp Forest	Warm Interior Chaparral	Warm Semi-desert/Mediterranean Alkali-Saline Wetland	Warm Southwest Riparian Forest	Western North America Vernal Pool	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Aquatic Vegetation	Western North American Freshwater Marsh	Western North American Temperate Grassland and Meadow	
Agile (=Pacific) kangaroo rat	*Dipodomys agilis*	X	X		X						X		X			X				X	7
American badger	*Taxidea taxus*	X	X			X	X			X			X			X				X	8
Arroyo toad	*Anaxyrus californicus*				X	X	X														3
Baja California coachwhip	*Coluber (= masticophis) fuliginosus*		X						X		X					X					4
Bald eagle	*Haliaeetus leucocephalus*						X														1
Bank swallow	*Riparia riparia*	X		X	X						X	X				X		X	X	X	9
Belding's savannah sparrow	*Passerculus sandwichensis beldingi*								X												1
Big free-tailed bat	*Nyctinomops macrotis*			X		X	X			X											4
Black oystercatcher	*Haematopus bachmani*			X																	1
Black skimmer	*Rynchops niger*								X												1
Black turnstone	*Arenaria melanocephala*			X					X												2
Blainville's horned lizard	*Phrynosoma blainvillii*		X		X					X	X		X								5
Brandt's cormorant	*Phalacrocorax penicillatus*								X												1
Brant	*Branta bernicla*	X							X					X		X				X	5
Burrowing owl	*Athene cunicularia*	X		X							X									X	4
California black rail	*Laterallus jamaicensis coturniculus*								X					X				X	X		4
California condor	*Gymnogyps californianus*	X	X	X	X	X	X				X		X			X				X	10
California glossy snake	*Arizona elegans occidentalis*	X	X		X					X			X								5
California leaf-nosed bat	*Macrotis californicus*									X											1
California least tern	*Sternula antillarum browni*								X												1
California legless lizard	*Anniella pulchra*				X	X			X		X										4
California newt	*Taricha torosa*		X		X	X									X	X					5
California red-legged frog	*Rana draytonii*					X										X		X	X		4
California red-sided garter	*Thamnophis sirtalis*																X	X	X		3

Table C-21 Southern California Coast Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																			Total (SGCN)
		California Annual and Perennial Grassland	California Chaparral	California Cliff, Scree, and Other Rock Vegetation	California Coastal Scrub	California Forest and Woodland	Californian–Vancouverian Montane and Foothill Forest	Introduced North American Mediterranean Woodland and Forest	North American Pacific Coastal Salt Marsh	North American Warm-Desert Xero-Riparian	Vancouverian Coastal Dune and Bluff	Vancouverian Flooded and Swamp Forest	Warm Interior Chaparral	Warm Semi-desert/Mediterranean Alkali-Saline Wetland	Warm Southwest Riparian Forest	Western North America Vernal Pool	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Aquatic Vegetation	Western North American Freshwater Marsh	Western North American Temperate Grassland and Meadow	
snake	*infernalis*																				
California spotted owl	*Strix occidentalis occidentalis*					X	X														2
California tiger salamander	*Ambystoma californiense*	X														X					2
Catalina california quail	*Callipepla californica catalinensis*	X	X		X	X					X	X	X			X	X			X	10
Catalina hutton's vireo	*Vireo huttoni unitti*					X	X					X									3
Channel island song sparrow	*Melospiza melodia graminea*								X			X		X			X	X	X		6
Channel islands spotted skunk	*Spilogale gracilis amphialus*		X		X	X	X				X	X	X								7
Clark's marsh wren	*Cistothorus palustris clarkae*								X					X				X	X		4
Coast patch-nosed snake	*Salvadora hexalepis virgultea*		X		X						X		X								4
Coastal california gnatcatcher	*Polioptila californica californica*				X						X										2
Dulzura kangaroo rat	*Dipodomys simulans*	X	X		X						X		X			X				X	7
Elegant tern	*Thalasseus elegans*								X												1
Foothill yellow-legged frog	*Rana boylii*											X									1
Fringed myotis	*Myotis thysanods*			X		X						X									3
Fulvous whistling-duck	*Dendrocygna bicolor*													X	X			X	X		4
Grasshopper sparrow	*Ammodramus savannarum*	X														X				X	3
Grizzly bear	*Ursus arctos*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	19
Gull-billed tern	*Gelochelidon nilotica*								X										X		2
Heermann's kangaroo rat	*Dipodomys heermanni heermanni*		X										X				X				3
Island night lizard	*Xantusia riversiana*	X	X		X																3
Large-billed savannah sparrow	*Passerculus sandwichensis rostratus*	X			X	X					X			X						X	6
Least bell's vireo	*Vireo bellii pusillus*											X									1
Least bittern	*Ixobrychus exilis*								X					X				X	X		4
Light-footed ridgway's rail	*Rallus obsoletus levipes*								X					X				X	X		4
Loggerhead shrike	*Lanius ludovicianus*	X				X										X				X	4

Table C-21 Southern California Coast Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																			Total (SGCN)
		California Annual and Perennial Grassland	California Chaparral	California Cliff, Scree, and Other Rock Vegetation	California Coastal Scrub	California Forest and Woodland	Californian–Vancouverian Montane and Foothill Forest	Introduced North American Mediterranean Woodland and Forest	North American Pacific Coastal Salt Marsh	North American Warm-Desert Xero-Riparian	Vancouverian Coastal Dune and Bluff	Vancouverian Flooded and Swamp Forest	Warm Interior Chaparral	Warm Semi-desert/Mediterranean Alkali-Saline Wetland	Warm Southwest Riparian Forest	Western North America Vernal Pool	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Aquatic Vegetation	Western North American Freshwater Marsh	Western North American Temperate Grassland and Meadow	
Lompoc kangaroo rat	*Dipodomys heermanni arenae*	X	X		X						X		X			X				X	7
Long-eared myotis	*Myotis evotis*	X					X								X						3
Long-eared owl	*Asio otus*	X	X			X						X	X			X	X			X	8
Long-legged myotis	*Myotis volans*					X															1
Mexican long-tongued bat	*Choeronycteris mexicana*		X	X									X								3
Mountain plover	*Charadrius montanus*	X		X												X				X	4
Northern harrier	*Circus cyaneus*	X							X					X		X	X	X	X	X	8
Olive-sided flycatcher	*Contopus cooperi*					X															1
Orange-throated whiptail	*Aspidoscelis hyperythra*		X		X					X	X										4
Oregon vesper sparrow	*Pooecetes gramineus affinis*	X														X				X	3
Pacifc pocket mouse	*Perognathus longimembris pacificus*				X					X	X										3
Pallid bat	*Antrozous pallidus*	X		X		X										X					4
Pronghorn	*Antilocapra americana*	X																			1
Purple martin	*Progne subis*	X				X	X									X	X	X	X	X	8
Red diamond rattlesnake	*Crotalus ruber*		X		X					X			X								4
Red knot	*Calidris canutus*								X												1
Redhead	*Aythya americana*																	X	X		2
Royal tern	*Thalasseus maximus*								X												1
Ruddy turnstone	*Arenaria interpres*								X												1
San Clemente bell's sparrow	*Artemisiospiza belli clementeae*		X		X								X								3
San Clemente bewick's wren	*Thryomanes bewickii leucophrys*		X			X						X	X								4
San Clemente island fox	*Urocyon littoralis clementae*		X		X						X		X								4
San Clemente loggerhead shrike	*Lanius ludovicianus mearnsi*	X				X										X				X	4
San Clemente spotted towhee	*Pipilo maculatus clementae*		X			X						X	X								4
San Diegan tiger whiptail	*Aspidoscelis tigris stejnegeri*		X		X					X			X								4
San Diego banded gecko	*Coleonxy variegatus*			X						X			X								3

Table C-21 Southern California Coast Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																			
		California Annual and Perennial Grassland	California Chaparral	California Cliff, Scree, and Other Rock Vegetation	California Coastal Scrub	California Forest and Woodland	Californian–Vancouverian Montane and Foothill Forest	Introduced North American Mediterranean Woodland and Forest	North American Pacific Coastal Salt Marsh	North American Warm-Desert Xero-Riparian	Vancouverian Coastal Dune and Bluff	Vancouverian Flooded and Swamp Forest	Warm Interior Chaparral	Warm Semi-desert/Mediterranean Alkali-Saline Wetland	Warm Southwest Riparian Forest	Western North America Vernal Pool	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Aquatic Vegetation	Western North American Freshwater Marsh	Western North American Temperate Grassland and Meadow	Total (SGCN)
	abbotti																				
San Jacinto kit fox	*Vulpes macrotis macrotis*	X														X				X	3
San Miguel island fox	*Urocyon littoralis littoralis*		X		X						X		X								4
San Nicolas island fox	*Urocyon littoralis dickeyi*		X		X						X		X								4
Sanderling	*Calidris alba*								X												1
Santa Catalina island fox	*Urocyon littoralis catalinae*		X		X						X		X								4
Santa Catalina island shrew	*Sorex ornatus willeti*											X									1
Santa Cruz island fox	*Urocyon littoralis santacruzae*		X		X						X		X								4
Santa Cruz island rufous-crowned sparrow	*Aimophila ruficeps obscura*	X	X		X						X		X			X				X	7
Santa Rosa island fox	*Urocyon littoralis santarosae*		X		X						X		X								4
Short-eared owl	*Asio flammeus*	X							X					X		X	X	X	X	X	8
Southern California legless lizard	*Anniella stebbinsi*				X	X					X										3
Southern California ringtail	*Bassariscus astutus octavus*		X		X	X					X	X	X								6
Southern California salt marsh shrew	*Sorex ornatus salicornicus*								X												1
Southern grasshopper mouse	*Onychomys torridus ramona*									X											1
Southern marsh harvest mouse	*Reithrodontomys megalotis limicola*								X												1
Southern western pond turtle	*Actinemys pallida*					X						X						X	X		4
Southwestern willow flycatcher	*Empidonax traillii extimus*											X					X				2
Stellar (=northern) sea lion	*Eumetopias jubatus*																				1
Stephens' California vole	*Microtus californicus stephensi*	X														X	X			X	4
Stephens' kangaroo rat	*Dipodomys stephensi*	X	X		X						X		X			X				X	7
Surfbird	*Calidris virgata*								X												1

Table C-21 Southern California Coast Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																			Total (SGCN)
		California Annual and Perennial Grassland	California Chaparral	California Cliff, Scree, and Other Rock Vegetation	California Coastal Scrub	California Forest and Woodland	Californian–Vancouverian Montane and Foothill Forest	Introduced North American Mediterranean Woodland and Forest	North American Pacific Coastal Salt Marsh	North American Warm-Desert Xero-Riparian	Vancouverian Coastal Dune and Bluff	Vancouverian Flooded and Swamp Forest	Warm Interior Chaparral	Warm Semi-desert/Mediterranean Alkali-Saline Wetland	Warm Southwest Riparian Forest	Western North America Vernal Pool	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Aquatic Vegetation	Western North American Freshwater Marsh	Western North American Temperate Grassland and Meadow	
Townsend's big-eared bat	*Corynorhinus townsendii*		X	X									X								3
Tricolored blackbird	*Agelaius tricolor*											X				X		X	X		4
Two-striped gartersnake	*Thamnophis hammondii*											X					X	X	X		4
Wandering tattler	*Tringa incana*			X																	1
Western snowy plover (coastal population)	*Charadrius nivosus*								X		X										2
Western spadefoot	*Spea hammondii*	X														X					2
Willow flycatcher	*Empidonax traillii*									X		X			X		X				6
Wood stork	*Mycteria americana*													X				X	X		3
Yellow rail	*Coturnicops noveboracensis*								X												1
Yellow warbler	*Setophaga petechia*					X						X									2
Yellow-breasted chat	*Icteria virens*											X									1
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*																X	X	X		3
	Total (Macrogroup)	31	33	14	32	27	11	1	27	13	28	21	30	12	5	29	14	19	20	24	

Table C-22 Southern California Mountain And Valleys Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																													
		California Annual and Perennial Grassland	California Chaparral	California Cliff, Scree, and Other Rock Vegetation	California Coastal Scrub	California Forest and Woodland	Californian–Vancouverian Montane and Foothill Forest	Cool Interior Chaparral	Cool Semi-Desert Wash and Disturbance Scrub	Great Basin Saltbush Scrub	Inter-Mountain Dry Shrubland and Grassland	Introduced North American Mediterranean Woodland and Forest	Mojavean–Sonoran Semi-Desert Scrub	North American Pacific Coastal Salt Marsh	North American Warm-Desert Xero-Riparian	Rocky Mountain Subalpine and High Montane Conifer Forest	Vancouverian Coastal Dune and Bluff	Vancouverian Flooded and Swamp Forest	Vancouverian Lowland Grassland and Shrubland	Vancouverian Subalpine Forest	Warm Interior Chaparral	Warm Semi-Desert/Mediterranean Alkali-Saline Wetland	Warm Southwest Riparian Forest	Western Cordilleran Montane Shrubland and Grassland	Western North America Dwarf Sage Shrubland and Steppe	Western North America Tall Sage Shrubland and Steppe	Western North America Vernal Pool	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Marsh	Western North American Montane-Subalpine Wet Shrubland and Wet Meadow	Western North American Temperate Grassland and Meadow	Total (SGCN)
Agile (=Pacific) kangaroo rat	*Dipodomys agilis*	X																									X					2
American badger	*Taxidea taxus*	X	X			X	X	X	X	X	X		X		X				X		X		X	X	X	X	X				X	18
Arroyo toad	*Anaxyrus californicus*					X	X								X								X									4
Baja California coachwhip	*Coluber (= masticophis) fuliginosus*		X							X					X						X											4
Bald eagle	*Haliaeetus leucocephalus*						X																									1
Big free-tailed bat	*Nyctinomops macrotis*			X		X	X						X			X														X		6
Bighorn sheep	*Ovis canadensis*														X																	1
Black swift	*Cypseloides niger*			X		X	X	X										X						X								6
Blainville's horned lizard	*Phrynosoma blainvillii*		X		X				X				X		X		X				X											7
Brown-crested flycatcher	*Myiarchus tyrannulus*												X										X									2
Burrowing owl	*Athene cunicularia*	X		X	X	X			X	X	X		X		X		X		X				X		X	X	X				X	16
California condor	*Gymnogyps californianus*	X	X	X	X	X	X	X									X		X		X			X			X					12
California glossy snake	*Arizona elegans occidentalis*	X			X					X			X																			4
California leaf-nosed bat	*Macrotus californicus*														X								X									2
California legless lizard	*Anniella pulchra*				X	X									X		X															4
California newt	*Taricha torosa*					X																	X						X	X		4
California red-legged frog	*Rana draytonii*					X												X											X		X	4
California red-sided gartersnake	*Thamnophis sirtalis infernalis*																						X					X	X	X	X	5
California spotted owl	*Strix occidentalis occidentalis*					X	X											X														3
Clark's marsh wren	*Cistothorus palustris clarkae*													X								X							X		X	4
Coast patch-nosed snake	*Salvadora hexalepis virgultea*		X		X					X			X				X				X											6

Table C-22 Southern California Mountain And Valleys Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																														
		California Annual and Perennial Grassland	California Chaparral	California Cliff, Scree, and Other Rock Vegetation	California Coastal Scrub	California Forest and Woodland	Californian–Vancouverian Montane and Foothill Forest	Cool Interior Chaparral	Cool Semi-Desert Wash and Disturbance Scrub	Great Basin Saltbush Scrub	Inter-Mountain Dry Shrubland and Grassland	Introduced North American Mediterranean Woodland and Forest	Mojavean–Sonoran Semi-Desert Scrub	North American Pacific Coastal Salt Marsh	North American Warm-Desert Xero-Riparian	Rocky Mountain Subalpine and High Montane Conifer Forest	Vancouverian Coastal Dune and Bluff	Vancouverian Flooded and Swamp Forest	Vancouverian Lowland Grassland and Shrubland	Vancouverian Subalpine Forest	Warm Interior Chaparral	Warm Semi-Desert/Mediterranean Alkali-Saline Wetland	Warm Southwest Riparian Forest	Western Cordilleran Montane Shrubland and Grassland	Western North America Dwarf Sage Shrubland and Steppe	Western North America Tall Sage Shrubland and Steppe	Western North America Vernal Pool	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Marsh	Western North American Montane-Subalpine Wet Shrubland and Wet Meadow	Western North American Temperate Grassland and Meadow	Total (SGCN)
Coastal cactus wren	*Campylorhynchus brunneicapillus sandiegensis*																						X									1
Coastal california gnatcatcher	*Polioptila californica californica*				X												X															2
Cope's leopard lizard	*Gambelia copei*									X			X		X																	3
Desert slender salamander	*Batrachoseps major aridus*																						X									1
Dulzura kangaroo rat	*Dipodomys simulans*		X		X	X							X																			4
Earthquake Merriam's kangaroo rat	*Dipodomys merriami collinus*									X			X		X																	3
Foothill yellow-legged frog	*Rana boylii*																	X					X									2
Fringed myotis	*Myotis thysanodes*			X		X																	X									3
Fulvous whistling duck	*dendrocygna bicolor*																										X		X			2
Grasshopper sparrow	*Ammodramus savannarum*	X																	X								X				X	4
Gray wolf	*Canis lupus*	X	X		X	X	X	X		X	X	X				X		X	X		X		X	X	X	X	X	X		X	X	21
Gray vireo	*Vireo vicinior*		X																		X											2
Grizzly bear	*Ursus arctos*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	30
Heermann's kangaroo rat	*Dipodomys heermanni heermanni*		X																		X							X		X	X	5
Jacumba pocket mouse	*Perognathus longimembris internationalis*	X	X		X	X		X									X				X			X			X					9
Jaguar	*Panthera onca*		X			X	X	X	X			X			X	X		X		X	X		X						X			13
Least bell's vireo	*Vireo bellii pusillus*																						X									1
Least bittern	*Ixobrychus exilis*													X								X							X		X	4
Lesser long-nosed bat	*Leptonycteris yerbabuenae*									X			X										X									3
Lodgepole chipmunk	*Tamias speciosus speciosus*		X																		X											2
Loggerhead shrike	*Lanius ludovicianus*	X				X													X				X				X				X	6

Table C-22 Southern California Mountain And Valleys Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																													
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Long-eared myotis	*Myotis volans*					X	X											X					X									4
Long-eared owl	*Asio otus*	X	X			X		X	X		X							X	X		X		X	X		X	X	X		X	X	16
Long-legged myotis	*Myotis volans*					X	X				X																					3
Mexican long-tongued bat	*Choeronycteris mexicana*		X										X																			2
Mohave desert tortoise	*Gopherus agassizii*									X			X		X																	3
Mount Pinos lodgepole chipmunk	*Tamias speciosus callipeplus*		X																		X											2
Mount Pinos sooty grouse	*Dendragapus fuliginosus howardi*						X																									1
Mountain plover	*Charadrius montanus*	X		X															X								X				X	5
Northern goshawk	*Accipiter gentilis*					X	X									X		X		X												5
Northern harrier	*Circus cyaneus*	X												X					X			X					X	X	X	X	X	9
Olive-sided flycatcher	*Contopus cooperi*					X	X																									2
Orange-throated whiptail	*Aspidoscelis hyperythra*		X		X												X				X											4
Oregon vesper sparrow	*Pooecetes gramineus affinis*	X							X		X								X						X	X	X				X	8
Pallid bat	*Antrozous pallidus*	X		X		X																					X					4
Palm Springs pocket mouse	*Perognathus longimembris bangsi*	X	X		X	X		X									X				X			X			X					9
Palm Springs round-tailed ground squirrel	*Xerospermophilus tereticaudus chlorus*												X		X																	2
Peninsular bighorn sheep dps	*Ovis canadensis nelsoni*														X																	1
Porcupine	*Erethizon dorsatum*						X									X				X							X	X	X	X		7
Pronghorn	*Antilocapra americana*	X																	X													2

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		California Annual and Perennial Grassland	California Chaparral	California Cliff, Scree, and Other Rock Vegetation	California Coastal Scrub	California Forest and Woodland	Californian–Vancouverian Montane and Foothill Forest	Cool Interior Chaparral	Cool Semi-Desert Wash and Disturbance Scrub	Great Basin Saltbush Scrub	Inter-Mountain Dry Shrubland and Grassland	Introduced North American Mediterranean Woodland and Forest	Mojavean–Sonoran Semi-Desert Scrub	North American Pacific Coastal Salt Marsh	North American Warm-Desert Xero-Riparian	Rocky Mountain Subalpine and High Montane Conifer Forest	Vancouverian Coastal Dune and Bluff	Vancouverian Flooded and Swamp Forest	Vancouverian Lowland Grassland and Shrubland	Vancouverian Subalpine Forest	Warm Interior Chaparral	Warm Semi-Desert/Mediterranean Alkali-Saline Wetland	Warm Southwest Riparian Forest	Western Cordilleran Montane Shrubland and Grassland	Western North America Dwarf Sage Shrubland and Steppe	Western North America Tall Sage Shrubland and Steppe	Western North America Vernal Pool	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Marsh	Western North American Montane-Subalpine Wet Shrubland and Wet Meadow	Western North American Temperate Grassland and Meadow	Total (SGCN)
Purple martin	*Progne subis*	X				X	X											X	X								X	X	X	X	X	10
Red diamond rattlesnake	*Crotalus ruber*		X										X		X						X											4
Redhead	*Aythya americana*																												X		X	2
San Bernardino flying squirrel	*Glaucomys sabrinus californicus*					X	X									X	X	X		X												6
San Bernardino golden-mantled ground squirrel	*Callospermophilus lateralis bernardinus*	X				X	X									X		X		X	X											7
San Bernardino kangaroo rat	*Dipodomys merriami parvus*									X			X		X																	3
San Bernardino mountains long-tailed vole	*Microtus longicaudus bernardinus*	X					X									X		X	X	X											X	7
San Diegan tiger whiptail	*Aspidoscelis tigris stejnegeri*		X		X					X			X		X																	5
San Diego banded gecko	*Coleonyx variegatus abbotti*									X			X		X																	3
San Joaquin pocket mouse	*Perognathus inornatus*	X				X													X								X				X	5
Scott's oriole	*Icterus parisorum*									X			X																			3
Snowy plover (interior population)	*Charadrius nivosus*			X																												1
Southern California legless lizard	*Anniella stebbinsi*				X										X		X															3
Southern California ringtail	*Bassariscus astutus octavus*		X		X	X		X									X	X			X		X	X								9
Southern grasshopper mouse	*Onychomys torridus ramona*									X			X																			2
Southern mountain yellow-legged frog	*Rana muscosa*						X											X					X									3
Southern rubber boa	*Charina umbratica*					X	X									X																3

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Common Name	Scientific Name	USNVC Macrogroup																														
		California Annual and Perennial Grassland	California Chaparral	California Cliff, Scree, and Other Rock Vegetation	California Coastal Scrub	California Forest and Woodland	Californian–Vancouverian Montane and Foothill Forest	Cool Interior Chaparral	Cool Semi-Desert Wash and Disturbance Scrub	Great Basin Saltbush Scrub	Inter-Mountain Dry Shrubland and Grassland	Introduced North American Mediterranean Woodland and Forest	Mojavean–Sonoran Semi-Desert Scrub	North American Pacific Coastal Salt Marsh	North American Warm-Desert Xero-Riparian	Rocky Mountain Subalpine and High Montane Conifer Forest	Vancouverian Coastal Dune and Bluff	Vancouverian Flooded and Swamp Forest	Vancouverian Lowland Grassland and Shrubland	Vancouverian Subalpine Forest	Warm Interior Chaparral	Warm Semi-Desert/Mediterranean Alkali-Saline Wetland	Warm Southwest Riparian Forest	Western Cordilleran Montane Shrubland and Grassland	Western North America Dwarf Sage Shrubland and Steppe	Western North America Tall Sage Shrubland and Steppe	Western North America Vernal Pool	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Marsh	Western North American Montane-Subalpine Wet Shrubland and Wet Meadow	Western North American Temperate Grassland and Meadow	Total (SGCN)
Southern western pond turtle	*Actinemys pallida*					X																	X						X		X	4
Southwestern willow flycatcher	*Empidonax traillii extimus*					X																	X							X		3
Stephens' kangaroo rat	*Dipodomys stephensi*	X																									X					2
Summer tanager	*Piranga rubra*																						X									1
Switak's banded gecko	*Coleonyx switaki*												X		X																	2
Tehachapi pocket mouse	*Perognathus alticolus inexpectatus*	X	X		X	X		X									X				X			X			X					9
Townsend's big-eared bat	*Corynorhinus townsendii*	X				X				X			X			X																5
Tricolored blackbird	*Agelaius tricolor*	X																					X				X		X		X	5
Two-striped gartersnake	*Thamnophis hammondii*					X												X					X					X	X	X	X	7
Vermilion flycatcher	*Pyrocephalus rubinus*																						X									1
Western spadefoot	*Spea hammondii*	X																									X					2
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*																						X									1
White-eared pocket mouse	*Perognathus alitcolus alticolus*	X			X												X										X					4
Willow flycatcher	*Empidonax traillii*																	X					X									2
Wood stork	*Mycteria americana*																					X	X						X			3
Yellow warbler	*Setophaga petechia*					X	X	X										X					X	X								6
Yellow-breasted chat	*Icteria virens*																						X									1
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*																											X	X	X		3
	Total (Macrogroup)	27	22	9	18	36	23	12	7	17	7	3	23	4	21	11	15	19	15	7	20	5	32	11	5	6	24	10	17	13	22	

Deserts Province

Table C-23 Mono Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																							
		Californian–Vancouverian Montane and Foothill Forest	Cool Interior Chaparral	Cool Semi-Desert Alkali-Saline Wetlands	Cool Semi-desert Wash and Disturbance Scrub	Great Basin Saltbush Scrub	Inter-Mountain Dry Shrubland and Grassland	Mojavean–Sonoran Semi-Desert Scrub	North American Pacific Coastal Salt Marsh	North American Warm-Desert Xero-Riparian	North American Warm Semi-Desert Cliff, Scree, and Rock Vegetation	Rocky Mountain Subalpine and High Montane Conifer Forest	Temperate Pacific Intertidal Shore	Vancouverian Flooded and Swamp Forest	Vancouverian Subalpine Forest	Warm Semi-Desert/Mediterranean Alkali-Saline Wetland	Warm Southwest Riparian Forest	Western Cordilleran Montane Shrubland and Grassland	Western North America Dwarf Sage Shrubland and Steppe	Western North America Tall Sage Shrubland and Steppe	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Marsh	Western North American Montane-Subalpine Wet Shrubland and Wet Meadow	Western North American Temperate Grassland and Meadow	Total (SGCN)
American badger	*Taxidea taxus*	X	X	X	X	X	X	X		X						X	X	X	X	X					13
American pika	*Ochotona princeps*										X										X		X		1
Bald eagle	*Haliaeetus leucocephalus*	X																							1
Bank swallow	*Riparia riparia*						X				X			X			X					X			5
Black toad	*Anaxyrus exsul*																				X	X	X	X	4
Burrowing owl	*Athene cunicularia*			X	X	X	X	X		X	X					X	X	X	X	X					12
Desert bighorn sheep	*Ovis canadensis nelsoni*									X															1
Fringed myotis	*Myotis thysanodes*										X														1
Gray-crowned rosy-finch	*Leucosticte tephrocotis*										X										X		X		3
Greater sage-grouse	*Centrocercus urophasianus*				X						X							X		X	X		X	X	7
Greater sandhill crane	*Grus canadensis tabida*																	X			X	X	X	X	5
Grizzly bear	*Ursus arctos*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	23
Least bittern	*Ixobrychus exilis*								X				X									X			3
Loggerhead shrike	*Lanius ludovicianus*						X										X								2
Long-eared myotis	*Myotis evotis*	X												X			X								3
Long-eared owl	*Asio otus*		X		X		X							X			X	X		X	X		X	X	10
Long-legged myotis	*Myotis volans*	X									X			X									X		4
Northern goshawk	*Accipiter gentilis*	X										X		X	X		X								5
Northern harrier	*Circus cyaneus*						X		X				X					X			X	X	X	X	8

Table C-23 Mono Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																							Total (SGCN)
		Californian–Vancouverian Montane and Foothill Forest	Cool Interior Chaparral	Cool Semi-Desert Alkali-Saline Wetlands	Cool Semi-desert Wash and Disturbance Scrub	Great Basin Saltbush Scrub	Inter-Mountain Dry Shrubland and Grassland	Mojavean–Sonoran Semi-Desert Scrub	North American Pacific Coastal Salt Marsh	North American Warm-Desert Xero-Riparian	North American Warm Semi-Desert Cliff, Scree, and Rock Vegetation	Rocky Mountain Subalpine and High Montane Conifer Forest	Temperate Pacific Intertidal Shore	Vancouverian Flooded and Swamp Forest	Vancouverian Subalpine Forest	Warm Semi-Desert/Mediterranean Alkali-Saline Wetland	Warm Southwest Riparian Forest	Western Cordilleran Montane Shrubland and Grassland	Western North America Dwarf Sage Shrubland and Steppe	Western North America Tall Sage Shrubland and Steppe	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Marsh	Western North American Montane-Subalpine Wet Shrubland and Wet Meadow	Western North American Temperate Grassland and Meadow	
Northern leopard frog	*Lithobates pipiens*									X											X	X		X	4
Olive-sided flycatcher	*Contopus cooperi*	X																							1
Pacific marten	*Martes caurina (=americana)*											X		X	X		X	X			X		X	X	8
Pallid bat	*Antrozous pallidus*						X				X														2
Panamint alligator lizard	*Elgaria panamintina*					X				X										X					3
Porcupine	*Erethizon dorsatum*	X										X			X						X	X	X		6
Pronghorn	*Antilocapra americana*				X	X	X											X	X	X				X	7
Pygmy rabbit	*Brachylagus idahoensis*				X		X											X		X					4
Redhead	*Aythya americana*																					X			1
Scott's oriole	*Icterus parisorum*					X		X																	2
Short-eared owl	*Asio flammeus*						X		X				X					X			X	X	X	X	8
Sierra Nevada mountain beaver	*Aplodontia rufa californica*	X										X		X	X						X		X		6
Sierra Nevada red fox	*Vulpes vulpes necator*																				X		X		2
Sierra Nevada yellow-legged frog	*Rana sierrae*													X			X				X		X	X	5
Snowy plover (interior population)	*Charadrius nivosus*										X														1
Southern grasshopper mouse	*Onychomys torridus ramona*			X		X		X								X									4

Table C-23 Mono Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																							Total (SGCN)
		Californian–Vancouverian Montane and Foothill Forest	Cool Interior Chaparral	Cool Semi-Desert Alkali-Saline Wetlands	Cool Semi-desert Wash and Disturbance Scrub	Great Basin Saltbush Scrub	Inter-Mountain Dry Shrubland and Grassland	Mojavean–Sonoran Semi-Desert Scrub	North American Pacific Coastal Salt Marsh	North American Warm-Desert Xero-Riparian	North American Warm Semi-Desert Cliff, Scree, and Rock Vegetation	Rocky Mountain Subalpine and High Montane Conifer Forest	Temperate Pacific Intertidal Shore	Vancouverian Flooded and Swamp Forest	Vancouverian Subalpine Forest	Warm Semi-Desert/Mediterranean Alkali-Saline Wetland	Warm Southwest Riparian Forest	Western Cordilleran Montane Shrubland and Grassland	Western North America Dwarf Sage Shrubland and Steppe	Western North America Tall Sage Shrubland and Steppe	Western North America Wet Meadow and Low Shrub Carr	Western North American Freshwater Marsh	Western North American Montane-Subalpine Wet Shrubland and Wet Meadow	Western North American Temperate Grassland and Meadow	
Southwestern willow flycatcher	*Empidonax traillii extimus*									X							X								2
Swainson's hawk	*Buteo swainsoni*						X				X														2
Townsend's big-eared bat	*Corynorhinus townsendii*	X	X		X	X	X	X		X	X	X		X	X		X	X	X	X	X	X	X		18
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*									X							X								2
Willow flycatcher	*Empidonax traillii*													X			X	X			X		X	X	6
Yellow rail	*Coturnicops noveboracensis*																				X	X			2
Yellow warbler	*Setophaga petechia*	X	X											X			X								4
Yellow-breasted chat	*Icteria virens*																X								1
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*																	X			X	X	X	X	5
	Total (Macrogroup)	11	5	4	8	8	13	6	4	9	12	6	4	12	6	4	16	14	5	9	19	13	18	13	

Table C-24 Mojave Desert Ecoregion

Common Name	Scientific Name	USNVC Macrogroup California Annual and Perennial Grassland	California Coastal Scrub	California Forest and Woodland	Cool Semi-Desert Wash and Disturbance Scrub	Great Basin Saltbush Scrub	Inter-Mountain Dry Shrubland and Grassland	Mojavean–Sonoran Semi-Desert Scrub	North American Pacific Coastal Salt Marsh	North American Warm-Desert Xero-Riparian	North American Warm Semi-Desert Cliff, Scree, and Rock Vegetation	Warm Interior Chaparral	Warm Southwest Riparian Forest	Warm Semi-Desert/Mediterranean Alkali-Saline Wetland	Western North America Dwarf Sage Shrubland and Steppe	Western North America Tall Sage Shrubland and Steppe	Western North American Freshwater Marsh	Total (SGCN)
Amargosa vole	*Microtus californicus scirpensis*																X	1
American badger	*Taxidea taxus*	X		X	X	X	X	X	X	X		X	X		X	X		12
American white pelican	*Pelecanus erythrorhynchos*										X							1
Arizona bell's vireo	*Vireo bellii arizonae*												X					1
Arizona myotis	*Myotis occultus*				X					X	X							3
Bald eagle	*Haliaeetus leucocephalus*												X	X				2
Bendire's thrasher	*Toxostoma bendirei*																	0
Big free-tailed bat	*Nyctinomops macrotis*		X	X		X	X	X		X	X	X	X		X	X	X	12
Bighorn sheep	*Ovis canadensis*				X					X								2
Blainville's horned lizard	*Phrynosoma blainvillii*		X		X		X					X						4
Brown-crested flycatcher	*Myiarchus tyrannulus*					X		X					X					3
Burrowing owl	*Athene cunicularia*	X	X	X	X	X	X	X	X	X	X		X		X	X		13
California condor	*Gymnogyps californianus*	X	X	X							X	X						5
California leaf-nosed bat	*Macrotus californicus*				X					X			X					3
Cave myotis	*Myotis velifer*				X					X			X					3
Couch's spadefoot	*Scaphiopus couchii*				X	X	X	X		X								5
Crissal thrasher	*Toxostoma crissale*				X					X			X					3
Desert bighorn sheep	*Ovis canadensis nelsoni*					X				X								2
Elf owl	*Micrathene whitneyi*												X					1
Fringed myotis	*Myotis thysanodes*			X							X							2
Gila monster	*Heloderma suspectum*				X	X		X		X								4
Gila woodpecker	*Melanerpes uropygialis*				X					X			X					3
Gilded flicker	*Colaptes chrysoides*												X					1
Gray vireo	*Vireo vicinior*											X						1
Gray wolf	*Canis lupis*												X			X		2
Grizzly bear	*Ursus arctos*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	16
Inyo California towhee	*Melozone crissalis eremophilus*		X	X								X	X					4
Jaguar	*Panthera onca*						X	X	X	X	X	X	X	X	X	X	X	11
Least bell's vireo	*Vireo bellii pusillus*									X			X					2

Table C-24 Mojave Desert Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																Total (SGCN)
		California Annual and Perennial Grassland	California Coastal Scrub	California Forest and Woodland	Cool Semi-Desert Wash and Disturbance Scrub	Great Basin Saltbush Scrub	Inter-Mountain Dry Shrubland and Grassland	Mojavean–Sonoran Semi-Desert Scrub	North American Pacific Coastal Salt Marsh	North American Warm-Desert Xero-Riparian	North American Warm Semi-Desert Cliff, Scree, and Rock Vegetation	Warm Interior Chaparral	Warm Southwest Riparian Forest	Warm Semi-Desert/Mediterranean Alkali-Saline Wetland	Western North America Dwarf Sage Shrubland and Steppe	Western North America Tall Sage Shrubland and Steppe	Western North American Freshwater Marsh	
Least bittern	*Ixobrychus exilis*													X			X	2
Loggerhead shrike	*Lanius ludovicianus*	X		X									X					3
Long-eared myotis	*Myotis evotis*																	0
Long-eared owl	*Asio otus*	X		X	X		X					X	X			X		7
Long-legged myotis	*Myotis volans*			X							X							2
Los Angeles pocket mouse	*Perognathus longimembris brevinasus*	X																1
Lucy's warbler	*Oreothlypis luciae*					X				X			X					3
Mohave desert tortoise	*Gopherus agassizii*				X	X	X	X		X								5
Mohave fringe-toed lizard	*Uma scoparia*						X	X			X							3
Mohave ground squirrel	*Spermophilus (=xerospermophilus) mohavensis*	X			X	X	X	X		X					X	X		8
Mohave river vole	*Microtus californicus mohavensis*	X																1
Mountain plover	*Charadrius montanus*	X									X							2
Northern harrier	*Circus cyaneus*	X												X			X	3
Pallid bat	*Antrozous pallidus*	X		X							X							3
Pronhorn	*Antilocapra americana*						X								X	X		3
Redhead	*Aythya americana*																X	1
Regal ring-necked snake	*Diadophis punctatus regalis*			X								X						2
San Joaquin pocket mouse	*Perognathus inornatus*	X		X														2
Scott's oriole	*Icterus parisorum*					X		X										2
Short-eared owl	*Asio flammeus*	X												X			X	3
Sierra Nevada bighorn sheep	*Ovis canadensis sierrae*					X				X								2
Snowy plover (interior population)	*Charadrius nivosus*										X			X				2
Sonora beaver	*Castor canadensis frondator (incl. Repentinus)*												X				X	2
Sonora mud turtle	*Kinosternon sonoriense*																X	1

Table C-24 Mojave Desert Ecoregion

Common Name	Scientific Name	USNVC Macrogroup																Total (SGCN)
		California Annual and Perennial Grassland	California Coastal Scrub	California Forest and Woodland	Cool Semi-Desert Wash and Disturbance Scrub	Great Basin Saltbush Scrub	Inter-Mountain Dry Shrubland and Grassland	Mojavean–Sonoran Semi-Desert Scrub	North American Pacific Coastal Salt Marsh	North American Warm-Desert Xero-Riparian	North American Warm Semi-Desert Cliff, Scree, and Rock Vegetation	Warm Interior Chaparral	Warm Southwest Riparian Forest	Warm Semi-Desert/Mediterranean Alkali-Saline Wetland	Western North America Dwarf Sage Shrubland and Steppe	Western North America Tall Sage Shrubland and Steppe	Western North American Freshwater Marsh	
Sonoran desert toad	*Incilius alvarius*							X		X							X	3
Southern grasshopper mouse	*Onychomys torridus ramona*					X	X	X	X									4
Southern western pond turtle	*Actinemys pallida*			X									X				X	3
Southwestern river otter	*Lontra canadensis sonora*																X	1
Southwestern willow flycatcher	*Empidonax traillii extimus*			X									X					2
Summer tanager	*Piranga rubra*												X					1
Swainson's hawk	*Buteo swainsoni*	X		X							X							3
Tehachapi pocket mouse	*Perognathus alticolus inexpectatus*	X																1
Townsend's big-eared bat	*Corynorhinus townsendii*		X	X	X	X	X	X		X	X	X	X		X	X	X	13
Tricolored blackbird	*Agelaius tricolor*	X															X	2
Vermilion flycatcher	*Pyrocephalus rubinus*												X					1
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*			X									X					2
Willow flycatcher	*Empidonax traillii*												X					1
Wood stork	*Mycteria americana*												X	X				2
Yellow warbler	*Setophaga petechia*			X									X					2
Yellow-breasted chat	*Icteria virens*												X					1
Yellow-eared pocket mouse	*Perognathus parvus xanthanotus*											X		X				2
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*																X	1
Yuma ridgway's rail	*Rallus obsoletus yumanensis*									X					X		X	3
	Total (Macrogroup)	17	7	19	16	15	14	15	5	22	15	12	31	9	9	10	17	

Table C-25 Sonoran Desert Ecoregion

Common Name	Scientific Name	USNVC Macrogroup							Total (SGCN)
		California Annual and Perennial Grassland	Great Basin Saltbush Scrub	Mojavean–Sonoran Semi-Desert Scrub	North American Pacific Coastal Salt Marsh	North American Warm-Desert Xero-Riparian	North American Warm Semi-Desert Cliff, Scree, and Rock Vegetation	Warm Southwest Riparian Forest	
American badger	*Taxidea taxus*	X	X	X		X		X	5
American white pelican	*Pelecanus erythrorhynchos*						X		1
Arizona bell's vireo	*Vireo bellii arizonae*							X	1
Arizona myotis	*Myotis occultus*		X			X	X		3
Bald eagle	*Haliaeetus leucocephalus*							X	1
Big free-tailed bat	*Nyctinomops macrotis*		X	X		X	X	X	5
Bighorn sheep	*Ovis canadensis*		X			X			2
Brown-crested flycatcher	*Myiarchus tyrannulus*			X				X	2
Burrowing owl	*Athene cunicularia*		X	X		X	X	X	5
California black rail	*Laterallus jamaicensis coturniculus*				X				1
California leaf-nosed bat	*Macrotus californicus*		X			X		X	3
Cave myotis	*Myotis velifer*		X			X		X	3
Colorado desert fringe-toed lizard	*Uma notata*			X			X		2
Couch's spadefoot	*Scaphiopus couchii*		X	X		X			3
Crissal thrasher	*Toxostoma crissale*		X			X		X	3
Desert bighorn sheep	*Ovis canadensis nelsoni*			X		X	X		3
Elf owl	*Micrathene whitneyi*							X	1
Fringed myotis	*Myotis thysanodes*					X	X	X	3
Gila monster	*Heloderma suspectum*		X	X				X	3
Gila woodpecker	*Melanerpes uropygialis*		X			X		X	3
Gilded flicker	*Colaptes chrysoides*							X	1
Grizzly bear	*Ursus arctos*	X	X	X	X	X	X	X	7
Jaguar	*Panthera onca*	X	X	X	X	X		X	6
Least bittern	*Ixobrychus exilis*				X				1
Loggerhead shrike	*Lanius ludovicianus*	X						X	2
Long-eared owl	*Asio otus*	X						X	2
Lowland leopard frog	*Lithobates yavapaiensis*							X	1
Lucy's warbler	*Oreothlypis luciae*		X			X		X	3
Mexican long-tongued bat	*Choeronycteris mexicana*			X		X	X		3
Mohave desert tortoise	*Gopherus agassizii*		X	X		X			3
Mohave fringe-toed lizard	*Uma scoparia*			X			X		2
Mountain plover	*Charadrius montanus*	X					X		2
Pallid bat	*Antrozous pallidus*	X					X		2

Table C-25 Sonoran Desert Ecoregion

Common Name	Scientific Name	USNVC Macrogroup							
		California Annual and Perennial Grassland	Great Basin Saltbush Scrub	Mojavean–Sonoran Semi-Desert Scrub	North American Pacific Coastal Salt Marsh	North American Warm-Desert Xero-Riparian	North American Warm Semi-Desert Cliff, Scree, and Rock Vegetation	Warm Southwest Riparian Forest	Total (SGCN)
Palm springs pocket mouse	*Perognathus longimembris bangsi*			X					1
Palo Verde mountains ringtail	*Bassariscus astutus willetti*							X	1
Peninsular bighorn sheep DPS	*Ovis canadensis nelsoni*			X		X	X		3
Pronghorn	*Antilocapra americana*	X							1
Sonora beaver	*Castor canadensis frondator* (incl. *Repentinus)*							X	1
Sonora mud turtle	*Kinosternon sonoriense*							X	1
Sonoran desert toad	*Incilius alvarius*					X		X	2
Sonoran pronghorn	*Antilocapra americana sonoriensis*	X							1
Sonora yellow warbler	*Setophaga petechia sonorana*					X		X	2
Southern grasshopper mouse	*Onychomys torridus ramona*		X	X					2
Southwestern river otter	*Lontra canadensis sonora*							X	1
Southwestern willow flycatcher	*Empidonax traillii extimus*					X		X	2
Summer tanager	*Piranga rubra*							X	1
Townsend's big-eared bat	*Corynorhinus townsendii*		X	X		X	X		4
Vermilion flycatcher	*Pyrocephalus rubinus*							X	1
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*							X	1
Willow flycatcher	*Empidonax traillii*					X		X	2
Wood stork	*Mycteria americana*							X	1
Yellow warbler	*Setophaga petechia*							X	1
Yellow-breasted chat	*Icteria virens*							X	1
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*							X	1
Yuma ridgway's rail	*Rallus obsoletus yumanensis*				X			X	2
Yuma ringtail	*Bassariscus astutus yumanensis*							X	1
	Total (Macrogroup)	9	17	17	5	23	14	37	

Table C-26 Colorado Desert Ecoregion

Common Name	Scientific Name	USNVC Macrogroup											Total (SGCN)
		California Annual and Perennial Grassland	California Coastal Scrub	Great Basin Saltbush Scrub	Mojavean–Sonoran Semi-Desert Scrub	North American Pacific Coastal Salt Marsh	North American Warm-Desert Xero-Riparian	North American Warm Semi-Desert Cliff, Scree, and Rock Vegetation	Warm Interior Chaparral	Warm Southwest Riparian Forest	Warm Semi-Desert/Mediterranean Alkali-Saline Wetland	Western North American Freshwater Marsh	
American badger	*Taxidea taxus*	X		X	X		X		X	X	X		7
American white pelican	*Pelecanus erythrorhynchos*							X					1
Arizona bell's vireo	*Vireo bellii arizonae*									X			1
Arizona myotis	*Myotis occultus*			X			X	X					3
Bald eagle	*Haliaeetus leucocephalus*									X	X		2
Big free-tailed bat	*Nyctinomops macrotis*		X	X	X		X	X	X	X			7
Bighorn sheep	*Ovis canadensis*				X			X					2
Black skimmer	*Rynchops niger*										X		1
Brown-crested flycatcher	*Myiarchus tyrannulus*				X					X			2
Burrowing owl	*Athene cunicularia*	X	X	X	X			X					5
California black rail	*Laterallus jamaicensis coturniculus*					X					X	X	3
California brown pelican	*Pelecanus occidentalis californicus*										X		1
California leaf-nosed bat	*Macrotus californicus*			X			X			X			3
California least tern	*Sternula antillarum browni*							X					1
Cave myotis	*Myotis velifer*			X			X			X			3
Coachella valley fringe-toed lizard	*Uma inornata*				X			X					2
Colorado desert fringe-toed lizard	*Uma notata*				X			X					2
Crissal thrasher	*Toxostoma crissale*			X	X		X			X			4
Couch's spadefoot	*Scaphiopus couchii*			X	X		X						3
Desert bighorn sheep	*Ovis canadensis nelsoni*			X			X						2
Flat-tailed horned lizard	*Phrynosoma mcallii*			X	X		X	X					4
Fringed myotis	*Myotis thysanodes*						X	X		X			3
Fulvous whistling-duck	*Dendrocygna bicolor*											X	1
Gila woodpecker	*Melanerpes uropygialis*			X			X			X			3
Gray vireo	*Vireo vicinior*								X				1
Greater sandhill crane	*Grus canadensis tabida*											X	1
Grizzly bear	*Ursus arctos*	X	X	X	X	X	X	X	X	X	X	X	11
Gull-billed tern	*Gelochelidon nilotica*							X				X	2
Large-billed savannah sparrow	*Passerculus sandwichensis rostratus*	X	X			X					X		4
Least bittern	*Ixobrychus exilis*					X					X	X	3
Lesser sandhill crane	*Grus canadensis canadensis*											X	1
Loggerhead shrike	*Lanius ludovicianus*	X								X			2
Long-eared owl	*Asio otus*	X							X	X			3
Long-legged myotis	*Myotis volans*							X					1
Lowland leopard frog	*Lithobates yavapaiensis*						X					X	2
Lucy's warbler	*Oreothlypis luciae*									X			1
Mexican long-tongued bat	*Choeronycteris mexicana*		X	X	X		X	X	X	X			7
Mohave desert tortoise	*Gopherus agassizi*			X	X		X						3

Table C-26 Colorado Desert Ecoregion

Common Name	Scientific Name	USNVC Macrogroup											Total (SGCN)
		California Annual and Perennial Grassland	California Coastal Scrub	Great Basin Saltbush Scrub	Mojavean–Sonoran Semi-Desert Scrub	North American Pacific Coastal Salt Marsh	North American Warm-Desert Xero-Riparian	North American Warm Semi-Desert Cliff, Scree, and Rock Vegetation	Warm Interior Chaparral	Warm Southwest Riparian Forest	Warm Semi-Desert/Mediterranean Alkali-Saline Wetland	Western North American Freshwater Marsh	
Mountain plover	*Charadrius montanus*	X						X					2
Pallid bat	*Antrozous pallidus*	X						X					2
Palm Springs pocket mouse	*Perognathus longimembris bangsi*				X								1
Palm Springs round-tailed ground squirrel	*Xerospermophilus tereticaudus chlorus*				X								1
Palo Verde mountains ringtail	*Bassariscus astutus willetti*		X							X			2
Pronghorn	*Antilocapra americana*	X		X									2
Red diamond rattlesnake	*Crotalus ruber*				X				X				2
Red knot	*Calidris canutus*										X		1
Redhead	*Aythya americana*											X	1
Ruddy turnstone	*Arenaria interpres*							X				X	2
Sanderling	*Calidris alba*										X		1
Sandstone night lizard	*Xantusia gracilis*							X	X				2
Scott's oriole	*Icterus parisorum*				X								1
Snowy plover (interior population)	*Charadrius nivosus*										X		1
Sonora mud turtle	*Kinosternon sonoriense*						X					X	2
Sonora beaver	*Castor canadensis frondator (incl. Repentinus)*						X			X		X	3
Sonoran desert toad	*Incilius alvarius*			X			X				X		3
Southwestern river otter	*Lontra canadensis sonora*						X			X			2
Southern California legless lizard	*Anniella stebbinsi*				X		X		X				3
Summer tanager	*Piranga rubra*									X			1
Townsend's big-eared bat	*Corynorhinus townsendii*		X	X	X		X	X	X	X			7
Valle de la Trinidad kangaroo rat	*Dipodomys merriami trinidadensis*				X								1
Vermilion flycatcher	*Pyrocephalus rubinus*									X			1
Western yellow-billed cuckoo	*Coccyzus americanus occidentalis*									X			1
Wood stork	*Mycteria americana*									X	X	X	3
Yellow warbler	*Setophaga petechia*									X			1
Yellow-breasted chat	*Icteria virens*									X			1
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*											X	1
Yuma Ridgway's rail	*Rallus obsoletus yumanensis*					X					X	X	3
Yuma ringtail	*Bassariscus astutus yumanensis*		X				X			X			3
	Total (Macrogroup)	9	8	17	20	5	22	19	10	26	14	15	

Table C-27 Southeastern Great Basin Ecoregion

Common Name	Scientific Name	USNVC Macrogroup											
		Cool Semi-Desert Wash and Disturbance Scrub	Great Basin Saltbush Scrub	Inter-Mountain Dry Shrubland and Grassland	North American Pacific Coastal Salt Marsh	Rocky Mountain Subalpine and High Montane Conifer Forest	Warm Semi-Desert/Mediterranean Alkali-Saline Wetland	Warm Southwest Riparian Forest	Western North America Dwarf Sage Shrubland and Steppe	Western North America Tall Sage Shrubland and Steppe	Western North American Freshwater Marsh	Western North American Temperate Grassland and Meadow	Total (SGCN)
American badger	*Taxidea taxus*	X	X	X			X	X	X	X			7
American pika	*Ochotona princeps*												0
Bald eagle	*Haliaeetus leucocephalus*												0
Bighorn sheep	*Ovis canadensis*												0
Black toad	*Anaxyrus exsul*										X	X	2
Burrowing owl	*Athene cunicularia*	X	X	X			X	X	X	X			7
California wolverine	*Gulo gulo*					X							1
Gray wolf	*Canis lupis*		X	X		X		X	X	X		X	7
Grizzly bear	*Ursus arctos*	X	X	X	X	X	X	X	X	X	X	X	11
Inyo california towhee	*Melozone crissalis eremophilus*	X		X									2
Inyo long-tailed weasel	*Mustela frenata inyoensis*	X	X	X		X				X			5
Inyo Mountains salamander	*Batrachoseps campi*							X					1
Least bittern	*Ixobrychus exilis*				X						X		2
Loggerhead shrike	*Lanius ludovicianus*			X				X					2
Long-eared myotis	*Myotis evotis*					X							1
Long-eared owl	*Asio otus*	X		X				X		X		X	5
Lucy’s warbler	*Oreothlypis luciae*		X					X					2
Mohave desert tortoise	*Gopherus agassizii*	X	X										2
Mohave ground squirrel	*Spermophilus (=xerospermophilus) mohavensis*	X	X	X					X	X			5
Northern goshawk	*Accipiter gentilis*					X							1
Northern harrier	*Circus cyaneus*			X	X						X	X	4
Pallid bat	*Antrozous pallidus*			X									1
Panamint alligator lizard	*Elgaria panamintina*							X					1
Pronghorn	*Antilocapra americana*		X	X									2
Pygmy rabbit	*Brachylagus idahoensis*								X	X		X	3
Regal ring-necked snake	*Diadophis punctatus regalis*							X				X	2
Sierra Nevada bighorn sheep	*Ovis canadensis sierrae*					X			X	X			3
Southern grasshopper mouse	*Onychomys torridus ramona*		X				X						2
Summer tanager	*Piranga rubra*							X					1
Swainson’s hawk	*Buteo swainsoni*			X									1
Townsend’s big-eared bat	*Corynorhinus townsendii*	X	X			X							3
Yellow warbler	*Setophaga petechia*							X					1
Yellow-breasted chat	*Icteria virens*							X					1
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*										X	X	2
	Total (Macrogroup)	9	11	13	3	8	4	13	7	9	5	8	

Marine Province

Table C-28 Marine and Offshore Islands

Common Name	Scientific Name	Northern California Coast	Central California Coast	Southern California Coast	Total (SGCN)
Ashy storm-petrel	*Oceanodroma homochroa*	X	X	X	3
Black oystercatcher	*Haematopus bachmani*	X	X	X	3
Black skimmer	*Rynchops niger*		X	X	2
Black storm-petrel	*Oceanodroma melania*			X	1
Black turnstone	*Arenaria melanocephala*	X		X	2
Brandt's cormorant	*Phalacrocorax penicillatus*	X	X	X	3
Burrowing owl	*Athene cunicularia*			X	1
California brown pelican	*Pelecanus occidentalis californicus*	X	X	X	3
California least tern	*Sternula antillarum browni*		X	X	2
Cassin's auklet	*Ptychoramphus aleuticus*	X	X	X	3
Common murre	*Uria aalge*	X	X	X	3
Craveri's murrelet	*Synthliboramphus craveri*		X	X	2
Elegant tern	*Thalasseus elegans*			X	1
Fork-tailed storm-petrel	*Oceanodroma furcata*	X			1
Green sea turtle	*Chelonia mydas*	X	X	X	3
Grizzly bear	*Ursus arctos*	X		X	2
Guadalupe fur-seal	*Arctocephalus townsendi*			X	1
Guadalupe murrelet	*Synthliboramphus hypoleucus*	X	X	X	3
Gull-billed tern	*Gelochelidon nilotica*			X	1
Island night lizard	*Xantusia riversiana*			X	1
Leatherback sea turtle	*Dermochelys coriacea*	X	X	X	3
Loggerhead sea turtle	*Caretta acretta*	X	X	X	3
Marbled murrelet	*Brachyramphus marmoratus*	X	X	X	3
Olive ridley sea turtle	*Lepidochelys olivacea*	X	X	X	3
Pelagic cormorant	*Phalacrocorax pelagicus*	X	X	X	3
Pigeon guillemot	*Cepphus columba*	X	X	X	3
Red knot	*Calidris canutus*	X	X	X	3
Rhinoceros auklet	*Cerorhinca monocerata*	X	X	X	3
Royal tern	*Thalasseus maximus*		X	X	2
Ruddy turnstone	*Arenaria interpres*	X	X	X	3
Sanderling	*Calidris alba*	X	X	X	3
Scripps's murrelet	*Synthliboramphus scrippsi*	X	X	X	3
Stellar (=northern) sea lion	*Eumetopias jubatus*	X	X	X	3
Surfbird	*Aphriza virgata*	X	X	X	3
Tufted puffin	*Fratercula cirrhata*	X	X	X	3
Two-striped gartersnake	*Thamnophis hammondii*			X	1
Wandering tattler	*Tringa incana*	X	X		2
Western snowy plover (coastal population)	*Charadrius nivosus*		X	X	2
	Total (Ecoregion)	26	28	36	

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Appendix D

Appendix D Ranked Lists of Vegetation Communities (Macrogroups) by Ecoregion

A systematic method was employed to identify and rank vegetation communities (macrogroups) for consideration as priority conservation targets in the State Wildlife Action Plan 2015 Update. Within each terrestrial conservation unit, conservation targets were selected, first based on analysis of three criteria: endemism (Table D-1), total biodiversity, and vulnerability (rarity), and then considered in context of need, based on pressures. Each vegetation community (macrogroup) was evaluated based on these criteria and ranked according to its score. Spreadsheets with lists of macrogroups, sorted by rank were provided to each team working in each conservation unit to identify the priority targets, for which conservations strategies would be developed.

In most cases one or more of the top ranked macrogroups were selected as the targets. In some cases (Modoc Plateau, Mojave Desert, Mono, Northwest Basin and Range, and Sonoran Desert), in addition to consideration of the ranking, the team applied an additional consideration of "pressure." If there were known pressures to a lower ranked macrogroup, and those pressures could be reduced through development and implementation of a focused conservation strategy, then that macrogroup could be selected as a target. Similarly, if there were known existing conservation efforts already in place that were focused on the macrogroup, it is possible this macrogroup was skipped in favor of one that had greater need. Tables D-2 through D-20 show the combined target rank for each macrogroup by ecoregion and which macrogroups were selected as priorities (shown in bold).

Table D-21 provides a list of all macrogroups in California, with the U.S. National Vegetation Classification macrogroup name and common name used in California, ecological description, and relationship to California Wildlife Habitat Relationship (CWHR) classification. In addition, the provinces where each community occurs and the provinces where the community has been identified as a priority target are identified.

Ranking Method

- The target rank is the sum of biodiversity, vulnerability, and endemism ranks. The smaller number is a "better" rank (i.e., the target contains more biodiversity, vulnerability, and endemism).
- Biodiversity, vulnerability and endemism were ranked from 1 - 5 in quantiles, representing the top 1/5 (rank 1), the second fifth (rank 2), and the bottom 1/5 (rank 5).
- Biodiversity ranks and endemism ranks were derived from CWHR queries that listed the total number of native species (i.e., biodiversity) and the number of endemic species by CWHR type, which was then cross-walked to the macrogroups. Vulnerability ranks were derived from calculating the inverse of the area each macrogroup occupies within each ecoregion times total biodiversity. This identified those macrogroups supporting the most species but least available in the ecoregion.

Table D-1 Endemism Rule

Proportion of North American range or population within California	Score
Mammals	
Percentage of Entire Range within California (EN). This criterion measures what proportion of the entire geographic range of a taxon occurs within California. Taxa mostly or entirely restricted to California are considered of greater concern in California than are taxa with only a small proportion of their range in the state. The teams relied on range maps in Hall (1981) to approximate a taxon's geographic range unless better alternatives were available.	
100% (endemic)	10
80% - 100%	7.5
50% - 80%	5
20% - 50%	2.5
< 20%	0
Birds	
Percentage of Entire Range within California (EN). This criterion measures what proportion of a taxon's North American range or population occurs within California. Taxa with a high proportion of their range or population within California are considered of greater concern than taxa with only a small proportion of their range or population in the state.	
100% (endemic)	10
>80% but <100% (near-endemic)	7.5
>50%-80%	5
>20%-50%	2.5
<20%	0
Amphibians and Reptiles	
Percentage of a species' entire range that occurs in California (EN). Endemism determines the extent to which conservation actions in California are likely to impact the taxon's persistence range wide. From another perspective, this is a way of measuring California's responsibility to conserve individual species. Taxa whose range is completely, or nearly completely, contained within California's borders are in need of greater conservation consideration from our state than taxa whose range only extends peripherally into California. We recognize that this presumes appropriate conservation measures are also being implemented in other areas of North America (including Mexico and Canada), and that such conservation may be more completely, or less completely, implemented in California. We again made this measure discrete in recognition of the inherent uncertainty in our knowledge of range limits.	
100% (endemic)	10
>66-99%	7
33-66	3
<33%	0

North Coast and Klamath Province

Table D-2 Northern California Coast Ecoregion

USNVC Macrogroup	Common Name	Target Rank[1]
Vancouverian Flooded and Swamp Forest*	**North Coastal and Montane Riparian Forest and Woodland**	**3**
California Forest and Woodland	California Foothill and Valley Forests and Woodlands	3
Californian–Vancouverian Montane and Foothill Forest	North Coastal Mixed Evergreen and Montane Conifer Forests	3
Warm Southwest Riparian Forest	American Southwest Riparian Forest and Woodland	6
Vancouverian Rainforest*	**Pacific Northwest Conifer Forests**	**7**
Western North American Freshwater Aquatic Vegetation	Freshwater Aquatic Vegetation	8
Western North American Freshwater Marsh*	**Freshwater Marsh**	**8**
Western North America Wet Meadow and Low Shrub Carr	Wet Mountain Meadow	9
Vancouverian Lowland Grassland and Shrubland	North Coast Deciduous Scrub and Terrace Prairie	9
Western North American Temperate Grassland and Meadow	Western Upland Grasslands	10
North American Pacific Coastal Salt Marsh	Salt Marsh	13
California Annual and Perennial Grassland	California Grassland and Flowerfields	13
California Coastal Scrub	Coastal Sage Scrub	13
Vancouverian Coastal Dune and Bluff*	**Coastal Dune and Bluff Scrub**	**13**
California Chaparral	Chaparral	14
Introduced North American Mediterranean woodland and forest	Non-Native Forest and Woodlands	15

[1] Based on analysis of total biodiversity, vulnerability (rarity), and endemism

* Selected macrogroup for conservation strategy development in SWAP 2015

Table D-3 Northern California Coast Ranges Ecoregion

USNVC Macrogroup	Common Name	Target Rank[1]
California Forest and Woodland	California Foothill and Valley Forests and Woodlands	3
Warm Southwest Riparian Forest	American Southwest Riparian Forest and Woodland	4
Western North American Temperate Grassland and Meadow	Western Upland Grasslands	4
California Annual and Perennial Grassland	California Grassland and Flowerfields	4
California Cliff, Scree, and Other Rock Vegetation	California Foothill and Coastal Rock Outcrop Vegetation	7
Temperate Pacific Intertidal Shore	Brackish (Estuarine) Submerged Aquatic Vegetation	7
Western North American Freshwater Aquatic Vegetation	Freshwater Aquatic Vegetation	7
Western North American Freshwater Marsh	Freshwater Marsh	7
Vancouverian Flooded and Swamp Forest*	**North Coastal and Montane Riparian Forest and Woodland**	**8**
Vancouverian Rainforest	Pacific Northwest Conifer Forests	8
Californian–Vancouverian Montane and Foothill Forest	North Coastal Mixed Evergreen and Montane Conifer Forests	8
California Chaparral	Chaparral	9
California Coastal Scrub	Coastal Sage Scrub	10

Table D-3 Northern California Coast Ranges Ecoregion

USNVC Macrogroup	Common Name	Target Rank[1]
Western North American Montane-Subalpine Wet Shrubland and Wet Meadow	Mountain Riparian Scrub and Wet Meadow	11
Western North America Wet Meadow and Low Shrub Carr	Wet Mountain Meadow	11
Cool Interior Chaparral	Montane Chaparral	13
Western Cordilleran Montane Shrubland and Grassland	Montane Upland Deciduous Scrub	13
Western North America Dwarf Sage Shrubland and Steppe	Great Basin Dwarf Sagebrush Scrub	15
Inter-Mountain Dry Shrubland and Grassland	Great Basin Upland Scrub	15
Rocky Mountain Subalpine and High Montane Conifer Forest	Subalpine Aspen Forests and Pine Woodlands	15
Vancouverian Subalpine Forest*	**Pacific Northwest Subalpine Forest**	**15**

[1] Based on analysis of total biodiversity, vulnerability (rarity), and endemism
* Selected macrogroup for conservation strategy development in SWAP 2015

Table D-4 Northern California Interior Coast Ranges Ecoregion

USNVC Macrogroup	Common Name	Target Rank[1]
California Forest and Woodland*	**California Foothill and Valley Forests and Woodlands**	**4**
Western North American Temperate Grassland and Meadow	Western Upland Grasslands	5
Western North American Freshwater Marsh	Freshwater Marsh	6
California Annual and Perennial Grassland	California Grassland and Flowerfields	6
Warm Southwest Riparian Forest	American Southwest Riparian Forest and Woodland	6
Vancouverian Flooded and Swamp Forest	North Coastal and Montane Riparian Forest and Woodland	9
Western North America Wet Meadow and Low Shrub Carr	Wet Mountain Meadow	10
Californian–Vancouverian Montane and Foothill Forest	North Coastal Mixed Evergreen and Montane Conifer Forests	12
California Coastal Scrub	Coastal Sage Scrub	13
Western Cordilleran Montane Shrubland and Grassland	Montane Upland Deciduous Scrub	15
California Chaparral	Chaparral	15

[1] Based on analysis of total biodiversity, vulnerability (rarity), and endemism
* Selected macrogroup for conservation strategy development in SWAP 2015

Table D-5 Klamath Ecoregion

USNVC Macrogroup	Common Name	Target Rank[1]
Vancouverian Rainforest	Pacific Northwest Conifer Forests	3
Western North American Temperate Grassland and Meadow*	**Western Upland Grasslands**	**3**
Western North American Montane/Boreal Peatland*	**Fen (Wet Meadow)**	**3**
Warm Southwest Riparian Forest	American Southwest Riparian Forest and Woodland	4
Vancouverian Flooded and Swamp Forest	North Coastal and Montane Riparian Forest and Woodland	4
Western North American Montane-Subalpine Wet Shrubland and Wet Meadow*	**Mountain Riparian Scrub and Wet Meadow**	**5**
Western North America Wet Meadow and Low Shrub Carr*	**Wet Mountain Meadow**	**5**
Californian–Vancouverian Montane and Foothill Forest	North Coastal Mixed Evergreen and Montane Conifer Forests	6
Western North American Freshwater Aquatic Vegetation	Freshwater Aquatic Vegetation	7
Western North American Freshwater Marsh	Freshwater Marsh	7
California Annual and Perennial Grassland	California Grassland and Flowerfields	8
Rocky Mountain Subalpine and High Montane Conifer Forest*	**Subalpine Aspen Forests and Pine Woodlands**	**10**
California Cliff, Scree, and Other Rock Vegetation	California Foothill and Coastal Rock Outcrop Vegetation	10
Inter-Mountain Dry Shrubland and Grassland	Great Basin Upland Scrub	10
Vancouverian Subalpine Forest	Pacific Northwest Subalpine Forest	11
California Coastal Scrub	Coastal Sage Scrub	11
Vancouverian Alpine Scrub, Forb Meadow, and Grassland*	**Alpine Vegetation**	**13**
Cool Interior Chaparral	Montane Chaparral	13
Western Cordilleran Montane Shrubland and Grassland*	**Montane Upland Deciduous Scrub**	**13**
North American Pacific Coastal Salt Marsh	Salt Marsh	14
Western North America Dwarf Sage Shrubland and Steppe	Great Basin Dwarf Sagebrush Scrub	15
Western North America Tall Sage Shrubland and Steppe	Big Sagebrush Scrub	15

[1] Based on analysis of total biodiversity, vulnerability (rarity), and endemism

* Selected macrogroup for conservation strategy development in SWAP 2015

Cascades and Modoc Plateau Province

Table D-6 Southern Cascades Ecoregion

USNVC Macrogroup	Common Name	Target Rank[1]
Western North American Montane/Boreal Peatland	Fen (Wet Meadow)	3
Western North American Temperate Grassland and Meadow*	**Western Upland Grasslands**	**3**
California Forest and Woodland	California Foothill and Valley Forests and Woodlands	3
Western North American Montane-Subalpine Wet Shrubland and Wet Meadow	Mountain Riparian Scrub and Wet Meadow	5
Western North America Wet Meadow and Low Shrub Carr	Wet Mountain Meadow	5
Vancouverian Flooded and Swamp Forest	North Coastal and Montane Riparian Forest and Woodland	5
Californian–Vancouverian Montane and Foothill Forest*	**North Coastal Mixed Evergreen and Montane Conifer Forests**	**6**
Western North American Freshwater Aquatic Vegetation	Freshwater Aquatic Vegetation	7
Western North American Freshwater Marsh	Freshwater Marsh	7
Warm Southwest Riparian Forest	American Southwest Riparian Forest and Woodland	7
Vancouverian Lowland Grassland and Shrubland	North Coast Deciduous Scrub and Terrace Prairie	9
California Coastal Scrub	Coastal Sage Scrub	10
Vancouverian Subalpine Forest	Pacific Northwest Subalpine Forest	10
Cool Semi-Desert Wash and Disturbance Scrub	High Desert Wash and "Rangeland" Scrub	12
Western North America Tall Sage Shrubland and Steppe	Big Sagebrush Scrub	12
California Chaparral	Chaparral	12
Vancouverian Alpine Scrub, Forb Meadow, and Grassland	Alpine Vegetation	13
Rocky Mountain Subalpine and High Montane Conifer Forest	Subalpine Aspen Forests and Pine Woodlands	13
Intermountain Singleleaf Pinyon–Western Juniper Woodland		13
Cool Interior Chaparral	Montane Chaparral	14
Western Cordilleran Montane Shrubland and Grassland	Montane Upland Deciduous Scrub	14
Western North America Dwarf Sage Shrubland and Steppe	Great Basin Dwarf Sagebrush Scrub	15

[1] Based on analysis of total biodiversity, vulnerability (rarity), and endemism

* Selected macrogroup for conservation strategy development in SWAP 2015

Table D-7 Modoc Plateau Ecoregion

USNVC Macrogroup	Common Name	Target Rank[1]
California Forest and Woodland	California Foothill and Valley Forests and Woodlands	3
Western North America Vernal Pool	Vernal Pools	4
Californian–Vancouverian Montane and Foothill Forest	North Coastal Mixed Evergreen and Montane Conifer Forests	5
Warm Southwest Riparian Forest	American Southwest Riparian Forest and Woodland	5
Western North American Montane-Subalpine Wet Shrubland and Wet Meadow	Mountain Riparian Scrub and Wet Meadow	5
Western North American Temperate Grassland and Meadow	Western Upland Grasslands	5

Table D-7 Modoc Plateau Ecoregion

USNVC Macrogroup	Common Name	Target Rank[1]
Western North American Freshwater Aquatic Vegetation	Freshwater Aquatic Vegetation	7
Western North American Freshwater Marsh	Freshwater Marsh	7
Vancouverian Flooded and Swamp Forest	North Coastal and Montane Riparian Forest and Woodland	8
Western North America Wet Meadow and Low Shrub Carr	Wet Mountain Meadow	8
California Annual and Perennial Grassland	California Grassland and Flowerfields	9
Cool Semi-Desert Wash and Disturbance Scrub	High Desert Wash and "Rangeland" Scrub	12
Western North America Tall Sage Shrubland and Steppe*	**Big Sagebrush Scrub**	**12**
Rocky Mountain Subalpine and High Montane Conifer Forest	Subalpine Aspen Forests and Pine Woodlands	13
Vancouverian Subalpine Forest	Pacific Northwest Subalpine Forest	13
Inter-Mountain Dry Shrubland and Grassland*	**Great Basin Upland Scrub**	**14**
Cool Interior Chaparral	Montane Chaparral	14
Western Cordilleran Montane Shrubland and Grassland	Montane Upland Deciduous Scrub	14
Western North America Dwarf Sage Shrubland and Steppe*	**Great Basin Dwarf Sagebrush Scrub**	**15**

[1] Based on analysis of total biodiversity, vulnerability (rarity), and endemism
* Selected macrogroup for conservation strategy development in SWAP 2015

Table D-8 Northwest Basin and Range Ecoregion

USNVC Macrogroup	Common Name	Target Rank[1]
Warm Southwest Riparian Forest	American Southwest Riparian Forest and Woodland	3
Western Cordilleran Montane Shrubland and Grassland	Montane Upland Deciduous Scrub	4
Inter-Mountain Dry Shrubland and Grassland	Great Basin Upland Scrub	6
Western North America Wet Meadow and Low Shrub Carr	Wet Mountain Meadow	6
Western North American Temperate Grassland and Meadow	Western Upland Grasslands	6
Western North American Freshwater Marsh	Freshwater Marsh	7
Rocky Mountain Subalpine and High Montane Conifer Forest	Subalpine Aspen Forests and Pine Woodlands	9
Californian–Vancouverian Montane and Foothill Forest	North Coastal Mixed Evergreen and Montane Conifer Forests	11
Cool Semi-Desert Wash and Disturbance Scrub	High Desert Wash and "Rangeland" Scrub	11
Intermountain Basins Pinyon–Juniper Woodland*	**Great Basin Pinyon-Juniper Woodland**	**11**
North American Pacific Coastal Salt Marsh	Salt Marsh	11
Western North America Tall Sage Shrubland and Steppe	Big Sagebrush Scrub	12
Cool Interior Chaparral	Montane Chaparral	14
Western North America Dwarf Sage Shrubland and Steppe	Great Basin Dwarf Sagebrush Scrub	14
Great Basin Saltbush Scrub	Shadscale-Saltbush Scrub	15
Warm Semi-Desert/Mediterranean Alkali–Saline Wetland	Salt Marsh Meadows	15

[1] Based on analysis of total biodiversity, vulnerability (rarity), and endemism
* Selected macrogroup for conservation strategy development in SWAP 2015

Bay Delta and Central Coast Province

Table D-9 Central California Coast Ecoregion

USNVC Macrogroup	Common Name	Target Rank[1]
Western North America Vernal Pool*	**Vernal Pools**	**4**
California Annual and Perennial Grassland*	**California Grassland and Flowerfields**	**4**
California Forest and Woodland	California Foothill and Valley Forests and Woodlands	4
Western North American Freshwater Marsh	**Freshwater Marsh**	**5**
Warm Southwest Riparian Forest*	**American Southwest Riparian Forest and Woodland**	**5**
Western North American Temperate Grassland and Meadow	Western Upland Grasslands	7
California Chaparral	Chaparral	8
Vancouverian Cliff, Scree, and Other Rock Vegetation*	**Northwest Coast Cliff and Outcrop**	**8**
Western North America Wet Meadow and Low Shrub Carr	Wet Mountain Meadow	8
Californian–Vancouverian Montane and Foothill Forest	North Coastal Mixed Evergreen and Montane Conifer Forests	8
California Coastal Scrub*	**Coastal Sage Scrub**	**11**
Vancouverian Coastal Dune and Bluff*	**Coastal Dune and Bluff Scrub**	**11**
Vancouverian Lowland Grassland and Shrubland*	**North Coast Deciduous Scrub and Terrace Prairie**	**11**
Vancouverian Rainforest	Pacific Northwest Conifer Forests	12
North American Pacific Coastal Salt Marsh	Salt Marsh	13
Introduced North American Mediterranean Woodland and Forest	Non-Native Forest and Woodlands	15
Warm Semi-Desert/Mediterranean Alkali–Saline Wetland	Salt Marsh Meadows	15

[1] Based on analysis of total biodiversity, vulnerability (rarity), and endemism

* Selected macrogroup for conservation strategy development in SWAP 2015

Table D-10 Central California Coast Ranges Ecoregion

USNVC Macrogroup	Common Name	Target Rank[1]
California Forest and Woodland	California Foothill and Valley Forests and Woodlands	3
Western North America Vernal Pool*	**Vernal Pools**	**4**
California Annual and Perennial Grassland*	**California Grassland and Flowerfields**	**4**
Western North American Temperate Grassland and Meadow	Western Upland Grasslands	5
Warm Southwest Riparian Forest*	**American Southwest Riparian Forest and Woodland**	**6**
California Chaparral	Chaparral	7
Vancouverian Flooded and Swamp Forest	North Coastal and Montane Riparian Forest and Woodland	7
Warm Interior Chaparral	Desert Transition Chaparral	8
California Coastal Scrub*	Coastal Sage Scrub	8
Vancouverian Coastal Dune and Bluff	Coastal Dune and Bluff Scrub	8
California Cliff, Scree, and Other Rock Vegetation	California Foothill and Coastal Rock Outcrop Vegetation	9
Western Cordilleran Montane Shrubland and Grassland	Montane Upland Deciduous Scrub	11

Table D-10 Central California Coast Ranges Ecoregion

USNVC Macrogroup	Common Name	Target Rank[1]
Warm Semi-Desert/Mediterranean Alkali–Saline Wetland	Salt Marsh Meadows	12
North American Warm-Desert Xero-Riparian	Desert Wash Woodland and Scrub	13
Great Basin Saltbush Scrub	Shadscale-Saltbush Scrub	14
Cool Semi-Desert Wash and Disturbance Scrub	High Desert Wash and "Rangeland" Scrub	15
Western North America Tall Sage Shrubland and Steppe	Big Sagebrush Scrub	15

[1] Based on analysis of total biodiversity, vulnerability (rarity), and endemism
* Selected macrogroup for conservation strategy development in SWAP 2015

Central Valley and Sierra Nevada Province

Table D-11 Great Valley Ecoregion

USNVC Macrogroup	Common Name	Target Rank[1]
Western North America Vernal Pool	Vernal Pools	4
California Annual and Perennial Grassland	California Grassland and Flowerfields	4
Warm Southwest Riparian Forest*	**American Southwest Riparian Forest and Woodland**	**4**
Vancouverian Lowland Grassland and Shrubland	North Coast Deciduous Scrub and Terrace Prairie	4
Vancouverian Flooded and Swamp Forest	North Coastal and Montane Riparian Forest and Woodland	4
Western North American Freshwater Aquatic Vegetation	Freshwater Aquatic Vegetation	6
Western North American Freshwater Marsh*	**Freshwater Marsh**	**6**
Western North American Temperate Grassland and Meadow	Western Upland Grasslands	8
California Forest and Woodland	California Foothill and Valley Forests and Woodlands	8
Western North America Wet Meadow and Low Shrub Carr	Wet Mountain Meadow	9
California Coastal Scrub	Coastal Sage Scrub	11
Vancouverian Coastal Dune and Bluff	Coastal Dune and Bluff Scrub	11
Mojavean–Sonoran Desert Scrub	Mojave and Sonoran Desert Scrub	13
North American Pacific Coastal Salt Marsh	Salt Marsh	13
Warm Semi-Desert/Mediterranean Alkali–Saline Wetland	Salt Marsh Meadows	14
Introduced North American Mediterranean Woodland and Forest	Non-Native Forest and Woodlands	15
North American Warm-Desert Xero-Riparian	Desert Wash Woodland and Scrub	15

[1] Based on analysis of total biodiversity, vulnerability (rarity), and endemism
* Selected macrogroup for conservation strategy development in SWAP 2015

Table D-12 Sierra Nevada Foothills Ecoregion

USNVC Macrogroup	Common Name	Target Rank[1]
California Forest and Woodland*	**California Foothill and Valley Forests and Woodlands**	**4**
Western North American Temperate Grassland and Meadow	Western Upland Grasslands	4
Western North America Vernal Pool	Vernal Pools	5
California Annual and Perennial Grassland	California Grassland and Flowerfields	5
Warm Southwest Riparian Forest	American Southwest Riparian Forest and Woodland	8
Vancouverian Flooded and Swamp Forest	North Coastal and Montane Riparian Forest and Woodland	8
Western North American Freshwater Marsh	Freshwater Marsh	8
Californian–Vancouverian Montane and Foothill Forest	North Coastal Mixed Evergreen and Montane Conifer Forests	9
Western North America Wet Meadow and Low Shrub Carr	Wet Mountain Meadow	9
Vancouverian Lowland Grassland and Shrubland	North Coast Deciduous Scrub and Terrace Prairie	10
Warm Interior Chaparral*	**Desert Transition Chaparral**	**12**
California Chaparral*	**Chaparral**	**12**
California Coastal Scrub	Coastal Sage Scrub	13
Cool Interior Chaparral*	**Montane Chaparral**	**15**
Western Cordilleran Montane Shrubland and Grassland	Montane Upland Deciduous Scrub	15
California Cliff, Scree, and Other Rock Vegetation*	**California Foothill and Coastal Rock Outcrop Vegetation**	**15**

[1] Based on analysis of total biodiversity, vulnerability (rarity), and endemism

* Selected macrogroup for conservation strategy development in SWAP 2015

Table D-13 Sierra Nevada Ecoregion

USNVC Macrogroup	Common Name	Target Rank[1]
Californian–Vancouverian Montane and Foothill Forest*	**North Coastal Mixed Evergreen and Montane Conifer Forests**	
California Forest and Woodland*	California Foothill and Valley Forests and Woodlands	3
Vancouverian Flooded and Swamp Forest	North Coastal and Montane Riparian Forest and Woodland	3
Western North American Montane/Boreal Peatland	Fen (Wet Meadow)	3
Western North American Temperate Grassland and Meadow*	**Western Upland Grasslands**	**3**
Western North American Montane-Subalpine Wet Shrubland and Wet Meadow	Mountain Riparian Scrub and Wet Meadow	4
Western North America Wet Meadow and Low Shrub Carr*	**Wet Mountain Meadow**	**4**
Western North American Freshwater Aquatic Vegetation	Freshwater Aquatic Vegetation	6
Western North American Freshwater Marsh	Freshwater Marsh	6
Vancouverian Lowland Grassland and Shrubland	North Coast Deciduous Scrub and Terrace Prairie	6
Warm Southwest Riparian Forest	American Southwest Riparian Forest and Woodland	6
Warm Interior Chaparral	Desert Transition Chaparral	8
Vancouverian Subalpine Forest*	**Pacific Northwest Subalpine Forest**	**9**
California Coastal Scrub	Coastal Sage Scrub	9
Cool Interior Chaparral*	Montane Chaparral	11
Western Cordilleran Montane Shrubland and Grassland	Montane Upland Deciduous Scrub	11

Table D-13 Sierra Nevada Ecoregion

USNVC Macrogroup	Common Name	Target Rank[1]
Intermountain Singleleaf Pinyon–Western Juniper Woodland		11
Great Basin Saltbush Scrub	Shadscale-Saltbush Scrub	12
Rocky Mountain Subalpine and High Montane Conifer Forest	Subalpine Aspen Forests and Pine Woodlands	12
Cool Semi-Desert Wash and Disturbance Scrub	High Desert Wash and "Rangeland" Scrub	12
Western North America Tall Sage Shrubland and Steppe	Big Sagebrush Scrub	12
Inter-Mountain Dry Shrubland and Grassland	Great Basin Upland Scrub	13
Rocky Mountain Alpine Scrub, Forb Meadow, and Grassland*	**Alpine Vegetation**	**14**
Vancouverian Alpine Scrub, Forb Meadow, and Grassland*	**Alpine Vegetation**	**14**
Western North America Dwarf Sage Shrubland and Steppe	Great Basin Dwarf Sagebrush Scrub	15

[1] Based on analysis of total biodiversity, vulnerability (rarity), and endemism
* Selected macrogroup for conservation strategy development in SWAP 2015

South Coast Ecoregion

Table D-14 Southern California Coast Ecoregion

USNVC Macrogroup	Common Name	Target Rank[1]
Warm Southwest Riparian Forest*	**American Southwest Riparian Forest and Woodland**	**3**
Western North American Freshwater Marsh*	**Freshwater Marsh**	**3**
California Forest and Woodland	California Foothill and Valley Forests and Woodlands	4
California Annual and Perennial Grassland*	**California Grassland and Flowerfields**	**5**
Western North America Vernal Pool	Vernal Pools	6
Vancouverian Flooded and Swamp Forest	North Coastal and Montane Riparian Forest and Woodland	6
California Coastal Scrub	Coastal Sage Scrub	7
Vancouverian Coastal Dune and Bluff	Coastal Dune and Bluff Scrub	7
Western North American Temperate Grassland and Meadow	Western Upland Grasslands	8
California Chaparral	Chaparral	9
Warm Interior Chaparral	Desert Transition Chaparral	9
Western North American Freshwater Aquatic Vegetation	Freshwater Aquatic Vegetation	10
Western North America Wet Meadow and Low Shrub Carr	Wet Mountain Meadow	10
California Cliff, Scree, and Other Rock Vegetation	California Foothill and Coastal Rock Outcrop Vegetation	11
Californian–Vancouverian Montane and Foothill Forest	North Coastal Mixed Evergreen and Montane Conifer Forests	11
Introduced North American Mediterranean Woodland and Forest	Non-Native Forest and Woodlands	15
North American Warm-Desert Xero-Riparian	Desert Wash Woodland and Scrub	15
North American Pacific Coastal Salt Marsh	Salt Marsh	15
Warm Semi-Desert/Mediterranean Alkali–Saline Wetland	Salt Marsh Meadows	15

[1] Based on analysis of total biodiversity, vulnerability (rarity), and endemism
* Selected macrogroup for conservation strategy development in SWAP 2015

Table D-15 South Coast Mountains and Valleys Ecoregion

USNVC Macrogroup	Common Name	Target Rank[1]
California Forest and Woodland	California Foothill and Valley Forests and Woodlands	3
Western North America Vernal Pool	Vernal Pools	3
California Annual and Perennial Grassland*	**California Grassland and Flowerfields**	**3**
Western North American Temperate Grassland and Meadow	Western Upland Grasslands	3
Warm Southwest Riparian Forest*	**American Southwest Riparian Forest and Woodland**	**4**
Vancouverian Lowland Grassland and Shrubland	North Coast Deciduous Scrub and Terrace Prairie	4
Vancouverian Flooded and Swamp Forest	Vancouverian Flooded and Swamp Forest	6
Western North American Freshwater Marsh	Freshwater Marsh	6
California Cliff, Scree, and Other Rock Vegetation	California Foothill and Coastal Rock Outcrop Vegetation	7
California Coastal Scrub	Coastal Sage Scrub	7
Vancouverian Coastal Dune and Bluff	Coastal Dune and Bluff Scrub	7
Californian–Vancouverian Montane and Foothill Forest	North Coastal Mixed Evergreen and Montane Conifer Forests	8
North American Warm-Desert Xero-Riparian	Desert Wash Woodland and Scrub	8
California Chaparral	Chaparral	8
Warm Interior Chaparral	Desert Transition Chaparral	8
Mojavean-Sonoran Desert Scrub	Mojave and Sonoran Desert Scrub	9
Western North American Montane-Subalpine Wet Shrubland and Wet Meadow	Mountain Riparian Scrub and Wet Meadow	10
Western North America Wet Meadow and Low Shrub Carr	Wet Mountain Meadow	10
Cool Interior Chaparral	Montane Chaparral	10
Western Cordilleran Montane Shrubland and Grassland	Montane Upland Deciduous Scrub	10
North American Pacific Coastal Salt Marsh	Salt Marsh	13
Warm Semi-Desert/Mediterranean Alkali–Saline Wetland	Salt Marsh Meadows	13
Great Basin Saltbush Scrub	Shadscale-Saltbush Scrub	13
Cool Semi-Desert Wash and Disturbance Scrub	High Desert Wash and "Rangeland" Scrub	14
Western North America Tall Sage Shrubland and Steppe	Big Sagebrush Scrub	14
Introduced North American Mediterranean Woodland and Forest	Non-Native Forest and Woodlands	15
Rocky Mountain Subalpine and High Montane Conifer Forest	Subalpine Aspen Forests and Pine Woodlands	15
Vancouverian Subalpine Forest	Pacific Northwest Subalpine Forest	15
Western North America Dwarf Sage Shrubland and Steppe	Great Basin Dwarf Sagebrush Scrub	15
Inter-Mountain Dry Shrubland and Grassland	Great Basin Upland Scrub	15

[1] Based on analysis of total biodiversity, vulnerability (rarity), and endemism

* Selected macrogroup for conservation strategy development in SWAP 2015

Deserts Province

Table D-16 Mono Ecoregion

USNVC Macrogroup	Common Name	Target Rank[1]
Warm Southwest Riparian Forest	American Southwest Riparian Forest and Woodland	3
Western Cordilleran Montane Shrubland and Grassland	Montane Upland Deciduous Scrub	3
Western North American Montane-Subalpine Wet Shrubland and Wet Meadow	Mountain Riparian Scrub and Wet Meadow	4
Western North America Wet Meadow and Low Shrub Carr	Wet Mountain Meadow	4
Western North American Temperate Grassland and Meadow	Western Upland Grasslands	4
Vancouverian Flooded and Swamp Forest	North Coastal and Montane Riparian Forest and Woodland	5
Californian–Vancouverian Montane and Foothill Forest	North Coastal Mixed Evergreen and Montane Conifer Forests	6
Rocky Mountain Subalpine and High Montane Conifer Forest	Subalpine Aspen Forests and Pine Woodlands	8
Inter-Mountain Dry Shrubland and Grassland	Great Basin Upland Scrub	8
North American Warm Semi-Desert Cliff, Scree, and Other Rock Vegetation	Sparsely Vegetated Desert Dune	9
Western North American Freshwater Marsh	Freshwater Marsh	9
Vancouverian Subalpine Forest	Pacific Northwest Subalpine Forest	10
North American Warm-Desert Xero-Riparian	Desert Wash Woodland and Scrub	10
Western North America Tall Sage Shrubland and Steppe*	**Big Sagebrush Scrub**	**11**
Cool Semi-Desert Wash and Disturbance Scrub	High Desert Wash and "Rangeland" Scrub	11
Mojavean–Sonoran Desert Scrub	Mojave and Sonoran Desert Scrub	12
Intermountain Basins Pinyon–Juniper Woodland*	**Great Basin Pinyon-Juniper Woodland**	**12**
Great Basin Saltbush Scrub	Shadscale-Saltbush Scrub	13
Warm Semi-Desert/Mediterranean Alkali–Saline Wetland	Salt Marsh Meadows	13
Cool Interior Chaparral	Montane Chaparral	13
North American Pacific Coastal Salt Marsh	Salt Marsh	14
Temperate Pacific Intertidal Shore	Brackish (Estuarine) Submerged Aquatic Vegetation	14
Vancouverian Alpine Scrub, Forb Meadow, and Grassland	Alpine Vegetation	15
Western North America Dwarf Sage Shrubland and Steppe	Great Basin Dwarf Sagebrush Scrub	15

[1] Based on analysis of total biodiversity, vulnerability (rarity), and endemism

* Selected macrogroup for conservation strategy development in SWAP 2015

Table D-17 Mojave Desert Ecoregion

USNVC Macrogroup	Common Name	Target Rank[1]
California Annual and Perennial Grassland	California Grassland and Flowerfields	3
North American Warm Semi-Desert Cliff, Scree, and Other Rock Vegetation	Sparsely Vegetated Desert Dune	5
Western North American Freshwater Marsh	Freshwater Marsh	5
Warm Southwest Riparian Forest	American Southwest Riparian Forest and Woodland	5
California Forest and Woodland	California Foothill and Valley Forests and Woodlands	6
Cool Semi-Desert Wash and Disturbance Scrub	High Desert Wash and "Rangeland" Scrub	7
California Coastal Scrub	Coastal Sage Scrub	8
Inter-Mountain Dry Shrubland and Grassland	Great Basin Upland Scrub	8
Mojavean–Sonoran Desert Scrub	Mojave and Sonoran Desert Scrub	10
North American Warm-Desert Xero-Riparian	Desert Wash Woodland and Scrub	10
Warm Interior Chaparral	Desert Transition Chaparral	11
Great Basin Saltbush Scrub*	**Shadscale-Saltbush Scrub**	**14**
North American Pacific Coastal Salt Marsh	Salt Marsh	14
Warm Semi-Desert/Mediterranean Alkali–Saline Wetland	Salt Marsh Meadows	14
Western North America Tall Sage Shrubland and Steppe	Big Sagebrush Scrub	14
Western North America Dwarf Sage Shrubland and Steppe	Great Basin Dwarf Sagebrush Scrub	15

[1] Based on analysis of total biodiversity, vulnerability (rarity), and endemism
* Selected macrogroup for conservation strategy development in SWAP 2015

Table D-18 Sonoran Desert Ecoregion

USNVC Macrogroup	Common Name	Target Rank[1]
California Annual and Perennial Grassland	California Grassland and Flowerfields	5
Warm Southwest Riparian Forest	American Southwest Riparian Forest and Woodland	6
Great Basin Saltbush Scrub	Shadscale-Saltbush Scrub	7
North American Warm Semi-Desert Cliff, Scree, and Other Rock Vegetation	Sparsely Vegetated Desert Dune	8
Western North American Freshwater Marsh	Freshwater Marsh	8
Mojavean–Sonoran Desert Scrub*	**Mojave and Sonoran Desert Scrub**	**10**
North American Warm-Desert Xero-Riparian	Desert Wash Woodland and Scrub	10
Warm Semi-Desert/Mediterranean Alkali–Saline Wetland	Salt Marsh Meadows	12
North American Pacific Coastal Salt Marsh	Salt Marsh	15

[1] Based on analysis of total biodiversity, vulnerability (rarity), and endemism
* Selected macrogroup for conservation strategy development in SWAP 2015

Table D-19 Colorado Desert Ecoregion

USNVC Macrogroup	Common Name	Target Rank[1]
California Annual and Perennial Grassland	California Grassland and Flowerfields	4
North American Warm Semi-Desert Cliff, Scree, and Other Rock Vegetation*	**Sparsely Vegetated Desert Dune**	**5**
Western North American Freshwater Marsh	Freshwater Marsh	6
Warm Southwest Riparian Forest	American Southwest Riparian Forest and Woodland	6
Mojavean–Sonoran Desert Scrub	Mojave and Sonoran Desert Scrub	8
Great Basin Saltbush Scrub	Shadscale-Saltbush Scrub	8
Warm Interior Chaparral	Desert Transition Chaparral	10
North American Warm-Desert Xero-Riparian*	**Desert Wash Woodland and Scrub**	**11**
California Coastal Scrub	Coastal Sage Scrub	11
Warm Semi-Desert/Mediterranean Alkali–Saline Wetland	Salt Marsh Meadows	11
North American Pacific Coastal Salt Marsh	Salt Marsh	15

[1] Based on analysis of total biodiversity, vulnerability (rarity), and endemism
* Selected macrogroup for conservation strategy development in SWAP 2015

Table D-20 Southeastern Great Basin Ecoregion

USNVC Macrogroup	Common Name	Target Rank[1]
Warm Southwest Riparian Forest*	**American Southwest Riparian Forest and Woodland**	**3**
Western Cordilleran Montane Shrubland and Grassland	Montane Upland Deciduous Scrub	4
Inter-Mountain Dry Shrubland and Grassland*	**Great Basin Upland Scrub**	**6**
Western North America Wet Meadow and Low Shrub Carr	Wet Mountain Meadow	6
Western North American Temperate Grassland and Meadow	Western Upland Grasslands	6
Western North American Freshwater Marsh	Freshwater Marsh	7
Rocky Mountain Subalpine and High Montane Conifer Forest	Subalpine Aspen Forests and Pine Woodlands	9
Californian–Vancouverian Montane and Foothill Forest	North Coastal Mixed Evergreen and Montane Conifer Forests	11
Cool Semi-Desert Wash and Disturbance Scrub*	**High Desert Wash and "Rangeland" Scrub**	**11**
North American Pacific Coastal Salt Marsh	Salt Marsh	11
Western North America Tall Sage Shrubland and Steppe	Big Sagebrush Scrub	12
Cool Interior Chaparral	Montane Chaparral	14
Western North America Dwarf Sage Shrubland and Steppe	Great Basin Dwarf Sagebrush Scrub	14
Great Basin Saltbush Scrub	Shadscale-Saltbush Scrub	15
Warm Semi-Desert/Mediterranean Alkali–Saline Wetland	Salt Marsh Meadows	15

[1] Based on analysis of total biodiversity, vulnerability (rarity), and endemism
* Selected macrogroup for conservation strategy development in SWAP 2015

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Table D-21 Terrestrial Vegetation Communities

USNVC Macrogroup	Common Name	Ecological Description	CWHR Classification	Geographic Occurrence (Province)	Geography Selected as Priority Conservation Target (Province)
California Forest and Woodland	California Foothill and Valley Forests and Woodlands	Includes all Mediterranean climate woodlands and forests in California from sea level to the point where snow and frost in combination with high winter precipitation enables cool temperate species of trees to dominate the overstory layer. This macrogroup ranges throughout the state west of the deserts and below the higher mountains where snow is the main form of precipitation. This includes the Central and South Coast Ranges, the Northern California Interior Coast Ranges, the Sierra Foothills, Central Valley, and lower elevations of the west slope of the Sierra, the Southern Cascades, the Southern Klamath Mountains, and the Transverse and Peninsular Ranges.	Blue Oak Woodland Blue-Oak-Foothill Pine Closed-Cone Pine-Cypress Coastal Oak Woodland Juniper Montane Hardwood Valley Oak Woodland	North Coast and Klamath, Cascades and Modoc Plateau Bay Delta and Central Coast Central Valley and Sierra Nevada South Coast Deserts	North Coast and Klamath Central Valley and Sierra Nevada
Californian–Vancouverian Montane and Foothill Forest	North Coastal Mixed Evergreen and Montane Conifer Forests	This broad macrogroup is representative of the cool-temperate forests which occur in the Pacific states from the Puget Sound area south into the higher mountains of southern California and adjacent Baja, Mexico. In California these range inland from the immediate coast and experience warm, relatively dry summers and cool rainy to cool snowy winters. All of these forests average cooler and wetter than the previous macrogroup (California Foothill and Valley Forests and Woodlands).	Douglas-Fir Eastside Pine Jeffrey Pine Klamath Mixed Conifer Montane Hardwood Montane Hardwood-Conifer Ponderosa Pine Sierran Mixed Conifer White Fir	North Coast and Klamath Cascades and Modoc Plateau Bay Delta and Central Coast Central Valley and Sierra Nevada South Coast Deserts	Central Valley and Sierra Nevada
Rocky Mountain Subalpine and High Montane Conifer Forest	Subalpine Aspen Forests and Pine Woodlands	This macrogroup represents the cold but less snowy subalpine to high montane forests of the Sierra, Cascades, Klamath, Transverse, and Peninsular Ranges of California. It is a wide ranging macrogroup, including similar forests and woodlands in the Rocky Mountains, and the high mountains of the Great Basin.	Aspen Lodgepole Pine Subalpine Conifer	North Coast and Klamath Cascades and Modoc Plateau Bay Delta and Central Coast Central Valley and Sierra Nevada South Coast Deserts	North Coast and Klamath
Vancouverian Rainforest	Pacific Northwest Conifer Forests	This is the Pacific Northwest temperate rainforest, which includes the giant conifer forests ranging from central California coast, all the way up to southeast Alaska. Mild winters with massive amounts of rain (and some snow north of California) and a maritime climate, with cool summers with either fog (in California) or some summer rain (north of California) are typical.	Redwood	North Coast and Klamath Bay Delta and Central Coast	North Coast and Klamath
Vancouverian Subalpine Forest	Pacific Northwest Subalpine Forest	Includes montane conifer forests and woodlands adapted to very high winter snowfall, from montane to subalpine altitudes. Snow loads are the greatest anywhere in North America, and persist well into the summer. Tree germination is also limited in some cases by the short period the ground is not covered by snow.	Red Fir Subalpine Conifer	North Coast and Klamath Cascades and Modoc Plateau Bay Delta and Central Coast Central Valley and Sierra Nevada	North Coast and Klamath Central Valley and Sierra Nevada
Intermountain Basins Pinyon–Juniper Woodland	Great Basin Pinyon-Juniper Woodland	Includes all mixed and pure pinyon and juniper stands in trans-montane California. These are largely found in the Mojave Desert mountains, and in the mountains of the Modoc Plateau, and Great Basin. They also occur on the eastern slopes of the Sierra Nevada and the Peninsular Ranges and the northern slopes of the Transverse Ranges. Outliers occur west of the Sierra Crest in Kings Canyon, and in the mountains of Ventura and Santa Barbara Counties.	Juniper Pinyon-Juniper	North Coast and Klamath Cascades and Modoc Plateau Bay Delta and Central Coast Central Valley and Sierra Nevada South Coast Deserts	Cascades and Modoc Plateau Deserts
Vancouverian Flooded and Swamp Forest (formerly Western Cordilleran montane–Boreal Riparian Scrub and Forest)	North Coastal and Montane Riparian Forest and Woodland	This is a new synthesis of parts of the older concept treated under Western Cordilleran montane–boreal riparian scrub and forest. Revisions of the NVC have split the tree-dominated forest and woodlands of the cool temperate parts of the state from the riparian scrubs. These riparian forests occur along the major rivers and streams in the outer and middle North Coast Ranges, and along the foothill and lower montane reaches of rivers and streams in the Klamath, Cascades, Sierra Nevada, Modoc Plateau, Transverse, and Peninsular ranges. Unlike the Warm Southwest Riparian Forest Macrogroup, surrounding upland vegetation is mainly conifer dominated and not broadleaf evergreen or deciduous woodland/forest.	Montane Riparian	North Coast and Klamath Cascades and Modoc Plateau Central Valley and Sierra Nevada	North Coast and Klamath
Western North American Montane-Subalpine Wet Shrubland and Wet Meadow (formerly Western Cordilleran Montane-Boreal Wet Meadow)	Mountain Riparian Scrub and Wet Meadow	This macrogroup contains montane meadow grasses, graminoids, and forbs and shrublands associated with meadows, riparian terraces, and seeps in the higher mountains of the state from the Peninsular and Transverse Ranges through the Sierra-Cascade Ranges and including the higher mountains of the Modoc Plateau, the Klamath Mountains and the high Inner North Coast Ranges. The vegetation tends to make small stands sorting ecologically based on moisture availability and on tolerance of disturbance. This concept joins both low riparian shrublands and associated wet meadows based on their overlap in ecologies and floristic composition.	Montane Riparian Wet Meadow	North Coast and Klamath Cascades and Modoc Plateau Bay Delta and Central Coast Central Valley and Sierra Nevada South Coast Deserts	North Coast and Klamath
Warm Southwest Riparian Forest (formerly Southwestern North American Riparian, Flooded and Swamp Forest)	American Southwest Riparian Forest and Woodland	The Great Valley, South Coast, and warm desert riparian forests and thickets are included in this macrogroup. The range of the main indicator trees and shrubs are the southwestern United States and northern Mexico. Most stands of this macrogroup occur below 4,000-feet elevation and are replaced by the cool-temperate version of riparian (Montane and North Coast Riparian Forest and Scrub) in the mountains and on the north coast	Palm Oasis Valley-Foothill Riparian	North Coast and Klamath Cascades and Modoc Plateau Bay Delta and Central Coast Central Valley and Sierra Nevada South Coast Deserts	Bay Delta and Central Coast Central Valley and Sierra Nevada South Coast Deserts

Table D-21 Terrestrial Vegetation Communities

USNVC Macrogroup	Common Name	Ecological Description	CWHR Classification	Geographic Occurrence (Province)	Geography Selected as Priority Conservation Target (Province)
California Chaparral	Chaparral	This includes all chaparral (evergreen sclerophyll-leaved shrublands) below the zone of regular snow accumulation in the mountains. The chaparral occurs throughout Mediterranean climate parts of California from the Klamath Mountains to the Mexican Border. It is represented by a wide variety of floristic alliances, but in general can be grouped in to coastal (maritime), xeric (dry, sunny slopes), mesic (cooler, shady slopes), and lower montane (somewhat frost sensitive) types. All of these groupings have different characteristic species and fire regimes.	Chamise-Redshanks Mixed Chaparral	North Coast and Klamath Cascades and Modoc Plateau Bay Delta and Central Coast Central Valley and Sierra Nevada South Coast Deserts	Central Valley and Sierra Nevada
California Coastal Scrub	Coastal Sage Scrub	This is the other main macrogroup of California shrublands. It differs from chaparral by being composed of drought-deciduous shrubs, which typically are smaller with less extensive root systems and shorter life spans. Many of the members of this macrogroup are also found in the warm deserts and show similar adaptations to hot-dry summer conditions.	Coastal Scrub	North Coast and Klamath Bay Delta and Central Coast Central Valley and Sierra Nevada South Coast Deserts	Bay Delta and Central Coast
California Annual and Perennial Grassland	California Grassland and Flowerfields	This macrogroup includes all annual forb/grass vegetation native and non-native, as well as native perennial grasslands growing within the California Mediterranean climate. This does not include the cool-moist north coastal terrace prairies, the montane meadow/upland grasslands, and non-native perennial pasture grasses. Stands of this macrogroup include everything from wildflower fields in the San Joaquin Valley and adjacent South and Central Coast Ranges, poppy fields of the western Mojave Desert, needlegrass grasslands of the foothills, valleys and coast ranges, and the largely non-native annual grasslands and weed patches in the dry, warm summer regions of California.	Annual Grassland Perennial Grassland	North Coast and Klamath Cascades and Modoc Plateau Bay Delta and Central Coast Central Valley and Sierra Nevada South Coast Deserts	Bay Delta and Central Coast South Coast
Western North American Temperate Grassland and Meadow	Western Upland Grasslands	This macrogroup applies to vegetation dominated by grasses, which are typically not restricted to moisture conditions that are higher than the surrounding landscape (not seeps, riparian, or wet meadows). In general, these grasslands are also widespread outside of California in surrounding states with cool-temperate climatic conditions. This vegetation occurs in the hills and mountains of the north Coast Ranges, Klamath Mountains, lower montane Sierra Nevada, Modoc Plateau, Great Basin, and southward to the Transverse and Peninsular Ranges.	Annual Grassland Perennial Grassland	North Coast and Klamath Cascades and Modoc Plateau Central Valley and Sierra Nevada Bay Delta and Central Coast	North Coast and Klamath Cascades and Modoc Plateau Central Valley and Sierra Nevada
Western Cordilleran Montane Shrubland and Grassland	Montane Upland Deciduous Scrub	This macrogroup includes several widespread western alliances that occur in rocky settings at mid to higher elevations. Stands occur in Klamath, Cascade, Sierra, higher inner North Coast Ranges and the Transverse and Peninsular Ranges. Stands are often adjacent to montane chaparral (which is largely evergreen) but often shows greater affinity to more mesic sites such as rocky canyons, north-facing slopes, or areas of greater snow accumulation. Some vegetation types are successional to forest, others persist due to avalanche disturbance, or poor soils, which preclude productive tree growth.	Montane Chaparral	North Coast and Klamath Cascades and Modoc Plateau Bay Delta and Central Coast Central Valley and Sierra Nevada South Coast Deserts	North Coast and Klamath
Vancouverian Lowland Grassland and Shrubland	North Coast Deciduous Scrub and Terrace Prairie	This macrogroup includes a combination of grasses and shrubs, which tend to intermix in stands along the immediate coastal strip from central California to north of the Oregon border. Cool foggy summers and rainy winters, coupled with salty winds tend to preclude forest development along the immediate coast, but inland these stands only persist through regular disturbance such as clearing, grazing/browsing. Stands also commonly occur adjacent to upland Coastal Dune and Bluff scrub. However, that macrogroup is characterized by more evergreen shrubs, which occur in well-drained exposed settings (exposed bluffs and dunes).	Coastal Scrub Perennial Grassland	North Coast and Klamath Cascades and Modoc Plateau Bay Delta and Central Coast Central Valley and Sierra Nevada South Coast Deserts	Bay Delta and Central Coast
Warm Interior Chaparral	Desert Transition Chaparral	These chaparral stands occur in the "rain-shadow" of the Mountains including the inland sides of the inner South Coast Ranges, the southern Sierra, Tehachapi, Transverse, and Peninsular Ranges. Compared to California chaparral the stands are less dense, contain a mix of other non-chaparral shrubs with desert affinities, and tend to have less frequent and less intense fires. Several of the characteristic species are also found in Arizona, New Mexico, and adjacent northern Mexico in similar "desert-margin" settings, and are thus, different floristically and ecologically from typical California Chaparral, although the two macrogroups may intermingle in some areas.	Chamise-Redshanks Chaparral Mixed Chaparral	Bay Delta and Central Coast Central Valley and Sierra Nevada South Coast Deserts	Central Valley and Sierra Nevada
Cool Interior Chaparral (formerly Western North American Cool/Montane Sclerophyllous Evergreen Scrub)	Montane Chaparral	This macrogroup is characterized by sclerophyllous leaved shrubs with wider geographic range than California. Many occur throughout the western mountains to the Rockies. These are cold-adapted and occupy successional relationships to various coniferoud forests on productive sites, or persist in rocky or other poor soil sites.	Montane Chaparral	North Coast and Klamath Cascades and Modoc Plateau Bay Delta and Central Coast Central Valley and Sierra Nevada South Coast Deserts	Central Valley and Sierra Nevada
Vancouverian Coastal Dune and Bluff	Coastal Dune and Bluff Scrub	Stands of coastal dune and bluff vegetation are limited to salty, rocky or sandy settings immediately adjacent to the open coast. Adaptations to salt spray, wind and shifting sands, result in several lifeforms including succulent or hairy leaves, long underground roots and stolons (adaptation to shifting sands), and good colonization of relatively unstable and sterile substrates.	Coastal Scrub	North Coast and Klamath Bay Delta and Central Coast Central Valley and Sierra Nevada South Coast	North Coast and Klamath Bay Delta and Central Coast

Table D-21 Terrestrial Vegetation Communities

USNVC Macrogroup	Common Name	Ecological Description	CWHR Classification	Geographic Occurrence (Province)	Geography Selected as Priority Conservation Target (Province)
Western North American Montane/Boreal Peatland	Fen (Wet Meadow)	Fens (often mistakenly called "bogs") are hydrologically and chemically unique wetlands, which are typically nutrient-poor and support many endemic vascular and non-vascular plants. (mostly mosses) Fens are typically small in size in California, and in California have only been well described from the Sierra, Klamath, and Cascade ranges. They also occur along the cool north coast.	Fresh Emergent Wetland Wet Meadow	North Coast and Klamath Cascades and Modoc Plateau Central Valley and Sierra	North Coast and Klamath
Western North American Freshwater Marsh	Freshwater Marsh	Fresh water is present throughout all or most of the growing season, species are widespread and tend to be tall emergent forms at lower elevations, but when water depth is > 1 m most vegetation is either anchored or floating hydrophytes (water lilies, duckweed, pondweed, etc.)	Fresh Emergent Wetland	North Coast and Klamath Cascades and Modoc Plateau Bay Delta and Central Coast Central Valley and Sierra Nevada South Coast Deserts	North Coast and Klamath Bay Delta and Central Coast Central Valley and Sierra Nevada South Coast
Western North America Vernal Pool	Vernal Pools *(strategies from Central Coast Province California Grasslands and Flowerfields apply to this macrogroup)*	Vernal pools are widespread in 17 different regions in the state from the Mediterranean climate pools of south-coastal through the Great Valley up to the cool temperate Modoc Plateau and Sierra Valley areas of the Northeastern part of the state. Pools generally fill and dry several times per winter, but generally are completely dry in the summer months. Vegetation is seasonally varied and also varies yearly due to fluctuating and unpredictable water levels. Most pools are small, but can be many acres in size in some areas such as the Modoc Plateau.	Annual Grassland Fresh Emergent Wetland	Cascades and Modoc Plateau Bay Delta and Central Coast Central Valley and Sierra Nevada South Coast	Bay Delta and Central Coast
Western North America Wet Meadow and Low Shrub Carr	Wet Mountain Meadow	Wet meadows are typical of low lying sites in the mountains and in some lower elevation valleys and depressions. Saturated soil or standing water through the growing season are key characteristics. Long-persisting standing water tends to convert sites to Freshwater Marsh macrogroup. Many wet meadow vegetation types occur in the mountainous areas of the state where cool snowy winters and short growing seasons prevail. However, there is a warmer winter lower elevation analog, and also one with invasive exotic species. This macrogroup is widespread throughout the state wherever freshwater meadows and seeps occur.	Wet Meadow	North Coast and Klamath Bay Delta and Central Coast Central Valley and Sierra Nevada South Coast Deserts	Central Valley and Sierra Nevada North Coast and Klamath
North American Pacific Coastal Salt Marsh	Salt Marsh	Salt marshes are generally tied to coastal tidally influenced wetlands in California. They have salinities similar to ocean water and do not develop the higher concentrations of salts characteristic of the Salt marsh meadow macrogroup. Many salt marsh species are widespread and species diversity is relatively low. Individual alliances within the macrogroup tend to sort out based on inundation frequencies and maximum water depths.	Saline Emergent Wetland	North Coast and Klamath Central Valley and Sierra Nevada Bay Delta and Central Coast South Coast Deserts	Bay Delta and Central Coast
Warm Semi-Desert/Mediterranean Alkali–Saline Wetland	Salt Marsh Meadows *(strategies developed for Salt Marsh apply to this macrogroup)*	This macrogroup includes herbaceous and shrubby perennial vegetation associated with saline or alkaline wetlands in the desert or along the upper edges of coastal salt marshes. The overlap between salty desert basins and coastal "high" salt marsh becomes more pronounced as one proceeds southward. In coastal southern California precipitation is only 10 inches per year and solar insulation and evaporation concentrate surface salts to similar levels found on or at the edges of many desert playas. Seeps of fresh or brackish water in either setting account for denser herbaceous growth indicative of one group of alliances in this macrogroup, while the evaporative flat pannes and playas of the coast and the desert are the home of the phreatophitic shrubby indicators of the other group in this category.	Alkali Desert Scrub Saline Emergent Wetland	Cascades and Modoc Plateau Bay Delta and Central Coast Central Valley and Sierra Nevada South Coast Deserts	Bay Delta and Central Coast
Mojavean–Sonoran Desert Scrub	Mojave and Sonoran Desert Scrub	This is an upland desert scrub found on hill slopes and alluvial fans throughout the arid Southwest where winter temperatures are not as cold as in the Great Basin Desert and summer temperatures are very hot. The Mojave has frost and occasional winter snows, the Sonoran rarely has any frost. The warmer Sonoran desert tends to have more summer rain, and more distinctive emergent arborescent species, such as saguaro, ocotillo, and the Mojave is cooler with fewer large cacti and large thorny trees, but has Joshua trees and other Yucca species.	Desert Scrub Desert Succulent Scrub Joshua Tree	North Coast and Klamath Bay Delta and Central Coast Central Valley and Sierra Nevada South Coast Deserts	Deserts
North American Warm-Desert Xero-Riparian Macrogroup (formerly Madrean Warm Semi-Desert Wash Woodland/Scrub)	Desert Wash Woodland and Scrub	This macrogroup includes the warm desert washes of the Sonoran and Colorado Desert. These have trees and large shrubs associated with them while the cooler Mojave desert has fewer trees but several shrub species. Stands vary depending upon subsurface water availability, minimum winter temperature, and intensity and frequency of flooding.	Desert Scrub Desert Wash	North Coast and Klamath Bay Delta and Central Coast Central Valley and Sierra Nevada South Coast Deserts	Deserts
Great Basin Saltbush Scrub Macrogroup (formerly Western North American Cool Semi-Desert Shrubland, Shrub-Steppe)	Shadscale-Saltbush Scrub	The shrubby cool desert saltbush species often form distinct bands above closed basins and below extensive sagebrush belts in the Great Basin Desert. This macrogroup addresses those saltbush scrubs, which typically are not growing in strongly saline or alkaline soils, but do tolerate higher pH (alkalinity) and often finer soil texture than Artemisia tridentata and related taxa of sagebrush.	Alkali Desert Scrub Desert Scrub Desert Wash	Cascades and Modoc Plateau Bay Delta and Central Coast Central Valley and Sierra Nevada South Coast Deserts	Deserts

Table D-21 Terrestrial Vegetation Communities

USNVC Macrogroup	Common Name	Ecological Description	CWHR Classification	Geographic Occurrence (Province)	Geography Selected as Priority Conservation Target (Province)
Cool Semi-Desert Wash and Disturbance Scrub	High Desert Wash and "Rangeland" Scrub	This is a cool desert macrogroup which is most common in the eastern portions of the state from Modoc Plateau, southward and east of the Cascades and Sierra into the mountains of the Mojave Desert. Stands form when fire or other clearing and disturbance remove stands of Artemisia, (in the big sagebrush scrub) or other shrubs characteristic of the Great Basin Upland Scrub macrogroup	Bitterbrush Low Sage Sagebrush	Cascades and Modoc Plateau Bay Delta and Central Coast Central Valley and Sierra Nevada South Coast Deserts	Deserts
Western North America Tall Sage Shrubland and Steppe	Big Sagebrush Scrub	This macrogroup is emblematic of the valleys and lower slopes of the Great Basin Desert and enters California in the Modoc Plateau, south and east of the Cascades and Sierra, into the higher mountains of the Mojave Desert. It also occurs in isolated patches in the Transverse and Peninsular ranges, the south and the inner north Coast Ranges sporadically northward to the eastern Klamath Mountains.	Sagebrush	North Coast and Klamath Cascades and Modoc Plateau Bay Delta and Central Coast Central Valley and Sierra Nevada South Coast Deserts	Cascades and Modoc Plateau Deserts
Western North America Dwarf Sage Shrubland and Steppe	Great Basin Dwarf Sagebrush Scrub	This macrogroup occurs in cool desert or even high mountain settings from the Eastern Sierra, Cascades, Modoc Plateau, southward into the southern Great Basin Mountains, and the desert side of the Transverse Ranges. It is characterized by low subshrub species in the genus Artemisia (sagebrush). These species form stands on poor soils, or exposed slopes and ridges where larger sagebrush species are unable to grow.	Low Sage	North Coast and Klamath Cascades and Modoc Plateau Central Valley and Sierra Nevada Deserts	Cascades and Modoc Plateau
Inter-Mountain Dry Shrubland and Grassland	Great Basin Upland Scrub	This macrogroup occurs in the cooler Mojave Desert mountains, the uplands of the Great Basin and Modoc Plateau, and in isolated pockets of the inner South Coast Ranges such as Temblor Range and Carrizo Plains. It is composed of shrublands with cool desert affinities but has been segregated from the short and tall species of sagebrush (Artemisia spp.). Most of the vegetation in this macrogroup occurs well beyond the eastern borders of CA into the Great Basin Province. Successional relationships exist between the several groups of alliances in this macrogroup, some are disturbance followers and may also occur in episodic washes. Some are persistent resprouting shrubs, which recover well after fire, and some are fire and browsing-sensitive with longer recovery times. Some perennial desert grasslands are also part of this macrogroup and increase with short fire intervals.	Bitterbrush Low Sage Sagebrush	North Coast and Klamath Cascades and Modoc Plateau Bay Delta and Central Coast Central Valley and Sierra Nevada South Coast Deserts	Cascades and Modoc Plateau Deserts
Vancouverian Alpine Scrub, Forb Meadow, and Grassland *and* Rocky Mountain Alpine Scrub, Forb Meadow, and Grassland	Alpine Vegetation	This macrogroup is representative of the state's alpine zone in the Sierra, Cascades, White, Sweetwater, and Klamath Mountains. It either occurs above timberline or is found localized within subalpine areas in cold air drainages (e.g. N-facing slopes, often near long persisting snow banks). The characteristic species are either herbaceous (many are cushion plants, some tufted or rhizomatous graminoids) or low prostrate or dwarf shrubs. Different groups segregate based on substrate type (scree, talus, felfield) and moisture regime (snowbank, felfield, etc.).	Alpine Dwarf-Shrub	North Coast and Klamath Cascades and Modoc Plateau Central Valley and Sierra Nevada South Coast Deserts	North Coast and Klamath
Temperate Pacific Intertidal Shore	Brackish (Estuarine) Submerged Aquatic Vegetation *(strategies from Marine target "Embayments, Estuaries, and Lagoons" apply to this macrogroup)*	This macrogroup is poorly defined currently in California, but should include both hard and soft bottom intertidal settings.	Estuarine	North Coast and Klamath Bay Delta and Central Coast South Coast	Marine
Western North American Freshwater Aquatic Vegetation	Freshwater Aquatic Vegetation *(strategies from Freshwater Marsh apply to this macrogroup)*	This macrogroup is poorly defined in the state, many wetland vegetation stands are best kept in the Freshwater marsh macrogroup. However, deeper water species which do not cover large areas of water surface would fall into this macrogroup.	Lacustrine Riverine	North Coast and Klamath Bay Delta and Central Coast Cascades and Modoc Plateau Central Valley and Sierra Nevada South Coast	North Coast and Klamath Bay Delta and Central Coast Central Valley and Sierra Nevada South Coast
California Cliff, Scree, and Other Rock Vegetation	California Foothill and Coastal Rock Outcrop Vegetation	Vegetative cover is generally < 2% cliffs and outcrops west of the deserts and inland from the immediate coast, south of central California. Rock surfaces or rapidly eroding unstable slopes are characteristic. Stands do not include alpine or subalpine sparse, rocky vegetation, and also do not include the sparsely vegetated portions of the warm and cold deserts.	Barren	North Coast and Klamath Cascades and Modoc Plateau Bay Delta and Central Coast Central Valley and Sierra Nevada South Coast Deserts	Central Valley and Sierra Nevada
Vancouverian Cliff, Scree, and Other Rock Vegetation	Northwest Coast Cliff and Outcrop	Taken to describe coastal cliffs on headlands and islands of the north coast.	Barren	Cascades and Modoc Plateau Bay Delta and Central Coast	Bay Delta and Central Coast
North American Warm Semi-Desert Cliff, Scree, and Other Rock Vegetation	Sparsely Vegetated Desert Dune	This macrogroup is characteristic of the desert dunes and contains both annual and perennial species with special strategies to deal with the shifting sands and the dry and unpredictable climate. Vegetation cover is variable depending upon unpredictable rainfall patterns.	Barren	North Coast and Klamath Cascades and Modoc Plateau Central Valley and Sierra Nevada South Coast Deserts	Deserts

Appendix E

Appendix E Conservation Strategies for All Macrogroups in California, Freshwater Aquatic Species Assemblages, Marine Ecosystems, and Anadromous Fishes

Table E-1 Terrestrial Conservation Strategies

USNVC Macrogroup	Common Name	Conservation Strategies	CWHR Classification
California Forest and Woodland	California Foothill and Valley Forests and Woodlands	Partner Engagement • Establish partnerships to enhance conservation opportunities. • Establish partnership: develop partnerships with agencies and organizations to enhance opportunities (currently BLM, RCDs, UCD, Audubon, Blue Ridge Berryessa Partnership). Direct Management • Conduct ecologically sound controlled burns on CDFW lands. • Conduct demonstration management, including providing public demonstrations of successful BMPs and scientifically documenting environmental change from implementation of BMPs. Economic Incentives • Provide economic incentives for improved resource management. • Provide economic incentives to landowners for managing grazing at to maintain appropriate levels of residual dry matter. Land Acquisition/Easement/Lease • Protect land through conservation easements. • Purchase and provide long-term conservation of land. Outreach and Education • Conduct demonstration management, including providing public demonstrations of successful BMPs and scientifically documenting environmental change from implementation of BMPs. • Provide education and outreach, including introduce landowners and leasee to BMPs for grazing; inform public of incentive programs available to them; educate recreation focused landowners on wildlife-BMP's; and keep CDFW staff current on relevant science (e.g., on restoration techniques, science). • Provide outreach and education for the conservation of natural resources.	• Blue Oak Woodland • Blue-Oak-Foothill Pine • Closed-Cone Pine-Cypress • Coastal Oak Woodland • Juniper • Montane Hardwood • Valley Oak Woodland
Californian–Vancouverian Montane and Foothill Forest	North Coastal Mixed Evergreen and Montane Conifer Forests	Data Collection and Analysis • Conduct research regarding effective target management. • Conduct research (data management) to identify areas with restoration potential to allow prioritization for protection and restoration. Work with other agencies doing restoration in sagebrush steppe habitat throughout the region. Map vegetation following standard protocol and fill information gaps into what has already been mapped. Prioritize for restoration areas of encroachment that have not crossed over to juniper woodland. Partner Engagement • Develop management plans and improve existing fire management plans. • Engage in decision-making process, through cooperation with federal agencies and private landowners on where controlled burns and forest thinning would be most beneficial to wildlife. Coordinate with state and federal agencies, tribal entities, the non-governmental organization community and other partners to establish a decision-making process to achieve shared objectives and broader coordination across overlapping areas. Management Planning • Develop management plans and improve existing fire management plans and identify high value wildlife habitat. Land Acquisition/Easement/Lease • Protect land through acquisition and conservation easements. • Protect land through acquisition and conservation easements, including increasing the amount of key conifer areas protected through purchase or conservation easement. Key conifer areas include old-growth forest, watercourse zones, and nest sites. Law and Policy • Advocate for laws and policies that protect and enhance natural resources. • Advocate for laws and policies; coordinate with agencies to allow fires to burn when possible. • Engage in decision-making process, through cooperation with federal agencies and private landowners on where controlled burns and forest thinning would be most beneficial to wildlife. Coordinate with state and federal agencies, tribal entities, the non-governmental organization community and other partners to establish a decision-making process to achieve shared objectives and broader coordination across overlapping areas. Outreach and Education • Provide outreach and education for the conservation of natural resources.	• Douglas-Fir • Eastside Pine • Jeffrey Pine • Klamath Mixed Conifer • Montane Hardwood • Montane Hardwood-Conifer • Ponderosa Pine • Sierran Mixed Conifer • White Fir
Rocky Mountain Subalpine and High Montane Conifer Forest	Subalpine Aspen Forests and Pine Woodlands	Data Collection and Analysis • Conduct comprehensive ecological assessment (research) on target, particularly aspen meadows. • Gather and analyze data on subalpine aspen forest and pine woodlands (mature conifer forest). Partner Engagement • Partner for joint advocacy with public and private sectors. Direct Management • Implement habitat restoration and enhancement of aspen meadows. Environmental Review • Conduct environmental review, maintain devotion of staff to environmental review of CEQA projects, and enhance staffing levels to commit to environmental review of NEPA projects on federal lands. Law and Policy • Advocate for laws and policies that protect natural resources. Outreach and Education • Provide outreach and education for the conservation of natural resources.	• Aspen • Lodgepole Pine • Subalpine Conifer
Vancouverian Rainforest	Pacific Northwest Conifer Forests	Data Collection and Analysis • Conduct research (data management) on conifer forest ecosystems and response to fire. Partner Engagement • Partner with USFS, NRCS, The Nature Conservancy (TNC), Western Klamath Restoration Partnership, Mendocino Firescape, and others for joint advocacy. Management Planning • Advocate for wildlife friendly fire management. • Develop management plans for the conservation of natural resources. • Provide input on project planning and decision making process, by leading or participating in land use planning for rural, urban, or agricultural lands (e.g. provide input on local land use plans), developing county-wide zoning plans, and participating in workgroup regarding low impact development siting. Direct Management • Manage invasive species. Outreach and Education • Provide outreach and education. Training and Technical Assistance • Provide training on invasive species management.	• Redwood

Table E-1 Terrestrial Conservation Strategies

USNVC Macrogroup	Common Name	Conservation Strategies		CWHR Classification
Vancouverian Subalpine Forest	Pacific Northwest Subalpine Forest	Data Collection and Analysis • Collect data on climate-related impacts to species and habitats in the red fir/subalpine zone, to better predict future distribution and viability and inform land acquisition and other strategies. • Collect data to evaluate effects of fuels treatments in the red fir zone, and whether treatments can partly offset climate-related increases in fire severity in the red fir zone. Partner Engagement • Establish partnership to co-monitor target habitat on state and federal lands. Management Planning • Develop or update management plans to integrate the effects of climate change. Direct Management • Implement fuels treatments in red fir, if determined to be effective (see "Data Collection and Analysis").	Economic Incentives • Develop economic incentives to reduce greenhouse gas emissions within California. Environmental Review • Review projects for potential increases in greenhouse gas emissions; require mitigation as needed. Land Use Planning • Provide input on local land use plans regarding the conservation of natural resources. • Provide input on local land use plans to incorporate climate change; provide local assistance grant funds for participation in general plan updates favoring natural resource conservation and climate change. Training and Technical Assistance • Provide science-based applications and tools for climate change and natural resources management.	• Red Fir • Subalpine Conifer
Intermountain Basins Pinyon–Juniper Woodland	Great Basin Pinyon-Juniper Woodland	Data Collection and Analysis • Conduct research on climate change. • Research impacts of climate change on pinyon-juniper woodland viability and distribution. Partner Engagement • Maintain partnerships through the Bi-state Action Plan, BLM, USFS, NPS, and USGS to help coordinate data collection and implement a management plan.	Direct Management • Identify highest priority areas for restoration and rehabilitation to lower or eliminate fire risk; conduct controlled burns and managed thinning in areas of post-settlement (1860) pinyon-juniper and juniper expansion or old growth stands with high canopy cover and fire risk; protect old growth juniper and pinyon-juniper; and continue implementation of Bi-state Action Plan. • Identify highest priority areas for restoration and rehabilitation to protect from annual grass or weed invasion.	• Juniper • Pinyon-Juniper
Vancouverian Flooded and Swamp Forest (formerly Western Cordilleran montane–Boreal Riparian Scrub and Forest)	North Coastal and Montane Riparian Forest and Woodland	Partner Engagement • Coordinate with Regional Conservation Districts (RCDs) and flood control agencies, counties, cities, and watershed groups/councils. • Develop Riparian and Wetlands Task Force. Direct Management • Develop buffers along major rivers and streams. • Habitat restoration and enhancement. • Improve implementation of grazing best management practices (BMPs).	Land Acquisition/Easement/Lease • Implement Santa Rosa Plain Conservation Strategy and Draft Santa Rosa Plain Recovery Plan. Utilize potential and existing conservation lands, including banks, mitigation sites and other public and private lands to develop and implement conservation actions and management plans for SGCN that inhabit grassland habitats, vernal pools and associated habitats on the Santa Rosa Plain. Law and Policy • Develop CDFW Riparian Conservation Policy. Outreach and Education • Provide outreach and education for the conservation of natural resources.	• Montane Riparian
Western North American Montane-Subalpine Wet Shrubland and Wet Meadow (formerly Western Cordilleran Montane-Boreal Wet Meadow)	Mountain Riparian Scrub and Wet Meadow	Data Collection and Analysis • Conduct comprehensive ecological assessment (research) and evaluate climate effects on aspen meadows. • Gathering and analyze data regarding aspen meadows and wildlife. Partner Engagement • Partner for joint advocacy by establishing partnership for privately managed lands and decision-making processes with other public and private entities. Direct Management • Implement habitat restoration and enhancement of aspen meadows.	Environmental Review • Conduct environmental review, maintain devotion of staff to environmental review of CEQA projects, and enhance staffing levels to commit to environmental review of NEPA projects on federal lands. Law and Policy • Advocate for laws and policies that protect natural resources. Outreach and Education • Provide outreach and education for conservation of natural resources.	• Montane Riparian • Wet Meadow

Table E-1 Terrestrial Conservation Strategies

USNVC Macrogroup	Common Name	Conservation Strategies		CWHR Classification
Warm Southwest Riparian Forest (formerly Southwestern North American Riparian, Flooded and Swamp Forest)	American Southwest Riparian Forest and Woodland	Data Collection and Analysis • Conduct research focused on informing the development of new or updating of existing best management practices (BMPs) for invasive species, grazing, and water flow. • Gather and analyze data to establish baseline inventory of SGCN distribution, habitats, and pressures. • Identify critical or sensitive riparian habitats in areas that may require special protections. Partner Engagement • Establish co-management partnership to conserve target habitat. Management Planning • Develop and implement Habitat Conservation Plans (HCPs) (Central Valley Flood Protection Plan, South Sacramento HCP, San Joaquin County Multi-Species Habitat Conservation and Open Space Plan, Bay Delta Conservation Plan, Yolo, Solano, Butte, and Yuba-Sutter HCPs). • Engage in local planning to encourage the use of bio (soft)-engineering for flood control, retention of functional floodplains, and deterrence and capture of waste and pollution. • Provide input on local planning. Lead or participate in land use planning for rural, urban, or agricultural lands (e.g., provide input on local land use plans; develop county-wide zoning plans; participate in workgroup regarding low impact development siting). Direct Management • Develop grazing BMPs. • Develop riparian buffers along major rivers and streams. • Improve road maintenance on county and state roads to reduce sediment impacts to stream habitats. • Manage barriers to water movement, with focus on improving stream water volume, groundwater levels, vegetation age-class heterogeneity, channel pattern, and seasonal flow variation. • Manage dams and other barriers to allow for fish passage. • Manage invasive species, with focus on reducing the extent of invasive species (particularly Arundo and tamarisk) and improving structural diversity of native vegetation. • Manage invasive species. • Manage invasive species: control invasive and problematic vegetation, control invasive mammals (feral horse and burro), and prevent degradation of riparian habitat and springs from feral horses and burros. • Manage water flows.	Land Acquisition/ Easement/ Lease • Acquire and conserve high-functioning riparian areas that have the greatest ecological potential (e.g., Santa Clara, San Luis Rey, and Ventura River watersheds, followed by larger impaired systems and those that support SGCN), and functioning riparian habitat on private property. • Acquire property and/or easements, including protection of land or water real property or rights through conservation easement. • Acquire water rights focused on improving in-stream flow for fish and riparian habitat. • Acquire water rights. • Acquire, conserve and manage habitat for SGCN that inhabit riparian forest and woodland habitats by finalizing draft conservation plans and implementing completed Natural Community Conservation Plans, Habitat Conservation Plans, and Conservation Strategies and other opportunities. Land Use Planning • Engage in decision-making process; share information and agency priorities. Law and Policy • Advocate for effective enforcement laws to reduce impacts of waste and disturbance on significant riparian areas. • Improve effective law enforcement focused on: complying with water rights and Section 1600 agreements, eliminating illegal water diversions, and increasing Law Enforcement Division (LED) staffing levels. Outreach and Education • Implement education and outreach to the public and local agencies regarding the value of riparian habitat, development of riparian buffers along major rivers and streams, and reducing encroachment of crops into riparian buffers. • Provide outreach and education for the conservation of natural resources. • Provide outreach and education focused on improving vegetation structural diversity, reducing infestations of invasive species (for plants, specifically Arundo and tamarisk), and protecting functioning riparian habitat on private property.	• Desert Riparian
California Chaparral	Chaparral	Data Collection and Analysis • Collect and analyze data regarding the target. Partner Engagement • Engage conservation partners, including state and federal agencies, tribal governments, the non-governmental organization community, and other partners to achieve shared objectives and broader coordination across overlapping areas. Establish partnership to co-monitoring species/habitats on federally managed lands. Establish decision-making processes with other public and private entities to determine or implement strategies. Convene an advisory committee to assist with implementation of strategies.	Management Planning • Work with partners on the development of large landscape conservation planning. Develop or update management plans to integrate the effects of climate change. Development of management plans for species, habitats and natural processes. Develop a management plan for SGCN or its habitat. Reintroduction, relocation, or stocking of native animals or plants to an area where they can better adapt. Translocate/breed in captivity a SGCN to establish new populations in suitable habitat. Restore SGCN to historically occupied habitats. Direct Management • Conduct direct resource management. Land Acquisition/ Easement/ Lease • Protect land through acquisition, easement, or lease.	• Chamise-Redshanks • Mixed Chaparral
California Coastal Scrub	Coastal Sage Scrub	Data Collection and Analysis • Collect biological and ecological data to address key information gaps on SGCN, habitats, and pressures. Partner Engagement • Establish and engage in partner relationships. Management Planning • Develop and implement management plans. Direct Management • Conduct direct resource management. Environmental Review • Implement environmental review, with focus on the following: non-conservation oriented policies; projects and plans to help ensure impacts to wildlife are minimized and benefits maximized; infrastructure development projects to ensure they are designed and sited to avoid impacts on species and habitat; state highway plans; forest management plans; and plans for transmission corridor siting.	Land Acquisition/ Easement/ Lease • Designate conservation areas with emphasis on sites or landscapes that have unique and important value to wildlife. • Protect priority habitats through fee title acquisition, permanent conservation easement, or other means; purchase land in a corridor connecting two protected areas to provide connectivity of habitat. Land Use Planning • Provide input to land use planning decisions. Law and Policy • Develop or influence law and policy that addresses vehicle emissions, timber harvest cumulative impacts, critical habitat, and marine species with ranges that overlap jurisdictional boundaries.	• Coastal Scrub

Table E-1 Terrestrial Conservation Strategies

USNVC Macrogroup	Common Name	Conservation Strategies		CWHR Classification
California Annual and Perennial Grassland	California Grassland and Flowerfields	Data Collection and Analysis ◓ Gather and analyze data to establish baseline inventory of SGCN distribution. ◓ Identify and conduct research on high-priority study questions for grassland habitat/conservation areas; conduct research to inform coordination with Caltrans and county transportation agencies on wildlife-friendly transportation corridors; implement and fund monitoring and research components of completed and draft NCCPs, HCPs, and Conservation Strategies. Partner Engagement ◓ Coordinate with Caltrans and county transportation agencies to use information on high-priority wildlife corridors in the design of wildlife-friendly transportation corridors. ◓ Coordinate with fire agencies to develop and implement fire management BMPs in grassland habitats. ◓ Partner for joint advocacy for the conservation of natural resources. Management Planning ◓ Coordinate with U.S. Fish and Wildlife Service (USFWS) and other agencies to assist local jurisdictions with conservation of grasslands (e.g., via the natural communities conservation plan/habitat conservation plan process) in light of increasing extent of vineyard development in grasslands.	Direct Management ◓ Manage invasive species, with focus on controlling or eradicating them in grassland habitats in the Central California Coast Ecoregion. ◓ Reduce extent and spread of invasive species, with emphasis on ecosystem function for SGCN. Land Acquisition/ Easement/ Lease ◓ Acquire and conserve high-value grassland habitats. ◓ Acquire, conserve, and manage habitat for SGCN that inhabit grassland habitats by finalizing draft conservation plans and implementing completed NCCPs, HCPs, and Conservation Strategies and other opportunities. Land Use Planning ◓ Develop statewide strategies on renewable energy development location siting; identify renewable energy development zones and obtain their approval by the Renewable Energy Action Team (REAT). ◓ Provide input on project planning and decision making process; ensure that city and county planning departments consider the conservation of grassland and vernal pool habitat.	◓ Annual Grassland ◓ Perennial Grassland
Western North American Temperate Grassland and Meadow	Western Upland Grasslands	Data Collection and Analysis ◓ Baseline data collection and analysis on effect of natural fire on grasslands. ◓ Conduct comprehensive ecological assessment (research) and evaluate climate effects on aspen meadows. ◓ Gathering and analyze data regarding aspen meadows and wildlife. ◓ Gather and analyze data on wet meadows and wildlife: establish baseline inventory of wet meadows and research ecosystem services of wet meadows (e.g., carbon sequestration). Partner Engagement ◓ Partner for joint advocacy by establishing partnership for privately managed lands and decision-making processes with other public and private entities. Management Planning ◓ Implement grazing practices that benefit meadow ecosystems (conduct managed grazing). ◓ Provide input on grazing management plans. Direct Management ◓ Enhance habitat: improve water quality and temperature, coordinate water storage and timing of release to improve meadow hydrology, improve surface water recharge, reduce erosion and bank cutting, restore meadow hydrology, and improve resiliency of meadows to flood events. ◓ Implement habitat restoration and enhancement of aspen meadows. ◓ Manage grazing. ◓ Manage invasive species ◓ Restore meadows impacted by roads and railroads: reduce sediment from existing and abandoned roads from entering meadows, restore hydrology altered by legacy roads and railroads, develop BMPs for road maintenance, and reduce the overall presence of roads and railroads in meadows (new and existing).	Economic Incentives ◓ Provide economic incentives by providing restoration grants, collaborating with federal agencies to identify opportunities to implement joint conservation actions, develop a habitat conservation plan or voluntary local program, or implement candidate conservation agreement to protect candidate species that are vulnerable. Environmental Review ◓ Conduct environmental review, maintain devotion of staff to environmental review of CEQA projects, and enhance staffing levels to commit to environmental review of NEPA projects on federal lands. Land Acquisition/Easement/Lease ◓ Protect and restore land through acquisitions or conservation easements. ◓ Protect land through acquisition and conservation easements, with emphasis on restoring and protecting degraded wet meadow habitat and conserving high-quality wet meadow. Land Use Planning ◓ Provide input on local planning regarding the conservation of natural resources. Law and Policy ◓ Advocate for laws and policies that protect natural resources. ◓ Advocate for laws and policies by influencing land use policies and coordinating with federal agencies to reduce grassland conversion. Outreach and Education ◓ Provide education and outreach to broad resource users on multiple-use policy and educate the public on the beneficial use of fire. ◓ Provide outreach and education for the conservation of natural resources.	◓ Annual Grassland ◓ Perennial Grassland
Western Cordilleran Montane Shrubland and Grassland	Montane Upland Deciduous Scrub	Data Collection and Analysis ◓ Conduct comprehensive ecological assessment (research). ◓ Gather and analyze data about aspen meadows and wildlife. Partner Engagement ◓ Partner for joint advocacy with public and private sectors. Establish partnership for privately managed lands. Establish decision making processes with other public and private entities to determine or implement strategies. Creating and maintaining partnerships will ensure the coordinated development of conservation strategies or actions to reduce climate-related stresses to species and habitats. Direct Management ◓ Implement habitat restoration and enhancement for aspen meadows.	Environmental Review ◓ Conduct environmental review. Maintain devotion of staff to environmental review of CEQA projects. Enhance staffing levels to commit to environmental review of NEPA projects on federal lands. Law and Policy ◓ Advocate for laws and policies that protect natural resources. Outreach and Education ◓ Provide outreach and education for the conservation of natural resources.	◓ Montane Chaparral

Table E-1 Terrestrial Conservation Strategies

USNVC Macrogroup	Common Name	Conservation Strategies	CWHR Classification
Vancouverian Lowland Grassland and Shrubland	North Coast Deciduous Scrub and Terrace Prairie	Data Collection and Analysis • Collect biological and ecological data to address key information gaps on SGCN, habitats, and pressures. Partner Engagement • Establish and engage in partner relationships. Management Planning • Develop and implement management plans. Direct Management • Conduct direct resource management. Environmental Review • Implement environmental review, with focus on the following: non-conservation oriented policies; projects and plans to help ensure impacts to wildlife are minimized and benefits maximized; infrastructure development projects to ensure they are designed and sited to avoid impacts on species and habitat; state highway plans; forest management plans; and plans for transmission corridor siting. Land Acquisition/ Easement/ Lease • Designate conservation areas with emphasis on sites or landscapes that have unique and important value to wildlife. • Protect priority habitats through fee title acquisition, permanent conservation easement, or other means; purchase land in a corridor connecting two protected areas to provide connectivity of habitat. Land Use Planning • Provide input to land use planning decisions. Law and Policy • Develop or influence law and policy that addresses vehicle emissions, timber harvest cumulative impacts, critical habitat, and marine species with ranges that overlap jurisdictional boundaries.	• Coastal Scrub • Perennial Grassland
Warm Interior Chaparral	Desert Transition Chaparral	Data Collection and Analysis • Collect and analyze data regarding the target. Partner Engagement • Engage conservation partners, including state and federal agencies, tribal governments, the non-governmental organization community, and other partners to achieve shared objectives and broader coordination across overlapping areas. Establish partnership to co-monitoring species/habitats on federally managed lands. Establish decision-making processes with other public and private entities to determine or implement strategies. Convene an advisory committee to assist with implementation of strategies. Management Planning • Work with partners on the development of large landscape conservation planning. Develop or update management plans to integrate the effects of climate change. Development of management plans for species, habitats and natural processes. Develop a management plan for SGCN or its habitat. Reintroduction, relocation, or stocking of native animals or plants to an area where they can better adapt. Translocate/breed in captivity a SGCN to establish new populations in suitable habitat. Restore SGCN to historically occupied habitats. Direct Management • Conduct direct resource management. Land Acquisition/ Easement/ Lease • Protect land through acquisition, easement, or lease.	• Chamise-Redshanks Chaparral • Mixed Chaparral
Cool Interior Chaparral (formerly Western North American Cool/Montane Sclerophyllous Evergreen Scrub)	Montane Chaparral	Data Collection and Analysis • Collect and analyze data regarding the target. Partner Engagement • Engage conservation partners, including state and federal agencies, tribal governments, the non-governmental organization community, and other partners to achieve shared objectives and broader coordination across overlapping areas. Establish partnership to co-monitoring species/habitats on federally managed lands. Establish decision-making processes with other public and private entities to determine or implement strategies. Convene an advisory committee to assist with implementation of strategies. Management Planning • Work with partners on the development of large landscape conservation planning. Develop or update management plans to integrate the effects of climate change. Development of management plans for species, habitats and natural processes. Develop a management plan for SGCN or its habitat. Reintroduction, relocation, or stocking of native animals or plants to an area where they can better adapt. Translocate/breed in captivity a SGCN to establish new populations in suitable habitat. Restore SGCN to historically occupied habitats. Direct Management • Conduct direct resource management. Land Acquisition/ Easement/ Lease • Protect land through acquisition, easement, or lease.	• Montane Chaparral
Vancouverian Coastal Dune and Bluff	Coastal Dune and Bluff Scrub	Data Collection and Analysis • Collect biological and ecological data to address key information gaps on SGCN, habitats, and pressures. Partner Engagement • Establish and engage in partner relationships. Management Planning • Develop and implement management plans. Direct Management • Conduct direct resource management. Environmental Review • Implement environmental review, with focus on the following: non-conservation oriented policies; projects and plans to help ensure impacts to wildlife are minimized and benefits maximized; infrastructure development projects to ensure they are designed and sited to avoid impacts on species and habitat; state highway plans; forest management plans; and plans for transmission corridor siting. Land Acquisition/ Easement/ Lease • Designate conservation areas with emphasis on sites or landscapes that have unique and important value to wildlife. • Protect priority habitats through fee title acquisition, permanent conservation easement, or other means; purchase land in a corridor connecting two protected areas to provide connectivity of habitat. Land Use Planning • Provide input to land use planning decisions. Law and Policy • Develop or influence law and policy that addresses vehicle emissions, timber harvest cumulative impacts, critical habitat, and marine species with ranges that overlap jurisdictional boundaries.	• Coastal Scrub
Western North American Montane/Boreal Peatland	Fen (Wet Meadow)	Data Collection and Analysis • Conduct comprehensive ecological assessment (research) and evaluate climate effects on aspen meadows. • Gather and analyze data regarding aspen meadows and wildlife. Partner Engagement • Partner for joint advocacy by establishing partnership for privately managed lands and decision-making processes with other public and private entities. Direct Management • Implement habitat restoration and enhancement of aspen meadows. Environmental Review • Conduct environmental review, maintain devotion of staff to environmental review of CEQA projects, and enhance staffing levels to commit to environmental review of NEPA projects on federal lands. Law and Policy • Advocate for laws and policies that protect natural resources. Outreach and Education • Provide outreach and education for the conservation of natural resources.	• Fresh Emergent Wetland • Wet Meadow

Table E-1 Terrestrial Conservation Strategies

USNVC Macrogroup	Common Name	Conservation Strategies		CWHR Classification
Western North American Freshwater Marsh	Freshwater Marsh	Management Planning • Develop management plans. Economic Incentives • Provide economic incentives for improved resource management. Land Acquisition/ Easement/ Lease • Purchase land and conservation easements.	Law and Policy • Advocate for laws and policies. Outreach and Education • Provide outreach and education.	• Fresh Emergent Wetland
Western North America Vernal Pool	Vernal Pools *(strategies from Bay Delta and Central Coast Province California Grasslands and Flowerfields apply to this macrogroup)*	Data Collection and Analysis • Identify and conduct research on high-priority study questions for grassland habitat/conservation areas; conduct research to inform coordination with Caltrans and county transportation agencies on wildlife-friendly transportation corridors; implement and fund monitoring and research components of completed and draft NCCPs, HCPs, and Conservation Strategies. Partner Engagement • Coordinate with Caltrans and county transportation agencies to use information on high-priority wildlife corridors in the design of wildlife-friendly transportation corridors. • Coordinate with fire agencies to develop and implement fire management BMPs in grassland habitats. Direct Management • Manage invasive species, with focus on controlling or eradicating them in grassland habitats in the Central California Coast Ecoregion.	Land Acquisition/ Easement/ Lease • Acquire, conserve, and manage habitat for SGCN that inhabit grassland habitats by finalizing draft conservation plans and implementing completed NCCPs, HCPs, and Conservation Strategies and other opportunities. Land Use Planning • Develop statewide strategies on renewable energy development location siting; identify renewable energy development zones and obtain their approval by the Renewable Energy Action Team (REAT). • Provide input on project planning and decision making process; ensure that city and county planning departments consider the conservation of grassland and vernal pool habitat.	• Annual Grassland • Fresh Emergent Wetland
Western North America Wet Meadow and Low Shrub Carr	Wet Mountain Meadow	Data Collection and Analysis • Conduct comprehensive ecological assessment (research) and evaluate climate effects on aspen meadows. • Gather and analyze data on wet meadows and wildlife: establish baseline inventory of wet meadows and research ecosystem services of wet meadows (e.g., carbon sequestration • Gathering and analyze data regarding aspen meadows and wildlife. Partner Engagement • Partner for joint advocacy by establishing partnership for privately managed lands and decision-making processes with other public and private entities Management Planning • Implement grazing practices that benefit meadow ecosystems (conduct managed grazing). • Provide input on grazing management plans. Direct Management • Enhance habitat: improve water quality and temperature, coordinate water storage and timing of release to improve meadow hydrology, improve surface water recharge, reduce erosion and bank cutting, restore meadow hydrology, and improve resiliency of meadows to flood events. • Implement habitat restoration and enhancement of aspen meadows. • Manage invasive species. • Restore meadows impacted by roads and railroads: reduce sediment from existing and abandoned roads from entering meadows, restore hydrology altered by legacy roads and railroads, develop BMPs for road maintenance, and reduce the overall presence of roads and railroads in meadows (new and existing).	Land Acquisition/Easement/Lease • Protect land through acquisition and conservation easements, with emphasis on restoring and protecting degraded wet meadow habitat and conserving high-quality wet meadow Environmental Review • Conduct environmental review, maintain devotion of staff to environmental review of CEQA projects, and enhance staffing levels to commit to environmental review of NEPA projects on federal lands. Law and Policy • Advocate for laws and policies that protect natural resources. Outreach and Education • Provide outreach and education for the conservation of natural resources. • Provide education and outreach to broad resource users on multiple-use policy and educate the public on the beneficial use of fire.	• Wet Meadow
North American Pacific Coastal Salt Marsh	Salt Marsh	Data Collection and Analysis • Conduct research regarding effective salt marsh management and restoration. Partner Engagement • Partner for joint advocacy. Management Planning • Implement integrated resource management. Direct Management • Control invasive species. Economic Incentives • Provide economic incentives for improved resource management.	Land Acquisition/ Easement/ Lease • Protect and restore land acquired through fee title or conservation easement, with focus on the following: acquire, protect, enhance, or restore salt marsh habitat; support the Delta Conservancy to establish restoration priorities; increase connectivity among salt marsh habitats; and enhance working landscapes to benefit fish and wildlife. Law and Policy • Advocate for laws and policies, with a focus on the following: influence land use policies to reduce impacts on salt marsh habitat; streamline permit process for restoration; enhance law enforcement capacity for protection of restoration sites; develop programmatic permits; and prepare for climate change. Outreach and Education • Implement education and outreach focused on educating local agencies and the public on the biological values of Bay Delta habitats and existing threats affecting fish and wildlife, and promoting effective and coordinated conservation strategies for the Bay Delta.	• Saline Emergent Wetland • Tidal Freshwater Wetland (in the Delta)

Table E-1 Terrestrial Conservation Strategies

USNVC Macrogroup	Common Name	Conservation Strategies		CWHR Classification
Warm Semi-Desert/Mediterranean Alkali–Saline Wetland	Salt Marsh Meadows *(strategies developed for Salt Marsh apply to this macrogroup)*	Data Collection and Analysis • Conduct research regarding effective salt marsh management and restoration. Partner Engagement • Partner for joint advocacy. Management Planning • Implement integrated resource management. Direct Management • Control invasive species. Economic Incentives • Provide economic incentives for improved resource management.	Land Acquisition/ Easement/ Lease • Protect and restore land acquired through fee title or conservation easement, with focus on the following: acquire, protect, enhance, or restore salt marsh habitat; support the Delta Conservancy to establish restoration priorities; increase connectivity among salt marsh habitats; and enhance working landscapes to benefit fish and wildlife. Law and Policy • Advocate for laws and policies, with focus a on the following: influence land use policies to reduce impacts on salt marsh habitat; streamline permit process for restoration; enhance law enforcement capacity for protection of restoration sites; develop programmatic permits; and prepare for climate change. Outreach and Education • Implement education and outreach focused on educating local agencies and the public on the biological values of Bay Delta habitats and existing threats affecting fish and wildlife, and promoting effective and coordinated conservation strategies for the Bay Delta.	• Alkali Desert Scrub • Saline Emergent Wetland • Tidal Freshwater Wetland (in the Delta)
Mojavean–Sonoran Desert Scrub	Mojave and Sonoran Desert Scrub	Partner Engagement • Establish co-management partnership. • Partner for joint advocacy; increase political awareness for conservation of desert scrub in the Sonoran Desert ecoregion, secure additional funding through grants or legislation, and advocate for development consistent with strategy. Management Planning • Develop HCP, NCCP, and management plans, with emphasis on minimizing impacts of housing and urban growth. Land Acquisition/Easement/Lease • Conserve lands to maintain long-term viability of SGCN.	Land Use Planning • Provide input on project planning and decision making process; conserve stream habitats and flows through participation in the planning and decision making process. Outreach and Education • Partner for joint advocacy; increase political awareness for conservation of desert scrub in the Sonoran Desert ecoregion, secure additional funding through grants or legislation, and advocate for development consistent with strategy. Training and Technical Assistance • Provide training to agency staff on renewable energy issues, including technology, relevant research, ecological impacts, and conservation strategies.	• Desert Scrub • Desert Succulent Scrub • Joshua Tree
North American Warm-Desert Xero-Riparian Macrogroup (formerly Madrean Warm Semi-Desert Wash Woodland/Scrub)	Desert Wash Woodland and Scrub	Data Collection and Analysis • Gather biological data and conduct research on SGCN and response to disturbance. Partner Engagement • Partner for joint advocacy, with focus on conservation of SGCNs that use railroad right-of-ways (ROW), and development of BMPs for ROW maintenance activities.	Land Use Planning • Develop BMPs for roads and railroads. Outreach and Education • Provide education, including to BLM and USFWS on impacts from operations and maintenance activities within railroad right-of-ways.	• Desert Scrub • Desert Wash
Great Basin Saltbush Scrub Macrogroup (formerly Western North American Cool Semi-Desert Shrubland, Shrub-Steppe)	Shadscale-Saltbush Scrub	Data Collection and Analysis • Gather and analyze data, particularly on the distribution of invasive species and their impacts on shadscale-saltbush scrub. • Gather data and conduct research to better understand alkali desert scrub ecology (e.g., population size, distribution, habitat relationships), threats, and climate change effects; collect and analyze baseline assessment information for alkali desert scrub. Partner Engagement • Establish and develop co-management partnerships; use partnerships with desert land managers to manage invasive species on conserved lands; and integrate climate change considerations into management plans for species and habitats. • Establish joint partnerships with desert land managers, particularly to manage invasive species on conserved lands. • Partner for joint advocacy; increase political awareness for conservation of alkali desert scrub in the Mojave ecoregion through education and outreach; secure additional funding through grants or legislation; and ensure renewable energy development is consistent with DRECP conservation strategies.	Management Planning • Develop and implement management plans to guide maintaining or restoring connectivity for alkali desert scrub and SGCN. Land Acquisition/ Easement/ Lease • Protect high-quality alkali desert scrub habitat through acquisition and easements. Outreach and Education • Develop and implement an outreach program on the impacts of invasive species. • Provide outreach and education on resource conservation practices. Training and Technical Assistance • Provide training on invasive species control and management.	• Alkali Desert Scrub • Desert Scrub • Desert Wash
Cool Semi-Desert Wash and Disturbance Scrub	High Desert Wash and "Rangeland" Scrub	Data Collection and Analysis • Monitor and map invasive species, and study fire and climate-related effects on target habitats. Partner Engagement • Maintain and enhance partnerships, particularly with NPS; form a collaborative group for data collection and research, especially with BLM.	Management Planning • Comment on and amend plans. Direct Management • Restore and protect priority areas: identify highest priority areas for restoration, rehabilitation, and protection from fire, invasive species, or wild burros.	• Bitterbrush • Low Sage • Sagebrush

Table E-1 Terrestrial Conservation Strategies

USNVC Macrogroup	Common Name	Conservation Strategies	CWHR Classification
Western North America Tall Sage Shrubland and Steppe	Big Sagebrush Scrub	Data Collection and Analysis • Conduct research (data management) on restoration to inform prioritization of potential restoration areas. • Prioritize and coordinate sage grouse research efforts with landowners and land managers; monitor pinyon juniper and cheatgrass invasions. Partner Engagement • Establish partnerships, coordinate efforts, and identify and combine funding sources with other agency funding, for protecting, restoring, and enhancing sagebrush habitat. • Implement management partnership/coordination. Management Planning • Provide input on grazing management plans, including review and comment on CEQA and NEPA documents for grazing management plans to help slow or reverse habitat degradation because of the negative impacts of certain grazing practices. Direct Management • Conduct controlled burns for fire/fuel reduction and habitat management in conifer/sagebrush areas (like those encroached by pinyon-juniper). • Implement habitat restoration and enhancement. • Implement resource management to promote healthy sagebrush ecosystems, through controlled burns (where appropriate and not in conflict with sage-grouse conservation), control of invasive species, and removal of pinyon-juniper. • Manage invasive species. Economic Incentives • Obtain funding for resource management. • Provide economic incentives for improved resource management. • Provide economic incentives and purchase leases, acquisitions, or conservation easements on important sage grouse habitat with various funding sources. Land Acquisition/ Easement/ Lease • Protect land through acquisition and easements; identify for protection high-quality sagebrush habitat within the Desert Creek/Fales, Bodie, and Long Valley population management units. Law and Policy • Develop BMPs for improved resource conservation. Outreach and Education • Advocate for wildlife friendly fire management. • Provide education and outreach for the ranching public and CDFW staff; educate staff on rangeland science; and educate ranching public on the need and status of BMPs.	• Sagebrush
Western North America Dwarf Sage Shrubland and Steppe	Great Basin Dwarf Sagebrush Scrub	Data Collection and Analysis • Conduct research (data management) on restoration to inform prioritization of potential restoration areas. Partner Engagement • Implement management partnership/coordination. Management Planning • Provide input on grazing management plans, including review and comment on CEQA and NEPA documents for grazing management plans to help slow or reverse habitat degradation because of the negative impacts of certain grazing practices. Direct Management • Conduct controlled burns for fire/fuel reduction and habitat management in conifer/sagebrush areas (like those encroached by pinyon-juniper). • Implement habitat restoration and enhancement. • Manage invasive species. Economic Incentives • Obtain funding for resource management. • Provide economic incentives for improved resource management. Law and Policy • Develop BMPs for improved resource management. Outreach and Education • Advocate for wildlife friendly fire management. • Provide education and outreach for the ranching public and CDFW staff; educate staff on rangeland science; and educate ranching public on the need and status of BMPs.	• Low Sage
Inter-Mountain Dry Shrubland and Grassland	Great Basin Upland Scrub	Data Collection and Analysis • Conduct research (data management) on restoration to inform prioritization of potential restoration areas. • Monitor and map invasive species, and study fire and climate-related effects on target habitats. Partner Engagement • Implement management partnership/coordination. • Maintain and enhance partnerships, particularly with NPS; form a collaborative group for data collection and research, especially with BLM. Management Planning • Comment on and amend plans. • Provide input on grazing management plans, including review and comment on CEQA and NEPA documents for grazing management plans to help slow or reverse habitat degradation because of the negative impacts of certain grazing practices. Direct Management • Conduct controlled burns for fire/fuel reduction and habitat management in conifer/sagebrush areas (like those encroached by pinyon-juniper). • Implement habitat restoration and enhancement. • Manage invasive species. • Restore and protect priority areas: identify highest priority areas for restoration, rehabilitation, and protection from fire, invasive species, or wild burros. Economic Incentives • Obtain funding for improved resource management. • Provide economic incentives for improved resource management. Law and Policy • Develop BMPs for improved resource management. Outreach and Education • Advocate for wildlife friendly fire management. • Provide education and outreach for the ranching public and CDFW staff; educate staff on rangeland science; and educate ranching public on the need and status of BMPs.	• Bitterbrush • Low Sage • Sagebrush

Table E-1 Terrestrial Conservation Strategies

USNVC Macrogroup	Common Name	Conservation Strategies	CWHR Classification
Vancouverian Alpine Scrub, Forb Meadow, and Grassland *and* Rocky Mountain Alpine Scrub, Forb Meadow, and Grassland	Alpine Vegetation	Data Collection and Analysis • Gather more information on alpine habitat requirements and impacts of climate change on the plant community and its KEAs, specifically in the North Coast and Klamath Province. • Gather more information on alpine vegetation habitat, particularly on the physical and biological variables affected by climate change. Partner Engagement • Establish partnerships to co-monitor alpine vegetation habitat on state and federal lands. • Establish partnerships to co-monitor target on state and federally managed lands, to establish decision-making processes with other public and private entities to determine or implement strategies, convene an advisory committee to assist with implementation of strategies and engage university students in research. Management Planning • Develop or update management plans to integrate the effects of climate change. • Manage grazing and invasive species, remove trails, restrict grazing and pack animal use of subalpine and alpine meadows on public lands, remove trail and campground use away from subalpine and alpine meadows, and treat and remove invasive species. Direct Management • Manage grazing and invasive species, remove trails, restrict grazing and pack animal use of subalpine and alpine meadows on public lands, remove trail and campground use away from subalpine and alpine meadows, and treat and remove invasive species. • Restore subalpine and alpine meadows, including restoration or enhancement of degraded habitats, monitoring populations, fencing for protection and removing barriers to species movement. Economic Incentives • Develop economic incentives to reduce the impacts of climate change within California. • Develop economic incentives to reduce greenhouse gas emissions within California. Outreach and Education • Engage urban citizens on climate change; expand conservation education programs (e.g., in grade schools) to include climate change. • Engage urban citizens, educate grade school children on climate change, and expand conservation education programs to include climate change and solutions to reduce impacts such as reducing greenhouse gas emissions. Training and Technical Assistance • Provide training on science based applications and tools. Provide science-based applications and tools for climate change and natural resources management. • Provide science-based applications and tools for climate change and natural resources management.	• Alpine Dwarf-Shrub
Temperate Pacific Intertidal Shore	Brackish (Estuarine) Submerged Aquatic Vegetation *(strategies from Marine target "Embayments, Estuaries, and Lagoons" apply to this macrogroup)*	Data Collection and Analysis • Encourage research that addresses questions that would improve ability to manage this target. • Improve Marine Province's management of resources that are vulnerable to climate change and ocean acidification. • Improve understanding of distribution of important pathogens. • Support target monitoring, compile results, and integrate data into management. • Work with partners to identify effects on the target of increased anthropogenic greenhouse gases and to develop and implement responses to these effects. Partner Engagement • Coordinate with local and state relevant agencies on shoreline and water quality management planning. • Encourage protection of lands that reduce runoff (buffers like greenways and gulches). • Encourage research that addresses questions that would improve ability to manage this target. • Improve education and outreach activities. • Improve engagement in decision-making process. • Improve implementation of non-structural and structural BMPs. • Improve management approaches for fostering the sustainability and resilience of the target. • Improve rapid response capabilities to events that degrade target. • Support development, implementation, and enforcement of effective regulations. • Work with partners to identify effects on the target of increased anthropogenic greenhouse gases and to develop and implement responses to these effects. Management Planning • Coordinate with local and state relevant agencies on shoreline and water quality management planning. • Implement CDFW Aquatic Invasive Species Management Plan. • Improve engagement in decision-making process. • Improve implementation of estuary, lagoon mouth and channel modifications. • Improve Marine Province's management of resources that are vulnerable to climate change and ocean acidification. • Improve rapid response capabilities to events that degrade target. Direct Management • Encourage research that addresses questions that would improve ability to manage this target. • Implement CDFW Aquatic Invasive Species Management Plan. • Improve implementation of estuary, lagoon mouth and channel modifications. • Improve management approaches for fostering the sustainability and resilience of the target. • Improve rapid response capabilities to events that degrade target. • Streamline permit processes that address control and eradication of invasive species. • Support target monitoring, compile results, and integrate data into management. • Work with partners to identify effects on the target of increased anthropogenic greenhouse gases and to develop and implement responses to these effects. Economic Incentives • Support policies and practices that minimize impacts on shoreline and wetlands. Environmental Review • Coordinate with local and state relevant agencies on shoreline and water quality management planning. • Improve engagement in decision-making process. • Improve implementation of non-structural and structural BMPs. • Improve practices to reduce human error. • Streamline permit processes that address control and eradication of invasive species. Land Acquisition/Easement/Lease • Encourage protection of lands that reduce runoff (buffers like greenways and gulches). Land Use Planning • Encourage protection of lands that reduce runoff (buffers like greenways and gulches). • Improve engagement in decision-making process. • Improve implementation of non-structural and structural BMPs. • Work with partners to identify effects on the target of increased anthropogenic greenhouse gases and to develop and implement responses to these effects. Law and Policy • Streamline permit processes that address control and eradication of invasive species. • Support development, implementation, and enforcement of effective regulations. • Support policies and practices that minimize impacts on shoreline and wetlands. Outreach and Education • Improve education and outreach activities. • Improve practices to reduce human error. Training and Technical Assistance • Increase training.	• Estuarine

Table E-1 Terrestrial Conservation Strategies

USNVC Macrogroup	Common Name	Conservation Strategies		CWHR Classification
Western North American Freshwater Aquatic Vegetation	Freshwater Aquatic Vegetation *(strategies from Freshwater Marsh apply to this macrogroup)*	Management Planning • Develop management plans. Economic Incentives • Provide economic incentives for improved resource management. Land Acquisition/ Easement/ Lease • Purchase land and conservation easements.	Law and Policy • Advocate for laws and policies. Outreach and Education • Provide outreach and education.	• Lacustrine • Riverine
California Cliff, Scree, and Other Rock Vegetation	California Foothill and Coastal Rock Outcrop Vegetation	Data Collection and Analysis • Collect and analyze data regarding the target. Partner Engagement • Engage conservation partners, including state and federal agencies, tribal governments, the NGO community, and other partners to achieve shared objectives and broader coordination across overlapping areas. Establish partnership to co-monitoring species/habitats on federally managed lands. Establish decision-making processes with other public and private entities to determine or implement strategies. Convene an advisory committee to assist with implementation of strategies.	Management Planning • Work with partners on the development of large landscape conservation planning. Develop or update management plans to integrate the effects of climate change. Development of management plans for species, habitats and natural processes. Develop a management plan for SGCN or its habitat. Reintroduction, relocation, or stocking of native animals or plants to an area where they can better adapt. Translocate/breed in captivity a SGCN to establish new populations in suitable habitat. Restore SGCN to historically occupied habitats. Direct Management • Conduct direct resource management. Land Acquisition/ Easement/ Lease • Protect land through acquisition, easement, or lease.	• Barren
Vancouverian Cliff, Scree, and Other Rock Vegetation	Northwest Coast Cliff and Outcrop	Data Collection and Analysis • Collect biological and ecological data to address key information gaps on SGCN, habitats, and pressures. Partner Engagement • Establish and engage in partner relationships. Management Planning • Develop and implement management plans. Direct Management • Conduct direct resource management. Environmental Review • Implement environmental review, with focus on the following: non-conservation oriented policies; projects and plans to help ensure impacts to wildlife are minimized and benefits maximized; infrastructure development projects to ensure they are designed and sited to avoid impacts on species and habitat; state highway plans; forest management plans; and plans for transmission corridor siting.	Land Acquisition/ Easement/ Lease • Designate conservation areas with emphasis on sites or landscapes that have unique and important value to wildlife. • Protect priority habitats through fee title acquisition, permanent conservation easement, or other means; purchase land in a corridor connecting two protected areas to provide connectivity of habitat. Land Use Planning • Provide input to land use planning decisions. Law and Policy • Develop or influence law and policy that addresses vehicle emissions, timber harvest cumulative impacts, critical habitat, and marine species with ranges that overlap jurisdictional boundaries.	• Barren
North American Warm Semi-Desert Cliff, Scree, and Other Rock Vegetation	Sparsely Vegetated Desert Dune	Data Collection and Analysis • Collect data on plant community and SGCN status within ecoregion through range-wide surveys, climate change studies, and monitoring invasive species population trends. Partner Engagement • Maintain partnership presence in the planning process of HCPs to ensure the conservation of this target. Management Planning • Support the development and implementation of ongoing/existing management plans.	Direct Management • Support implementation of existing HCPs to protect, restore, or enhance those areas of target habitat that are prioritized for such or have been degraded by invasive species or OHV. Enhance enforcement of existing HCPs, including illegal OHV use. Existing HCPs include Imperial Sand Dunes RAMP, Heber Dunes SVRA General Plan, Lower Colorado River MSCP, San Diego East County MSCP, Coachella Valley MSHCP, IID, and the DRECP. Land Use Planning • Continue to provide input on local land use plans.	• Barren

USNVC=U.S. National Vegetation Classification CWHR=California Wildlife Habitat Relationship

Table E-2 Freshwater Aquatic Conservation Strategies

Aquatic Targets	Conservation Strategies	
Anthropogenically Created Aquatic Features	Data Collection and Analysis • Collect data on the distribution of invasive species and impacts to the target habitat, species utilization of anthropogenic waterways, and the distribution of temporary aquatic habitats associated with roads and railroads to inform management. Partner Engagement • Establish co-management partnerships and cooperative management plans with land management agencies, water agencies, private landowners, regional land trusts, environmental organizations, railroads, and transportation agencies. Direct Management • Manage invasive species to expand range of aquatic/semi-aquatic SGCNs.	Land Use Planning • Provide input on project planning and decision making process; conserve anthropogenic aquatic habitats through participation in the planning and decision making process. Law and Policy • Develop and implement BMPs for managed grazing, maintenance of drains/canals, and road and railway maintenance. Outreach and Education • Provide outreach and education, with emphasis on improving public awareness, concern, and participation in resource conservation.
Carson River Native Fish Assemblage	Data Collection and Analysis • Conduct research on SGCNs; study the distribution and abundance of mountain whitefish and mountain sucker in the Carson River Basin, and the susceptibility of the Carson River Basin to invasive species. Management Planning • Develop basin management plans. Direct Management • Enhance habitat; improve water quality and temperature consistent with the Basin Plan, and coordinate water storage and timing of release between CDFW and water agencies to benefit fish habitat and water users. • Manage dams and other barriers to fish passage. • Reintroduce Lahontan cutthroat trout and Paiute cutthroat trout to their historic ranges. • Restore native species; manage invasive species and restore/maintain native fish populations in target streams.	Land Acquisition, Easement, Lease • Purchase land and/or acquire easements: acquire water rights by purchasing lands along the critical Carson River tributaries, acquire conservation easements to protect riparian areas in the Carson River Basin, acquire large mountain meadow ranches for conservation, and acquire water storage rights in the Carson River Basin. Law and Policy • Implement effective law enforcement related to: illegal water diversions, illegal fishing, and invasive species in the Carson River Basin; compliance with 1600 agreements; and compliance with water rights. Outreach and Education • Conduct outreach; inform public of issues related to introduced genetic material, risks of invasive species, and importance of aquatic biodiversity management plants. Training and Technical Assistance • Provide training to staff and managers on non-native genetic issues, invasive species management and control techniques, and fish identification.
Cienegas	Data Collection and Analysis • Gather and analyze data on impacts of water management and water use, renewable energy projects, groundwater use for farming and livestock, and invasive species on native species within cienegas. Partner Engagement • Establish and develop co-management partnerships. Direct Management • Participate in interagency review of water management and use, particularly groundwater withdrawals. • Translocate or reintroduce native aquatic SGCN and establish genetically viable populations.	Land Acquisition, Easement, Lease • Protect high-quality cienegas through acquisition/easement/lease. Outreach and Education • Provide outreach and education about the need for resource management of cienegas.
Clear Lake Native Fish Assemblage	Partner Engagement • Establish collaborative partnerships. Direct Management • Control damage to creeks from off-highway vehicle use. • Develop BMPs for increased spring/summer flows for improved lake and fish health, improved fish passage, and water diversions. • Manage invasive species. Economic Incentives • Provide economic incentives for improved resource management.	Land Acquisition, Easement, Lease • Purchase land and/or acquire easements. Law and Policy • Increase Law Enforcement Division (LED) staffing levels and implement effective law enforcement related to: illegal water diversions, illegal fishing, and invasive species introductions; compliance with 1600 agreements; and compliance with water rights. Outreach and Education • Provide outreach and education for the conservation of natural resources.
Coastal Lagoons	Data Collection and Analysis • Conduct baseline surveys for SCGN/habitat and pressures in at least 50% of coastal lagoons within the ecoregion. Direct Management • Develop an interagency direct management plan for coastal lagoons. • Manage dams and other barriers to improve fish passage and stream ecosystem function. Land Acquisition, Easement, Lease • Protect riparian areas by acquiring land adjacent to lagoons, and reduce water diversion from the critical lagoons and tributary streams during late spring to summer.	Law and Policy • Influence the drafting of laws and policies that promote conservation of lagoon habitat. Training and Technical Assistance • Provide training and technical assistance, including training interagency staff in fish identification and invasive species management/control techniques.

Table E-2 Freshwater Aquatic Conservation Strategies

Aquatic Targets	Conservation Strategies	
Eagle Lake Native Fish Assemblage	Data Collection and Analysis • Prepare groundwater assessment. Partner Engagement • Engage in decision-making process. Management Planning • Develop BMPs for water management and conservation in the Pine Creek watershed. Coordinate with USFS to create enhanced wetlands and multi-use management (wildlife, livestock, and fish) policy. Managed water could better be used for fish as there are alternative water sources for wildlife and livestock in the Pine Creek watershed. • Promote domestic water efficiency and conservation through reducing water use by increased efficiency from residence and businesses. Direct Management • Encourage use of alternative water sources (wells), water conservation practices, and reduce the impacts of water loss at water treatment sites. • Implement the Eagle Lake Rainbow Trout Conservation Strategy, which was developed amongst the USFWS, USFS, and CDFW. • Improve road maintenance to reduce sediment from roads entering streams. • Manage dams and other barriers by installing control structures (gate or gate valve) to allow more bypass flows and fish passage. • Manage grazing. • Manage invasive species.	Outreach and Education • Provide education and outreach by educating the public on the development, status and need for BMPs and about invasive species. Economic Incentives • Provide economic incentives for grazing on public lands to follow BMPs. Law and Policy • Develop grazing BMPs for managed grazing, including barriers to sensitive areas, fencing timing, and grazing rotations.
Goose Lake Native Fish Assemblage	Data Collection and Analysis • Design and implement inventory and assessment of fish populations and fish habitat. Direct Management • Manage dams and other barriers. • Manage invasive species. • Reduce livestock access to natural water features with wells and alternative water sources.	Law and Policy • Develop or update grazing BMPs and conduct managed grazing. Outreach and Education • Education and outreach; inform public of restoration plans and why treatment is necessary.
Native Aquatic Species Assemblage/ Communities	Direct Management • Develop buffers. Develop county stream buffer policy and guidelines in conjunction with ongoing regional efforts to develop riparian buffers; adequate support and clear policy guideline are needed. • Manage dams and other barriers by reviewing potential cost/benefit of modifying or removing dams that block access to significant amounts of high quality salmonid spawning and rearing habitat and modifying or removing Cape Horn Dam and Scott Dam from the upper Eel River, Dwinnel dam on the Shasta River, and dams from upper Klamath River. • Promote water conservation measures by reducing the amount of land growing water intensive crops, considering less water intensive crops, providing incentives for water conservation, and encouraging public participation in enforcement of wasteful use of water (peer pressure). • Reduce need for livestock access to streams and riparian corridors by providing and locating water supply to livestock in grazing areas away from streams (use wells and other off channel sources). Land Acquisition/Easement/Lease • Acquire of riparian areas. Protect stream ecosystems by riparian land purchase and conservation easements.	Economic Incentives • Provide economic incentives to private landowners to influence responsible stewardship of land/water and specific species and establish good stewardship recognition or payments to landowners practicing sound resource management that benefits stream ecosystems. Law and Policy • Support effective law enforcement by increasing funding for federal and state enforcement resources and increasing public awareness. • Advocate for laws and policies. Develop, change, influence, and help implement formal legislation, regulations, and voluntary standards. Outreach and Education • Provide outreach and education. Outreach efforts targeted to specific groups, communities, resource users, policy makers, stakeholders and/or the public to improve awareness and change knowledge, attitudes, and behaviors. Outreach includes both formal (classroom) and non-formal education efforts to: (1) landowners to implement land management practices to benefit species; (2) decision makers about impacts on at-risk quality standards for key water bodies and aquatic species).
Native Fish Assemblage	Data Collection and Analysis • Collect and analyze data to establish a baseline inventory of SCGN distribution. • Identify areas that may act as climate refugia. Direct Management • Control invasive species. • Improve fish passage by working with federal, state, and local agencies to identify and remove key fish barriers to fish movement and sediment flow, and keep priority areas barrier free. • Protect and restore floodplain function. • Restore natural flows. • Translocate species to increase current distribution; specifically, translocate Santa Ana sucker, Santa Ana speckled dace, and UTS into suitable habitat in the Big Tujunga, San Gabriel, and Santa Clara watersheds.	Land Acquisition/Easement/Lease • Protect and restore unarmored threespine stickleback (UTS) habitat within the Santa Clara River mainstem, Soledad Canyon, and Bouquet Canyon. Outreach and Education • Implement outreach.

Table E-2 Freshwater Aquatic Conservation Strategies

Aquatic Targets	Conservation Strategies	
Salt Marsh	Data Collection and Analysis • Conduct research regarding effective salt marsh management and restoration. Partner Engagement • Partner for joint advocacy. Management Planning • Implement integrated resource management. Direct Management • Control invasive species. Economic Incentives • Provide economic incentives for improved resource management.	Land Acquisition/Easement/Lease • Protect and restore land acquired through fee title or conservation easement, with focus on the following: acquire, protect, enhance, or restore salt marsh habitat; support the Delta Conservancy to establish restoration priorities; increase connectivity among salt marsh habitats; and enhance working landscapes to benefit fish and wildlife. Law and Policy • Advocate for laws and policies, with focus on the following: influence land use policies to reduce impacts on salt marsh habitat; streamline permit process for restoration; enhance law enforcement capacity for protection of restoration sites; and develop programmatic permits. Outreach and Education • Implement education and outreach focused on educating local agencies and the public on the biological values of Bay Delta habitats and existing threats affecting fish and wildlife, and promoting effective and coordinated conservation strategies for the Bay Delta.
San Joaquin Native Fish Assemblage	Data Collection and Analysis • Gather and analyze data; establish baseline inventory of SGCN and habitat, and threat distributions. Management Planning • Provide input on local planning; engage in local planning to encourage the use of bio(soft) engineering for flood control, retention of functional floodplains, and deterrence and capture of waste and pollution. Direct Management • Control invasive species: assess, map, and develop control plans for invasive aquatic species. • Improve fish passage: assess, prioritize, and remove/modify fish passage barriers. • Protect and restore floodplain function; implement and maintain priority floodplain restoration projects. • Restore natural flows.	Law and Policy • Advocate for effective enforcement of laws related to protection of significant riparian areas. Outreach and Education • Provide outreach and education for the conservation of natural resources.
South Coast Native Aquatic Herp Assemblage	Data Collection and Analysis • Conduct research to identify causal mechanism for Chytrid fungus and prevent its spread in amphibian populations. Direct Management • Manage flows, dams, and other barriers to best benefit aquatic herps and for fish passage. • Manage invasive species to improve conditions for native fish and aquatic herps. • Protect and restore habitat, and create riparian buffers adjacent to streams. • Reintroduce native species.	Land Acquisition/Easement/Lease • Protect land in fee or with conservation easements, with focus on riparian habitats that have the greatest ecological potential such as larger impaired systems and those that support SGCN. Outreach and Education • Provide outreach and education.
Springs and Spring Brooks	Data Collection and Analysis • Study and document impacts of invasive species, renewable energy projects, and dams and water management and use on spring ecosystems and associated species for future management actions. Partner Engagement • Establish and develop co-management partnerships. Management Planning • Provide input on local planning decisions.	Direct Management • Manage dams and other barriers to control fish passage. • Manage invasive species to expand range of native fishes. • Translocate or reintroduce native aquatic SGCN and establish genetically viable populations. Land Acquisition/Easement/Lease • Protect high-quality springs and spring brooks through acquisition/easement/lease. Outreach and Education • Provide outreach and education, with emphasis on improving public awareness, concern, and participation in resource conservation that leads to improved conditions for native fish.
Upper Kern River Native Fish Assemblage	Data Collection and Analysis • Conduct research on SGCN; update genetic status for golden trout; refine distribution for hardhead and Kern River rainbow trout. Management Planning • Develop new or revised management plans for native fish and implement existing Conservation Assessment and Strategy for golden trout. Direct Management • Reintroduce golden trout to its historic range. • Restore and enhance meadow habitat; improve water quality and temperature consistent with the Basin Plan. • Restore native species; manage invasive species, and remove non-native trout from target streams.	Land Acquisition/Easement/Lease • Purchase land and/or acquire easements. Outreach and Education • Conduct outreach; inform public of issues related to introduced genetic material, risks of invasive species, and importance of aquatic and riparian habitat restoration. Training and Technical Assistance • Provide training to staff and managers on non-native genetic issues, invasive species management, and control techniques.
Walker River Native Fish Assemblage	Data Collection and Analysis • Collect data on the impacts of diversions, water management, water use, and the distribution of introduced genetic material on the native fish community. Partner Engagement • Establish and develop co-management partnership to affect change in dams and/or water management and use following interagency agreement. Management Planning • Develop, update, and implement grazing BMPs. • Ensure that planning and decision-making processes support the conservation of stream habitats and flows as a result of CDFW input. • Reduce impacts to native fish as a result of roads and railroads and invasive species through development and use of BMPs.	Direct Management • Implement direct management activities to restore aquatic habitats and ensure that SGCNs are maintained or enhanced. • Manage water for beneficial uses by native aquatic species. • Remove introduced brook trout in the context of recovery of listed Lahontan cutthroat trout. • Translocate or reintroduce native fish species. Law and Policy • Implement effective enforcement of laws. Outreach and Education • Provide outreach and education on native aquatic resource conservation efforts.

Table E-3 Marine Conservation Strategies

Conservation Targets	Conservation Strategies
Deep Zone (>100m)	Marine strategies to be developed in the future
Embayments, Estuaries, and Lagoons	Data Collection and Analysis • Encourage research that addresses questions that would improve ability to manage this target. • Improve Marine Province's management of resources that are vulnerable to climate change and ocean acidification. • Improve understanding of distribution of important pathogens. • Support target monitoring, compile results, and integrate data into management. • Work with partners to identify effects on the target of increased anthropogenic greenhouse gases and to develop and implement responses to these effects. Partner Engagement • Coordinate with local and state relevant agencies on shoreline and water quality management planning. • Encourage protection of lands that reduce runoff (buffers like greenways and gulches). • Encourage research that addresses questions that would improve ability to manage this target. • Improve education and outreach activities. • Improve engagement in decision-making process. • Improve implementation of non-structural and structural BMPs. • Improve management approaches for fostering the sustainability and resilience of the target. • Improve rapid response capabilities to events that degrade target. • Support development, implementation, and enforcement of effective regulations. • Work with partners to identify effects on the target of increased anthropogenic greenhouse gases and to develop and implement responses to these effects. Management Planning • Coordinate with local and state relevant agencies on shoreline and water quality management planning. • Implement CDFW Aquatic Invasive Species Management Plan. • Improve engagement in decision-making process. • Improve implementation of estuary, lagoon mouth and channel modifications. • Improve Marine Province's management of resources that are vulnerable to climate change and ocean acidification. • Improve rapid response capabilities to events that degrade target. Direct Management • Encourage research that addresses questions that would improve ability to manage this target. • Implement CDFW Aquatic Invasive Species Management Plan. • Improve implementation of estuary, lagoon mouth and channel modifications. • Improve management approaches for fostering the sustainability and resilience of the target. • Improve rapid response capabilities to events that degrade target. • Streamline permit processes that address control and eradication of invasive species. • Support target monitoring, compile results, and integrate data into management. • Work with partners to identify effects on the target of increased anthropogenic greenhouse gases and to develop and implement responses to these effects. Economic Incentives • Support policies and practices that minimize impacts on shoreline and wetlands. Environmental Review • Coordinate with local and state relevant agencies on shoreline and water quality management planning. • Improve engagement in decision-making process. • Improve implementation of non-structural and structural BMPs. • Improve practices to reduce human error. • Streamline permit processes that address control and eradication of invasive species. Land Acquisition/Easement/Lease • Encourage protection of lands that reduce runoff (buffers like greenways and gulches). Land Use Planning • Encourage protection of lands that reduce runoff (buffers like greenways and gulches). • Improve engagement in decision-making process. • Improve implementation of non-structural and structural BMPs. • Work with partners to identify effects on the target of increased anthropogenic greenhouse gases and to develop and implement responses to these effects. Law and Policy • Streamline permit processes that address control and eradication of invasive species. • Support development, implementation, and enforcement of effective regulations. • Support policies and practices that minimize impacts on shoreline and wetlands. Outreach and Education • Improve education and outreach activities. • Improve practices to reduce human error. Training and Technical Assistance • Increase training.
Intertidal Zone	Marine strategies to be developed in the future
Islands	See Appendix H
Mid-Depth Zone (30-100m)	Marine strategies to be developed in the future
Nearshore Subtidal Zone (0-30m)	Marine strategies to be developed in the future
Offshore Rocks	Marine strategies to be developed in the future

Table E-4 Anadromous Fish Conservation Strategies

Geography	Conservation Target	Conservation Strategy	
Statewide	In-River Spawning and Rearing Habitat	Document range and distribution of spawning and rearing habitat. Enhance and protect key spawning and rearing habitat for each specific anadromous species.	Promote restoration actions that focus on ecological processes and climate change resilience.
	River Flow	Develop water management and conservation plans necessary to conserve anadromous fishes. Identify annual flow regimes necessary for migration, rearing, and spawning of each anadromous species.	Implement water management and conservation plans.
	Wetland Habitat	Identify current condition of riparian and marsh habitat associated with anadromous species. Protect key areas necessary to maintain viable populations.	Restore marsh and riparian habitat to improve carrying capacity of anadromous fishes.
North Coast and North Central Coast	California Anadromous Salmonid Stronghold Watersheds	Assess ecological and human activities conditions that are allowing for healthy fish populations. Establish collaborative working groups for each Stronghold (Smith, Mattole, and South Fork Eel rivers).	Establish technical, agency, and financial support to maintain and expand ecological and human conditions supporting strong salmon and steelhead populations.
	Coastal Estuaries	Establish estuary function and structure that will allow anadromous migration and be responsive to climate change. Evaluate current condition and estuarine needs for coho salmon, eulachon, longfin smelt in key estuaries (i.e., Smith, Klamath, and Eel rivers and Humboldt Bay).	Restore and enhance estuary habitat and processes essential for anadromous species.
	Russian River	Develop and implement water management plan to ensure Russian River fisheries and land use are compatible. Expand Warm Springs Hatchery complex to function as a potential regional conservation facility for coho salmon and other listed species in the North-Central Domain.	Restore and enhance estuary and river habitat necessary to support viable populations of all listed anadromous fishes (i.e., Chinook salmon, coho salmon, steelhead, green sturgeon).
Klamath-Trinity Rivers Basin	Pacific Lamprey	Establish standing committee to implement interstate/intertribal 2012 Pacific lamprey conservation agreement. Implement habitat restoration and monitoring programs.	Secure funding specific for conserving Pacific lamprey in the Klamath/Trinity Rivers Basin.
	Ecological Processes	Establish agreements and practices to ensure adequate ecological processes are maintained to support sustainable anadromous populations across the basins. Establish monitoring and evaluation programs to track ecological processes and functioning.	Evaluate wood debris, gravel, and water cycling and transport mechanisms across the basins.
	Listed And At-Risk Salmonids	Establish standing inter-organizational team to implement federal and state recovery plans, the Trinity River Restoration Plan, and Klamath River Settlement. Integrate recovery actions with strategic hatchery management (e.g., Iron Gate and Trinity River facilities).	Integrate sustainable river and tribal fisheries with establishing sustainable, natural populations of salmon and steelhead.
South-Central and Southern California Coasts	Steelhead Trout Populations	Determine role of resident populations to recovery and sustainability of anadromous populations. Establish a robust monitoring program to evaluate steelhead populations, habitat, and ecological processes.	Secure additional funding necessary to pursue essential habitat recovery.
	Migration Barriers	Accelerate planning and remediation of rim dam barriers to key steelhead populations. Modify land use practices (e.g., water use, agriculture, recreation, urban and road development) to minimize effects on migration corridors.	Remediate most downstream barriers to steelhead entering rivers and streams.
	Water Management	In addition to the statewide strategy, identify key streams and locations essential for over-summering juvenile and adult steelhead. Investigate ability and options to creating water banks for steelhead habitat.	Update CDFW management and conservation plan to integrate modern water management, including drought and climate change parameters.
Central Valley	Pacific Lamprey	Establish standing committee to implement interstate/intertribal 2012 Pacific lamprey conservation agreement. Implement habitat restoration and monitoring programs.	Secure funding specific for conserving Pacific lamprey in the Central Valley.
	Sturgeon	Establish fisheries management and conservation plans for white and green sturgeon. Implement habitat restoration and monitoring programs.	Secure funding specific for conserving sturgeon populations and fisheries in the Central Valley.
	Chinook Salmon And Steelhead	Conduct rim dam re-introduction pilot projects on Yuba and Sacramento rivers and evaluate efficacy of expanding rearing and spawning habitats for recovery. Establish biological production goals for each species, coupled with SMART ecological objectives, prioritized restoration actions, focused biotic and abiotic monitoring, and adaptive management planning framework that are developed and overseen by an established standing inter-organizational team to integrate activities of NMFS and CDFW recovery programs, Central Valley Program Improvement Act program, Bay Delta Conservation Plan, San Joaquin River Restoration program, and CDFW fisheries programs to establish sustained salmon and steelhead populations and fisheries.	Revise and integrate hatchery practices of the 6 facilities in the Central Valley to maximize scientific standards, minimize effects of programs on natural spawning populations and river habitat, and promote healthy fisheries populations.

Appendix F

Appendix F Invasive Species in California

This section was written by Elizabeth Brusati and Doug Johnson, California Invasive Plant Council and adapted from the introduction to the state's Strategic Framework on Invasive Species (ISCC 2011).

Impacts of Invasive Species

Invasive species are organisms that have invaded California from elsewhere and that damage our environment, agricultural production, public health, and economy. Some of these organisms were introduced inadvertently while others were introduced intentionally, without consideration of the harm they might cause. Although most of the thousands of species brought into our state cause little or no apparent harm, a small percentage are able to thrive in California to the detriment of native biological diversity, recreation, agriculture, infrastructure, and public health. Though it is difficult to compute harm from invasive species in financial terms, in *Environmental and Economic Costs Associated with Non-Indigenous Species in the United States* (1999), Pimental et al. place the cost to the United States at over $100 billion each year. (The scientific literature on invasive species and their impacts is extensive. See, for example, citations at www.invasivespeciesinfo.gov.)

Invasive species in California range from diseases, such as the insidious sudden oak death, to 200-pound feral pigs and from quagga mussels that clog infrastructure (e.g., pipes, pumps, equipment, etc.) and exert impacts on waterways to insects that damage and destroy crops and forests. Some introduced species are voracious predators, others out-compete native species for resources, and some are capable of re-engineering the environment to suit their preferences, changing hydrology, soil chemistry, and fire regimes. Collectively, invasive species are recognized as a major threat to biodiversity; they significantly impact over half of all federally listed threatened and endangered species, and are second only to habitat loss as a threat to these species (Wilcove et al. 1998). As the United Nation's Convention on Biological Diversity says, "[a]lien species that become invasive are considered to be a main direct driver of biodiversity loss across the globe. In addition, alien species have been estimated to cost our economies hundreds of billions of dollars each year (CBD 2015)."

The federal and state governments have developed and implemented plans and programs that promote interdisciplinary, interagency, and multi-stakeholder efforts to combat the threats posed by invasive species. The "Policy Background" section below provides a description of policies and plans that provide the framework and guidance for state and federal agency actions and programs described under "Agency Programs." This appendix also provides a discussion of how the agency and non-governmental organization (NGOs) efforts targeting specific taxonomic groups of species, which is organized by plants, insects and terrestrial invertebrates, aquatic and marine invertebrates, and vertebrates in the Invasive Species Leadership by Taxonomic Group" section below.

The sidebars in this section highlight only a few of the hundreds of invasive plant and animal species in California. The California Invasive Species Advisory Committee (CISAC) compiled an all-taxa list of invasive species found in the state (as well as known invasive species with potential for being introduced into the state in the future). This list and other information can be accessed from www.iscc.ca.gov.

Policy Background

In 1999, the federal government defined invasive species through Executive Order 13112 as "a species that is non-native to the ecosystem and whose introduction causes, or is likely to cause, economic or environmental harm, or harm to human health." Federal agencies were directed to prepare an invasive species management plan. In 2008, the National Invasive Species Council (NISC) revised the federal management plan, laying out a blueprint for action (NISC 2008). Increasingly, states have followed this lead, seeking the benefits of a coherent plan to coordinate the many agencies whose missions touch on the problem. Table F-1 shows how actions listed in the SWAP relate to the national invasive species management plan, while Table F-2 lists all objectives and tasks recommended by NISC (2008).

In California, Assembly Bill 2763 (Laird), signed by the governor in 2008, directed state agencies under the leadership of the California Department of Food and Agriculture (CDFA) to strengthen planning to anticipate the potential responses needed for future invasive species. This resulted in the formation of the Invasive Species Council of California (ISCC, comprising secretaries of six state agencies) and the CISAC (comprising 24 stakeholder representatives and expert advisors). In 2011, CISAC completed (and ISCC approved) *Stopping the Spread: A Strategic Framework for Protecting California from Invasive Species* (ISCC 2011). This plan built on two previously existing plans, the *California Noxious and Invasive Weed Action Plan* (CDFA 2005) and the *California Aquatic Invasive Species Management Plan* (CDFG 2008). The plan includes 40 recommendations for strengthening the state's response to invasive species. Table F-3 shows how actions listed by each province for SWAP fulfill recommended actions in *Stopping the Spread*. Table F-4 summarizes all recommendations from *Stopping the Spread*.

Agency Programs

A number of agencies at the federal and state government levels, as well as NGOs, have established programs that manage invasive species as part of meeting their mission. Invasive species are a landscape-level problem, thus, solutions must also be landscape-level and not limited by jurisdictional boundaries. Interagency collaborative bodies and their efforts to tackle invasive species are also described below.

State Agencies

Numerous California state agencies and departments have developed programs to address particular aspects of the invasive species challenge relevant to their mission. In some states, a single agency has been created to coordinate the state's overall response to invasive species, but that does not exist in California at this time. For more detailed information on invasive species programs in California, refer to the state's *Aquatic Invasive Species Management Plan* (CDFG 2008) and the *Invasive and Noxious Weed Action Plan* (CDFA 2005).

California Department of Fish and Wildlife

The California Department of Fish and Wildlife (CDFW) is the trustee agency for wildlife and habitat protection.

The CDFW Invasive Species Program (ISP) executes the state's extensive quagga mussel (*Dreissena bugensis*) and zebra mussel (*Dreissena polymorpha*) prevention and control activities. The program's overall mission is to reduce the negative effects of invasive animals and plants, both terrestrial and aquatic, on the wildlands and waterways of California. The program puts an emphasis on identifying and addressing the ways by which species are introduced and moved, typically inadvertently, by human activities. In 2014, CDFW held the first Invasive Species Action Week, seeking to engage the many volunteers across the state who help control invasive species. The ISP continues to grow, but does not yet have full capacity to take a comprehensive approach to addressing the impact of invasive species on wildlife statewide (CDFW 2015a).

Marine Invasive Species Program (MISP) within CDFW's Office of Spill Prevention and Response (OSPR) coordinates with the California State Lands Commission (SLC) to control the introduction of Non-Indigenous Species (NIS) from the ballast of ocean-going vessels. MISP is responsible for conducting biological surveys to assess the amount and types of marine invasive species present in state coastal and estuarine waters, and the degree of success of ballast water management activities. OSPR manages the California Aquatic Non-Native Organism Database (CANOD) and is working to establish consistency among the various major databases being used to analyze similar types of aquatic invasive species (AIS)-related information (CDFW 2015b).

CDFW is also responsible for preventing the introduction and spread of invasive animals in the state, controlling invasive species on land DFW owns or manages, and reducing invasive species populations that impact game or special status species. DFW maintains a regulatory list of live restricted animals (Title 14, sec. 671), through which several invasive animals, among other species, are prohibited from importation, possession, and transportation unless under a permit issued by DFW. Fish and Game Code also prohibits the sale, possession, import, transport, transfer, or live release of *Caulerpa* spp. and live or dead mussels of the family Dreissenidae (e.g., quagga, zebra, dark false), unless under DFW permit. DFW also regulates the aquaculture industry, including the import, sale, and placement of aquatic plants and animals into state waters.

California Department of Parks and Recreation

California Department of Parks and Recreation's (State Parks) resource management policies call for preservation and restoration of native plants and animals and systematic removal of invasive species in wildland settings. Of all State Parks' expenditures on natural resource management, control of invasive species is the single largest expense. State Parks has taken aggressive action to control or eliminate the most serious invasive plants, with the Early Detection and Rapid Response (EDRR) program initiated to detect new invasive plant introductions when populations are small. State Parks partners with the non-profit California Invasive Plant Council (Cal-IPC) and other agencies and organizations in planning and implementing strategic regional invasive plant management projects. State Parks also implements quagga/zebra mussel prevention programs in water bodies the department manages that are deemed vulnerable to mussel infestation (California Department of Parks and Recreation 2015).

State Parks Division of Boating and Waterways (DBW) manages the state's largest and oldest aquatic weed control program, working with other public agencies to control water hyacinth (*Eichhornia crassipes*), and more recently Brazilian elodea (*Egeria densa*) and South American spongeplant (*Limnobium laevigatum*), in the Sacramento-San Joaquin Delta, its tributaries, and the Suisun Marsh. DBW also leads the California Clean Boating Network, a collaboration of government, business, boating, and academic organizations working to increase and improve clean boating education efforts, including invasive species education, across the state. DBW will also manage the new boater registration "Mussel Fee" that provides grant funding to eligible agencies for quagga and zebra mussel prevention programs at uninfested reservoirs that allow boating and fishing recreation (DBW 2015).

California Department of Water Resources

The California Department of Water Resources (DWR) addresses invasive species that impact water supply, water delivery and flood control. Activities related to invasive species are diverse. DWR conducts monthly monitoring of benthic (bottom-dwelling) invertebrates, zooplankton and phytoplankton throughout the upper San Francisco Estuary and reports trends in invertebrate abundance and community composition, including newly introduced species, to the State Water Resources Control Board (SWRCB). DWR contributes to programs aimed at controlling invasive plants along eroding Sacramento River banks, within flood control and water conveyance structures and along urban streams. DWR also conducts research on invasive species with the potential to impact the State's water resources including the invasive algal species *Microcystis* spp. in the upper San Francisco Estuary, the impacts of the Chinese mitten crab (*Eriocher sinensis*) on the benthic invertebrate community in the Sacramento-San Joaquin Delta, quagga and zebra mussel impacts on State Water Project infrastructure, and northern pike (*Esox lucius*) control at Lake Davis and downstream protection, including the installation of a structure to prevent pike escape over the dam (DWR 2015).

California Coastal Conservancy

For over 20 years, the California Coastal Conservancy (Coastal Conservancy) has been involved in the control and eradication of aquatic invasive species, pursuant to Division 21 of the Public Resources Code. The Coastal Conservancy developed, funded and operates the Invasive Spartina Project in San Francisco Bay that shows great promise in eradicating invasive *Spartina* cordgrass species and their associated hybrids. The Coastal Conservancy is also involved in efforts to control giant reed (*Arundo donax*) in many coastal watersheds. The Coastal Conservancy directly develops projects and provides grant funds related to resources enhancement and restoration, including control and elimination of invasive species (California Coastal Conservancy 2015).

State Water Resources Control Board

The SWRCB and regional boards have been working in support of, and in an advisory capacity to, other state agencies on various aquatic invasive species activities, such as hull fouling and ballast water management. Invasive species come under SWRCB purview as part of the state's efforts to implement and enforce the Clean Water Act since a 2005 federal court ruling defined non-indigenous species as "pollutants" present in discharges and found that such discharges are not exempt from permitting. The SWRCB supported extensive mapping of invasive giant reed in coastal watersheds from the Bay Area to Mexico.

California State Lands Commission

SLC manages the mandatory, statewide, multi-agency MISP. This program works to implement regulations governing ballast water management for vessels operating on the west coast of North America. In addition to its regulatory activities, SLC facilitates scientific research and technology development to enhance management efforts of the program and to inform policymakers. Limited funding is provided for research that targets priority information gaps and to technologies that show exceptional promise for the treatment of ballast water. In recent years, the SLC has prepared a number of reports for the state legislature documenting commercial vessel fouling in California, proposing performance standards for ballast water discharges, and summarizing vessel ballast water activities and compliance. SLC also coordinates interagency efforts to manage invasive aquatic plants such as Eurasian watermilfoil (*Myriophyllum spicatum*) in Lake Tahoe (SLC 2015). http://www.slc.ca.gov/spec_pub/mfd/ballast_water/Ballast_Water_Default.html

San Francisco Bay Conservation and Development Commission

The San Francisco Bay Conservation and Development Commission (BCDC) recognizes the threat of non-native invasive species to the Bay's ecosystem, and the *San Francisco Bay Plan* contains policies regarding the monitoring, control, and eradication of aquatic invasive species in the Bay.

California Department of Food and Agriculture

As prescribed by its mission statement, one of the primary mandates of CDFA is to "[p]rotect against invasion of exotic pests and diseases." This mandate focuses primarily on protecting agriculture. However, some of CDFA's activities overlap with efforts to protect wildlife, especially their invasive plant programs, but these have been virtually eliminated in recent years due to budget cuts. CDFA's regulatory authority includes quarantine, exterior pest exclusion (border protection stations and inspections), interior pest exclusion (survey of pet/aquaria stores, aquatic plant dealers, and nurseries), and detection and control/eradication programs. The CDFA Plant Pest Diagnostic Center identifies plant species, assigns plant pest ratings, and supports the listing of noxious weed species. CDFA has a long-standing partnership with County Agricultural Commissioners (CACs) to address invasive plants across the state. CDFA oversaw the operation of the state's Weed Management Area (WMA) network from their creation in 2000 until funding was lost in 2010. WMAs eradicated several thousand high-priority invasive plant populations across the state. CDFA's weed biocontrol lab, which also lost funding in 2010, distributed biocontrol agents developed by the U.S. Department of Agriculture (USDA) Agricultural Research Service to the CACs. With funding from the U.S. Forest Service (USFS), CDFA supported the development of CalWeedMapper, the statewide mapping and decision-support tool, by the nonprofit

California Invasive Plant Council (Cal-IPC), and the development of the Weed Heuristics: Invasive Population Prioritization for Eradication Tool (WHIPPET), another decision-support prioritization tool, at UC Davis. The one wildland program remaining at CDFA is its partnership with CDFW and State Parks' DBW on aquatic weed control, with a still-active hydrilla (*Hydrilla verticillata*) program (CDFA 2015).

County Agricultural Commissioners

CACs have long been at the forefront in addressing invasive species throughout the state. They work collaboratively with CDFA and other agencies to exclude, detect, and eradicate or manage a wide range of pest species. CACs perform numerous inspections of incoming plant materials, checking for compliance with quarantine requirements and for noxious weeds and other pests. Nurseries and pet stores are also inspected. The CACs have worked with CDFA to obtain additional resources to fund more effective programs. Once plant materials enter the state, it is generally the CACs who perform inspections and carry out most of the weed eradication and management activities. While the CACs are not a "state" agency, they form a statewide system, represented at the state level by California Agricultural Commissioners and Sealers Association (CACASA) and have specific authorities granted by state law to carry out pest prevention programs. From 2000 to 2010, CACs received seed grants from the state through the WMA program, resulting in significant progress on the ground and substantial in-kind contributions from a wide array of partners (CACASA 2015). CACs also coordinate with state and federal agencies on the new Weed Free Forage program. Weed Free Forage is hay, feed, straw, or straw mulch that has been inspected and certified to not contain propagative plant parts or seeds from species on the California Noxious Weed List.

California Department of Pesticide Regulation

The California Department of Pesticide Regulation (DPR) is vested with the primary responsibility to enforce federal and state pesticide laws and regulations pertaining to the proper and safe use of pesticides in California. DPR regulates pesticides under a comprehensive program that includes enforcement of pesticide use in agricultural and urban environments, prevention of environmental contamination, environmental monitoring for emergency eradication projects, and other related functions. DPR conducts monitoring of emergency invasive species eradication projects to ascertain that the public and the environment are being protected and the correct amounts of pesticides are being applied. DPR conducts sampling in consultation with the CACs, CDFW, the Regional Water Quality Control Boards, and other stakeholders. DPR works cooperatively with other government agencies to share information and monitoring results (DPR 2015).

California Department of Transportation

California Department of Transportation (Caltrans) manages invasive plants along rights-of-way for state highways. These management activities are critical because roadways are a significant pathway of spread for invasive plants. Caltrans has worked on best management practices (BMPs) for preventing the spread of invasive plants during construction and maintenance, and reviews roadside landscaping palettes for plant species that could be invasive (Caltrans 2015).

Federal Agencies

More than 40 percent of lands in California are federally managed; consequently, federal land and natural resource agencies have an important role in addressing invasive species issues. The roles and efforts of some of the major federal agencies to manage invasive species or conduct research on invasive species control are described below.

U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service (USFWS) is the only agency of the U.S. Government whose primary responsibility is the conservation of the nation's fish, wildlife, and plants. Because of these responsibilities, USFWS is very concerned about the impacts that invasive species are having on wildlife across the nation. National Wildlife Refuges in California control invasive species as part of their mission to protect wildlife habitat. Invasive species are often part of the reason that species are listed under the Endangered Species Act, which is administered by USFWS.

Also under the purview of USFWS is the listing and regulation of injurious wildlife under the Lacey Act. Injurious wildlife are mammals, birds, amphibians, reptiles, fish, crustaceans, mollusks and their offspring or gametes that are injurious to the interests of human beings, agriculture, horticulture, forestry, wildlife or wildlife resources of the United States. Listing of species as injurious wildlife prohibits their importation into the U.S. and interstate transport among the states and U.S. territories, unless under a permit from USFWS. The Service's Office of Law Enforcement, using wildlife inspectors at major airports, ocean ports, and border crossings, seeks to prevent the introduction of injurious wildlife through its wildlife inspection program. However, possession and intrastate transport of injurious wildlife is not prohibited under the Lacey Act, and is the discretionary responsibility of each state. http://www.fws.gov/invasives/

National Park Service

The National Park Service (NPS) works to manage invasive species on park lands through a suite of national and local programs, each based upon the following strategies: cooperation and collaboration, inventory and monitoring, prevention, early detection and rapid response, treatment and control, and restoration. At the national level, NPS has fostered a successful invasive plant management program with the creation of the Exotic Plant Management Teams. These 16 teams provide highly trained mobile assistance in invasive plant management to parks throughout the National Park System. Almost all parks have incorporated invasive species management into long range planning goals for natural and cultural landscapes, as well as in day to day operations. Nationally, 70 percent of the invasive species in National Parks are invasive plants (NPS 2009).

U.S. Forest Service

The U.S. Forest Service (USFS) manages 20 million acres in California and implements several programs that manage invasive species to protect resources. The USFS implements an Invasive Species Program to reduce, minimize, or eliminate the potential for introduction, establishment, spread, and impact of invasive species across all landscapes and ownerships. The Invasive Species Program integrates many divisions of the agency. The State and Private Forestry program of the USFS is one that connects a variety of stakeholders across different forests, states, communities, and includes private landowners. This program provides funds to the state for implementing weed management projects on non-federal lands (USFS 2014).

USDA Agricultural Research Service

The Pacific West Area Agricultural Research Services (ARS) facility in Albany, California houses the Exotic and Invasive Weeds Research Unit of the U.S. Department of Agriculture (USDA). This group develops biological control agents for invasive plants by working with collaborating institutions around the world to identify host-specific insects from the home range of the plants. They have developed biocontrol agents for many invasive plant species in California, including the highly effective tamarisk beetle (USDA 2015).

Bureau of Land Management

Although the Bureau of Land Management (BLM) participates in the control of large invasive plant infestations, the agency's primary focus is providing adequate capability to detect and treat smaller weed infestations in high-risk areas before they have a chance to spread. The BLM Weed Management and Invasive Species Program receives support from a number of BLM programs that are affected by invasive species. These include the BLM Rangeland Management, Forestry, Fire Fuels Reduction, Soil, Water, Air, and Riparian programs. In most cases, BLM works with county governments, local community governments, and private landowners to detect and treat weed infestations. To leverage funding and share expertise, the BLM partners with more than 50 Coordinated Weed Management Areas (CWMAs) in the Western United States. CWMA partners include state, federal, county, and private land managers (BLM 2014).

National Oceanic and Atmospheric Administration

To help prevent and control invasive species in our coastal waters and along our coasts, the National Oceanic and Atmospheric Administration (NOAA) provides funding for restoration and also oversees the National Marine Fisheries Service (NMFS). NOAA provides BMPs for activities such as cleaning watercraft and equipment, decontamination of shells, decontamination of crane bags used in unloading ships, and replanting restoration project sites. It also hosts an online database of Aquatic Nuisance Species experts. NOAA also supports the West Coast Ballast Outreach Project to educate the maritime industry. NOAA has a leadership role as the co-chair of both the NISC and the Aquatic Nuisance Species Task Force (NOAA 2015).

Inter-Agency Partnerships

Invasive Species Council of California

Invasive Species Council of California (ISCC) represents the highest level of leadership and authority in state government regarding invasive species. The ISCC is an inter-agency council created to help coordinate and ensure complementary, cost-efficient, environmentally sound, and effective state activities regarding invasive species. The ISCC was first proposed by the legislature in 2004 in a bill that was vetoed. It was subsequently established by departmental action on February 10, 2009. The ISCC approved the ISCC By-Laws and CISAC Charter on April 8, 2009.

ISCC is chaired by the Secretary of the CDFA and vice-chaired by the Secretary of the California Natural Resources Agency. Its members also include Secretaries from the California Environmental Protection Agency; California Business, Transportation and Housing Agency; California Health and Human Services Agency; and California Emergency Management Agency.

California Invasive Species Advisory Committee

California Invasive Species Advisory Committee (CISAC) comprises 24 stakeholder representatives from federal and local agencies, non-governmental organizations (NGOs), industry, and academia. The purpose of the CISAC is to advise the ISCC on a broad array of issues related to preventing the introduction of invasive species and providing for their control and/or eradication, as well as minimizing the economic, ecological, and human health impacts that are caused by invasive species.

California Agency Aquatic Invasive Species Team

California Agency Aquatic Invasive Species Team (CAAIST) is comprised of members from each state agency and/or department that has identified a lead representative for Aquatic Invasive Species (AIS) work. This team meets regularly to coordinate implementation of the state AIS plan. This team also reports to executive level managers to implement actions in the plan and is led by CDFW’s State Invasive Species Coordinator.

Interagency Quagga/Zebra Mussel Team

Interagency Quagga/Zebra Mussel Team, comprised of federal and state agencies and private partners, has been working together to contain and control quagga and zebra mussels in California since the discovery of quagga mussels in Lake Mead in January 2007 and subsequently in water bodies in southern California.

California Interagency Noxious and Invasive Plant Committee

California Interagency Noxious and Invasive Plant Committee (CINIPC) is an ad hoc group formed in 2000 to provide coordination between state and federal agencies involved in invasive plant management. The group meets regularly to share updates and has produced a Strategic Blueprint identifying agreed-upon approaches to landscape-level management of invasive plants.

Non-Governmental Organizations

California Invasive Plant Council

California Invasive Plant Council (Cal-IPC) is a NGO that serves as a hub for invasive plant management in the state. Cal-IPC brings together partnerships to plan and execute high-priority projects, while providing informational resources and decision-support tools to support the state’s land managers (Cal-IPC 2015).

Invasive Species by Taxonomic Group

Invasive species in California can be categorized into taxonomic groups for plants, insects and terrestrial invertebrates, aquatic and marine invertebrates, and vertebrates (mammals, birds, fish, amphibians, and reptiles). The approaches that various agencies and organizations use to manage invasive species are organized by taxonomic group below.

Plants

Statewide leadership and coordination on invasive plant management was historically provided by CDFA. However, in 2010 their programs were mostly eliminated due to budget cuts. Restoring CDFA or another agency to provide statewide leadership and coordination has been identified as a major need by CISAC. From the NGO sector, Cal-IPC provides substantial coordination for invasive plant management at the statewide level. CDFA has the statutory authority to regulate noxious weeds. Cal-IPC evaluates and lists invasive plant species based on environmental harm.

At the local level, CACs lead invasive plant management efforts. They are typically the lead agency for the local WMA. They have a mandate to control noxious weeds in partnership with CDFA.
Virtually all land management agencies, from the USFS and its 21 million acres across the state to hundreds of local regional parks, work on invasive plants in one form or another. State Parks and CDFW control invasive plants on their properties to protect habitat value. Caltrans manages invasive plants along roadways. Management of aquatic invasive plants in the Delta is conducted by State Parks' DBW. CDFA is the lead agency for detecting and eradicating hydrilla across the state. As of 2014, the Program has eradicated *Hydrilla* from 25 sites across 15 counties and is currently treating 6 sites in Nevada, Shasta, Yuba, and Lake counties, including sites in Clear Lake. Leadership on invasive aquatic plants in other parts of the state is ad hoc.

Insects and Terrestrial Invertebrates

The Pest Exclusion Branch of CDFA works to keep exotic agricultural and environmental pests out of the state of California and to prevent or limit the spread of newly discovered pests within the state. CACs work closely with CDFA on monitoring and eradication efforts.

Forest pests are handled by a partnership between the USFS, California Department of Fire and Forestry Protection (CAL FIRE), and CDFA.

Aquatic and Marine Invertebrates

Several agencies oversee different aspects of invasive invertebrates in the freshwater aquatic and marine environments. CDFW's invasive species program works to control and prevent the spread of aquatic invasive species, such as quagga mussels, zebra mussels, and New Zealand mudsnails (*Potamopygrus antipodarum*). DWR tracks invertebrates such as Asian clams as part of their surveys in the Sacramento-San Joaquin Delta. As described above under the discussion of CDFW and SLC, MISP is an interagency program based out of SLC that enforces regulations on ballast water discharge by cargo ships.

Vertebrates

CDFW oversees regulation and management of vertebrate species (mammals, birds, fish, amphibians, reptiles) in California, including invasive species. CDFW removes invasive fish and amphibian species to improve the survival of native species, especially those that are listed as threatened or endangered. State Parks conducts feral pig removal on its lands, as do other land-owning agencies.

Selected Species Accounts

Giant Reed

Giant reed (*Arundo donax*) is a grass that lives up to its name by growing as much as 8 meters tall. Giant reed arrived in California in the 1700s, initially planted for erosion control; however, it is now a serious problem along many waterways. Giant reed reduces habitat value along riparian areas for some wildlife species because it greatly changes the structure of the vegetation along waterways. Among these changes, it provides less food for aquatic insects and arthropods than other vegetation types, affecting animals higher up the food web that depend on these insects. Along the Santa Ana River in Ventura County, populations of the endangered least Bell's vireo (*Vireo bellii pusillus*) rebounded after giant reed was removed and replaced with native species. A study examining potential effects of arundo on threatened and endangered wildlife species identified several species on which arundo has moderate to severe negative impacts. Many of these impacts result from the changes to water flow and channel structure. Threatened or endangered species for which giant reed has been identified as a specific negative impact include arroyo toad (*Anaxyrus (= Bufo) californicus*), least Bell's vireo, southwestern willow flycatcher (*Empidonax traillii extimus*), western yellow-billed cuckoo (*Coccyzus americanus occidentalis*), western snowy plover (*Charadrius alexandrinus nivosus*), tidewater goby (*Eucyclogobius newberryi*), unarmored three spine stickleback (*Gasterosteus aculeatus williamsoni*), southern steelhead (*Oncorhynchus mykiss*), Santa Ana sucker (*Catostomus santaanae*).

Red Brome

The spread of red brome *(Bromus madritensis* ssp. *rubens*) has significantly increased the frequency of fires in the Mojave Desert. This annual was introduced into California in the 1800s and now invades chaparral, woodland, and grassland habitats. Burning and disturbance by livestock grazing or off-highway vehicles can increase red brome. Years of high rainfall result in population explosions and spread. It may spread rapidly and recolonize areas where drought previously caused it to die back. Red brome represents a higher potential fuel load compared to native desert plants. By increasing fires, red brome may promote the conversion of native shrubland to invasive annual grassland, reducing food and habitat for threatened and endangered species such as the desert tortoise (*Gopherus agassizii*) and the greater sage grouse (*Centrocercus urophasianus*).

Brazilian Elodea

Brazilian elodea (*Egeria densa*), also known as *Egeria*, is a fast-growing shallow-water submerged aquatic plant that infests approximately 12,000 acres of the 50,000 surface acres of the San Joaquin/Sacramento River Delta (Delta). This species is a native of Brazil and Argentina and has invaded much of the United States. *Egeria*'s introduction is believed to have resulted from someone cleaning an aquarium and discarding the plant into the Delta. *Egeria* grows in subsurface mats that can be several feet thick. *Egeria* can obstruct waterways, forcing boaters to stop and clear propellers, or in more extreme cases, prevent passage of vessels. The plant can also impede migration of anadromous and pelagic fish. *Egeria* changes the structure of shallow water ecosystems, forming walls between deepwater and inter-tidal habitat. Impenetrable mats of *Egeria* can force fish such as salmon and Delta smelt (*Hypomesus transpacificus*) into more open waterways, where food resources may be scarce and where fish are more vulnerable to predators. The mats of *Egeria* can also impede water flows, crowd out native plants, entrap sediments, alter the food web by impeding light access, depleting dissolved oxygen, and clog agricultural and municipal water intakes.

American Bullfrog

American bullfrogs (*Lithobates catesbeianus*) have become widespread throughout California. Bullfrogs are native to the central and eastern United States. American bullfrogs occupy a wide range of both natural and manmade aquatic habitats. American bullfrogs were intentionally introduced into the western United States as a food source and for biological control of insects, and may have been accidentally introduced into some areas during fish stocking. Adult American bullfrogs have voracious appetites and will eat anything they can fit into their mouths, including invertebrates, birds, bats, rodents, frogs, newts, lizards, snakes, and turtles. Bullfrog tadpoles mainly eat algae, aquatic plant material, and invertebrates, but they will also eat the tadpoles of other frog species. As a result of these feeding behaviors, all life stages of bullfrogs prey upon and are able to out-compete native frogs and other aquatic species. Additionally, bullfrogs are a known carrier of chytrid fungus, which causes the potentially fatal skin disease in frogs called chytridiomycosis. Chytridomycosis is believed to be a leading cause of the decline of native amphibian populations all over the world and responsible for the extinction of over 100 species since the 1970s.

New Zealand Mudsnails

As their name implies, these mudsnails (*Potamopyrgus antipodarum*) are native to the rivers and lakes of New Zealand. In California, they are found in many lakes and river systems. New Zealand mudsnails are found on a wide variety of substrates and vegetation in fresh and brackish lakes, rivers, streams, and estuaries. They are tolerant of turbidity, siltation, increased salinity, poor water quality, cold temperatures, and short-term desiccation. It is believed that mudsnails were introduced to western rivers through shipments of live gamefish, but subsequent spread is likely due to recreational activities. Dense populations become the dominant macroinvertebrate through displacing and outcompeting native species. They may consume up to half of the food resources in a stream and have been linked to reduced populations of aquatic insects, including mayflies, caddisflies, chironomids, and other insects important to trout and salmon. High-density New Zealand mudsnail populations are likely to cause substantial negative impacts on fisheries by replacing preferred, nutritious foods.

Quagga and Zebra Mussels

Quagga and zebra (*Dreissenid*) mussels are typically the same size as a fingernail but can grow up to about 2 inches long. They attach to aquatic plants, boats, motors, trailers, and recreation equipment or can be present in water (in addition to substrates, docks, piers, anchors, etc). Both species arrived to the Great Lakes in ballast water discharge from ships from Europe in the late 1980s. They have spread throughout the U.S. primarily through human-related activities, such as on trailered boats, transported in bilges, live wells, motors, or on any fishing, boating, other equipment or wet surfaces, and pet fur. In California, quagga mussels have been found in Orange, Riverside, San Diego, San Bernardino, and Ventura counties while zebra mussels have been found in San Benito County, according to CDFW data. Spread of the mussels threatens water delivery systems, hydroelectric facilities, agriculture, recreational boating and fishing, and fresh water ecosystems. They will ruin beaches with razor sharp foul smelling shells. California could spend hundreds of millions of dollars protecting the state's water system from infestations.

Brown-headed Cowbird

In California, brown-headed cowbirds (*Molothrus ater*) are a common resident and summer visitor that breed throughout much of the state. Brown-headed cowbirds are native to the Great Plains region of the United States and prefer open habitats interspersed with shrubs or trees and that provide ample forage and host nests. Brown-headed cowbirds originally evolved in a symbiotic relationship with herds of grazing animals, moving throughout the Great Plains region with herds as they kicked up insects for easy foraging. Brown-headed cowbirds parasitize the nests of more than 220 bird species, meaning they lay their eggs solely in other species' nests. They often remove the egg(s) of the host bird. Brown-headed cowbird chicks usually hatch sooner, are larger, and develop faster than the host chicks. Their larger size and persistent behavior gains them more care from the host parents. Nest parasitism lowers the reproductive success of host birds and has led to population declines in several bird species. In California, the riparian songbirds least Bell's vireo (*Vireo bellii pusillus*) and willow flycatcher (*Empidonax traillii*) are listed as endangered due to loss of riparian habitat and nest parasitism by brown-headed cowbirds.

Feral pigs

Pigs (*Sus scrofa*) are native to Eurasia and northern Africa. In the early 1700s Spanish and Russian settlers introduced domestic pigs to California as livestock and, over time, many became feral. In the 1920s, a Monterey county landowner introduced the European wild boar, a wild subspecies of *Sus scrofa* into California, which bred with the domestic pigs. The result of these introductions is a wild boar/feral domestic pig hybrid. Wild pigs currently exist in 56 of the state's 58 counties and can be found in a variety of habitats ranging from woodland, chaparral, meadow and grasslands. Pigs disturb natural plant communities, opening up space for invasive plants. They also compete with wildlife for food and carry diseases that can infect native wildlife.

The full list of objectives and tasks from NISC is below in Table F-1. Table F-2 provides the objectives and implementation tasks from the National Invasive Species Management Plan.

Table F-1 SWAP Conservation Strategies and Actions Listed by National Invasive Species Management Plan Objectives

NISC Objectives and Tasks	SWAP Province
PREVENTION	
Objective P.2: Prevent establishment of unintentionally introduced invasive species introduced through high risk pathways.	
Advocate for post-burn weed control.	South Coast
Coordinate with Caltrans and county transportation agencies.	Bay Delta – Central Coast
Objective P.3: Improve the international, federal, state, and tribal standards and guidelines to protect the united states from invasive species.	
Conduct research focused on informing the development of Best Management Practices (BMPs) for invasive species.	Central Valley – Sierra Nevada
Advocate BMPs for grazing practices.	Central Valley – Sierra Nevada
Reduce impacts to native fish as a result of roads and railroads and invasive species through development and use of BMPs.	Deserts
EARLY DETECTION AND RAPID RESPONSE	
Objective EDRR.1: Enhance current monitoring efforts for early detection.	
Conduct assessment of the distribution and type of invasive species.	Central Valley – Sierra Nevada
Conduct assessment/map invasive species occurrence by watershed.	Bay Delta – Central Coast
Create early detection rapid response program for new occurrences of invasive species.	Marine
Prioritize early detection of invasive species.	Klamath-North Coast
Provide education and outreach, with the following objectives: private landowners have increased knowledge in the identification and management of invasive species; ...public is participating in monitoring invasive species and rapid response.	Central Valley – Sierra Nevada
CONTROL AND MANAGEMENT	
Objective CM.2: Reduce the spread and harm caused by invasive species.	
Manage invasive species; control invasive and problematic native vegetation (introduced from roads, pack animals, livestock feed), control invasive fish and wildlife (livestock, pack animals, non-native fish), and prevent wet meadow habitat degradation.	Central Valley – Sierra Nevada
Coordinate with land management agencies to reduce spread of invasive grasses such as cheat-grass and medusa head.	Cascades-Modoc Plateau
Develop partnerships with agencies and non-governmental organizations (NGOs).	Bay Delta – Central Coast
Collaborate with existing agencies or groups involved with invasive species monitoring and treatment.	Bay Delta – Central Coast
Implement integrated resource management, with focus on coordination and integration of ongoing management activities (e.g., grazing BMPs, invasive species, water management, land use), and enhancing working landscapes to benefit fish and wildlife.	Bay Delta – Central Coast
Develop Invasive Coordination Group to streamline and coordinate current agencies, organizations, activities.	South Coast
Maintain partnerships through the Bi-state Action Plan, BLM, USFS, NPS, and USGS to help coordinate data collection and implement management plan.	Deserts

NISC objectives are in shaded rows with the relevant SWAP actions below them.

Table F-1 SWAP Conservation Strategies and Actions Listed by National Invasive Species Management Plan Objectives

NISC Objectives and Tasks	SWAP Province
Establish joint partnerships with desert land managers, particularly to manage invasive species on conserved lands.	Deserts
Manage invasive species.	all
Objective CM.3: Develop workforce competencies to perform control and management activities.	
Provide training to staff and managers on non-native genetic issues, invasive species management and control techniques, and fish identification.	Central Valley – Sierra Nevada
Provide criteria on how to conduct eradication and/or control measures for invasive species	Marine
Design and conduct training for local CDFW staff, other agencies, NGOs, and consultants.	Deserts
RESTORATION	
Objective R.2: Restore high-value areas impacted by invasive species.	
Set priorities for treatment of invasive species	Cascades-Modoc Plateau
Identify highest priority areas for restoration and rehabilitation to protect from annual grass or weed invasion.	Cascades-Modoc Plateau
Develop plan to prioritize/control invasive species.	Bay Delta – Central Coast
Identify highest priority areas for restoration and rehabilitation to manage and protect from annual grass and weed invasion.	Deserts
Restore and protect priority areas: identify highest priority areas for restoration, rehabilitation, and protection from fire, invasive species, or wild burros.	Deserts
(For implementation of HCPs) - Prioritize plant communities requiring invasive weed treatment or restoration from OHV or grazing impacts.	Deserts
Manage invasive species, with focus on controlling or eradicating them in grassland habitats in the Central California Coast Ecoregion.	Bay Delta – Central Coast
ORGANIZATIONAL COLLABORATION	
Objective OC.6: Enhance outreach on invasive species.	
Provide education and outreach by educating the public on the development, status and need for BMPs and about invasive species.	Cascades-Modoc Plateau
Provide outreach and education: raise public awareness and support for native fish restoration projects, and educate the public on the risks of invasive species and the importance of aquatic biodiversity management plans.	Central Valley – Sierra Nevada
Provide outreach and education focused on improving vegetation structural diversity, reducing infestations of invasive species (for plants, specifically Arundo and tamarisk), and protecting functioning riparian habitat on private property.	South Coast
Develop and implement an outreach program on the impacts of invasive species.	Deserts
Objective OC.8: Enhance data standards and quality to improve access and ability to search across data bases and federal data sources.	
Increase content within, and accessibility to, the CDFW invasive species database.	Marine

Source: NISC 2008.

NISC objectives are in shaded rows with the relevant SWAP actions below them.

Table F-2 Objectives and Implementation Tasks from the National Invasive Species Management Plan
PREVENTION
Objective P.1: Prevent establishment of intentionally introduced invasive species.
P.1.1: Develop screening processes to evaluate invasiveness of plants which are intended for planting and are moving in trade. P.1.2: Develop screening processes to evaluate invasiveness of terrestrial and aquatic nonnative wildlife (e.g., fish, mollusks, crustaceans, mammals, birds, reptiles and amphibians) moving in trade. P.1.3: Develop a process to identify high-priority invasive plants, animals, and plant or animal pathogens for agencies' actions.
Objective P.2: Prevent establishment of unintentionally introduced invasive species introduced through high risk pathways.
P.2.1: Reduce the movement of invasive plants pests and pathogens with propagative plant material. P.2.2: Sponsor research on new technologies for ballast water management and formally assess their efficacy. Sponsor research on other ship-based pathways, assessing their impacts to the environment. P.2.3: Support efforts in new techniques or practices to reduce the spread of aquatic invasive species through recreational activities. P.2.4: Reduce movement of invasive species on or in Solid Wood Packing Materials (SWPM).
Objective P.3: Improve the international, federal, state, and tribal standards and guidelines to protect the United States from invasive species.
P.3.1: Strengthen and/or support the development of risk-based sanitary and phytosanitary international standards and guidelines under IPPC, Office International des Epizooties (OIE), North American Plant Protection Organization (NAPPO) and other international flora. P.3.2: Improve and expand domestic and international risk analysis processes. Include new risk methodologies and scientific advances in understanding invasive species. Expand the scope of conducting risk assessments to include all nonnative terrestrial and aquatic organisms moved as a result of human activity or action. P.3.3: Design a process to identify and rank pathways by invasive species risk. Encourage agencies to modify and incorporate the process into their own regulatory and nonregulatory programs. P. 3.4: Integrate agency data sets to improve assessment of invasive species threats prior to arrival. P.3.5: Support efforts by non-federal stakeholders to develop/enhance codes of conduct and Best Management Practices (BMPs). P.3.6: Share BMPs among NISC members to prevent or mitigate invasive species establishment or movement.
EARLY DETECTION AND RAPID RESPONSE
Objective EDRR.1: Enhance current monitoring efforts for early detection.
EDRR.1.1: Identify and evaluate monitoring efforts for high-priority invasive species and supporting technological infrastructure including an evaluation of their geographic and temporal coverage. EDRR.1.2: Prepare protocols to identify high priority locations for targeted monitoring efforts. Initiate three systematic monitoring pilot programs. EDRR.1.3: Improve and support recruitment and training of volunteers for EDRR efforts at the local level, utilizing existing programs and infrastructure (such as Master Gardeners, Master Naturalists, Cooperative Extension, Sea Grant, National Wildlife Refuge "Friends" Groups, 4-H Groups, National Park support groups, and others). EDRR.1.4: Enhance plant and animal pathogen detection methods.
Objective EDRR.2: Make taxonomic information more readily available to governments and the public.
EDRR.2.1: Develop or enhance taxonomic expert lists to facilitate identification of terrestrial and aquatic organisms.
Objective EDRR.3: Develop and enhance capacity and tools to support EDRR efforts.
EDRR.3.1: Prepare protocols to evaluate and map invasive species risks. EDRR.3.2: Engage risk assessment experts to provide authoritative and timely assessments of current or potential invasions. EDRR.3.3: Develop and evaluate the use of predictive models to forecast the spread of specific invasive species.
Objective EDRR.4: Enhance existing capability to conduct planning for EDRR.
EDRR.4.1: Prepare model guidance or plans that encourage RR contingency planning at the appropriate level (such as, international, national, state, regional or local). Include planning for communications, response funding, cooperative mechanisms and other relevant issues.

NISC objectives are in shaded rows with the relevant SWAP actions below them.

Table F-2 Objectives and Implementation Tasks from the National Invasive Species Management Plan

Objective EDRR.5: Develop options paper to fund rapid response efforts.
EDRR.5.1: Work with ISAC, states and others to develop mechanisms for cooperation and funding rapid response efforts, such as options for matching grants to states. EDRR.5.2: Explore options for research funding for preparedness and other programs that are required for RR.
CONTROL AND MANAGEMENT
Objective CM.1: Evaluate control and management capabilities and identify strategic gaps.
CM.1.1: Identify and evaluate regional invasive species control and management efforts. CM.1.2: Identify and address strategic gaps in regional invasive species control and management efforts and tools.
Objective CM.2: Reduce the spread and harm caused by invasive species.
CM.2.1: Reduce the spread of invasive species.
CM. 2.2: Support on-the-ground control and management efforts
Objective CM.3: Develop workforce competencies to perform control and management activities.
CM. 3.1: Increase invasive species training for land and water resource managers, and others as appropriate.
Objective CM.4: Enhance ecosystem recovery processes that contribute to control and management.
CM.4.1: Enhance ecosystem recovery decision tools and conduct ecosystem assessments.
RESTORATION
Objective R.1: Include invasive species considerations in formal guidance for restoration projects.
R.1.1: Address invasive species concerns in planning for restoration projects in federal land and water management field and guidance manuals.
Objective R.2: Restore high-value areas impacted by invasive species.
R.2.1: Restore sites that have the highest ecological or economic value or contribute most to protecting human health.
Objective R.3: Restore habitat at multiple scales and demonstrate model approaches that engage local communities and the public.
R.3.1: Coordinate multi-taxa restoration projects at the regional, watershed or landscape level (Healthy Lands Initiative, for example), addressing water quality, fisheries (both fresh and marine), and terrestrial plants and animals (including their pests and pathogens) in restoration planning.
ORGANIZATIONAL COLLABORATION
Objective OC.1: Improve knowledge and understanding of legal and regulatory tools available to address invasive species.
OC.1.1: Complete an analysis of current federal laws and regulations dealing with invasive species.
OC.1.2: Provide information and briefings as requested on invasive species issues.
Objective OC.2: Expand the coordination of invasive species programs and expenditures to leverage resources.
OC.2.1: Update the invasive species crosscut budget for Federal agency expenditures concerning invasive species.
Objective OC.3: Improve federal research capacity and coordination to address a broader array of invasive species issues.
OC.3.1: Improve the coordination and effectiveness of federal research.
OC.3.2: Improve economic modeling of invasive species impacts.
Objective OC.4: Enhance policy and improve regulatory processes on invasive species.
OC.4.1: As required by EO 13112, prepare, in cooperation with the President's Council on Environmental Quality (CEQ), guidance to federal agencies to prevent and control invasive species that is fully compliant with the National Environmental Policy Act (NEPA).
OC.4.2: Collect, organize and make available federal agency guidance to prevent, control and manage invasive species.
OC.4.3: Develop an improved regulatory process for the development, testing, assessment and approval of biological control agents.

NISC objectives are in shaded rows with the relevant SWAP actions below them.

Table F-2 Objectives and Implementation Tasks from the National Invasive Species Management Plan

Objective OC.5: Strengthen coordination among federal agencies to facilitate the development of international priorities for invasive species.
OC.5.1: Promote and facilitate communication on international invasive species issues and activities.
OC.5.2: Represent NISC interests in the formulation of United States policy positions related to invasive species in the context of discussions under relevant international organizations and agreements.
OC.5.3: As appropriate, seek to incorporate invasive species issues into the environmental cooperation mechanisms developed in connection with free trade agreements (FTA).
Objective OC.6: Enhance outreach on invasive species.
OC.6.1: Determine approaches regarding invasive species pathways for strategic outreach to targeted user groups and businesses.
OC.6.2: Work with existing educational organizations to enhance invasive species information delivery to primary and secondary educators.
OC.6.3: Develop basic messages for common public awareness concerning invasive species for NISC member agencies and staff to utilize.
Objective OC.7: Improve and streamline NISC members' reporting on invasive species programs and activities.
OC.7.1: Require performance reports from NISC members.
Objective OC.8: Enhance data standards and quality to improve access and ability to search across data bases and federal data sources.
OC.8.1: Develop and provide portal and reference information, as well as public access to federal research information, as appropriate and consistent with applicable law.
OC.8.2: Work cooperatively to develop common data standards and enhance databases.

Source: NISC 2008.

NISC objectives are in shaded rows with the relevant SWAP actions below them.

Table F-3 lists recommended actions from the ISCC Strategic Framework (shaded boxes) followed by SWAP conservation actions and strategies that fulfill those recommendations (ISCC 2011). Many provinces included more general actions such as managing invasive species, conducting outreach, or coordinating with the California Invasive Plant Council, that are important but that do not fit neatly within ISCC actions. Other actions, such as restoring important habitat, may address invasive species indirectly. Each SWAP action is listed only once in the table.

Table F-3 SWAP Conservation Strategies and Actions by ISCC Strategic Framework Recommended Actions

ISCC Strategic Framework Recommended Action	SWAP Province
LEADERSHIP AND COORDINATION	
LC-1. Secure adequate long-term funding to sustain effective invasive species programs.	
Develop invasive plant tax.	South Coast
PREVENTION AND EXCLUSION	
PE-1. Identify and address new and existing pathways for entry and movement of invasive species.	
Manage invasive species; control invasive and problematic native vegetation (introduced from roads, pack animals, livestock feed), control invasive fish and wildlife (livestock, pack animals, non-native fish), and prevent wet meadow habitat degradation.	Central Valley – Sierra Nevada
Advocate for post-burn weed control.	South Coast
PE-2. Increase interagency communication to ensure coordinated prevention approaches.	
Coordinate with National Resources Conservation Service (NRCS), other agencies.	Central Valley – Sierra Nevada
PE-4. Develop and Implement Best Management Practices (BMPs) to prevent invasive species spread.	
Conduct research focused on informing the development of Best Management Practices (BMPs) for invasive species.	Central Valley – Sierra Nevada
Advocate BMPs for grazing practices.	Central Valley – Sierra Nevada
Reduce impacts to native fish as a result of roads and railroads and invasive species through development and use of BMPs.	Deserts
PE-7. Maintain a list of invasive species that harm or could harm California.	
Increase content within, and accessibility to, the CDFW invasive species database.	Marine
DETECTION AND RESPONSE	
DR-3. Align regulatory processes to facilitate rapid response and eradication of newly discovered invasive species.	
Streamline regulatory process for CDFW staff and other entities to implement control and eradication work	Marine
DR-4. Expand invasive species surveillance efforts, integrating new tools in risk assessment to set priorities.	
Prioritize early detection of invasive species.	Klamath-North Coast
DR-6. Train key individuals and organizations to detect new invasive species.	
Create early detection rapid response program for new occurrences of invasive species.	Marine
ERADICATION AND MANAGEMENT	
Develop strategy for removal of brook trout from Pine Creek.	Cascades-Modoc Plateau
Manage invasive species: control or eradicate invasive species on 1,000 acres of public lands by watershed.	Bay Delta – Central Coast

Table F-3 SWAP Conservation Strategies and Actions by ISCC Strategic Framework Recommended Actions

ISCC Strategic Framework Recommended Action	SWAP Province
Manage invasive species, with focus on controlling or eradicating them in grassland habitats in the Central California Coast Ecoregion.	Bay Delta – Central Coast
EM-2. Support regional collaborations and public-private partnerships.	
Coordinate with land management agencies to reduce spread of invasive grasses such as cheat-grass and medusa head.	Cascades-Modoc Plateau
Develop partnerships with agencies and non-governmental organizations (NGOs).	Bay Delta – Central Coast
Collaborate with existing agencies or groups involved with invasive species monitoring and treatment.	Bay Delta – Central Coast
Develop Invasive Coordination Group to streamline and coordinate current agencies, organizations, activities.	South Coast
Maintain partnerships through the Bi-state Action Plan, BLM, USFS, NPS, and USGS to help coordinate data collection and implement management plan.	Deserts
Establish joint partnerships with desert land managers, particularly to manage invasive species on conserved lands.	Deserts
EM-6. Establish standardized mapping and reporting protocols.	
Conduct assessment of the distribution and type of invasive species.	Central Valley – Sierra Nevada
Conduct assessment/map invasive species occurrence by watershed.	Bay Delta – Central Coast
EM-8. Minimize invasive plant spread along roadsides and utility corridors.	
Coordinate with Caltrans and county transportation agencies.	Bay Delta – Central Coast
EM-9. Develop and implement prioritization models for managing invasive species.	
Set priorities for treatment of invasive species	Cascades-Modoc Plateau
Identify highest priority areas for restoration and rehabilitation to protect from annual grass or weed invasion.	Cascades-Modoc Plateau
Develop plan to prioritize/control invasive species.	Bay Delta – Central Coast
Identify highest priority areas for restoration and rehabilitation to manage and protect from annual grass and weed invasion.	Deserts
Restore and protect priority areas: identify highest priority areas for restoration, rehabilitation, and protection from fire, invasive species, or wild burros.	Deserts
(For implementation of HCPs) - Prioritize plant communities requiring invasive weed treatment or restoration from OHV or grazing impacts.	Deserts
Coordinate with California Invasive Plant Council.	Klamath-North Coast, Bay Delta – Central Coast, South Coast, Deserts
EM-10. Expand training programs for using Integrated Pest Management (IPM) principles and Best Management Practices (BMPs).	
Provide training on invasive species management (for local CDFW staff and NGOs).	Klamath-North Coast
Provide education and outreach, with the following objectives: private landowners have increased knowledge in the identification and management of invasive species; …public is participating in monitoring invasive species and rapid response.	Central Valley – Sierra Nevada
Implement integrated resource management, with focus on coordination and integration of ongoing management activities (e.g., grazing BMPs, invasive species, water management, land use), and enhancing working landscapes to benefit fish and wildlife.	Bay Delta – Central Coast
Provide training to staff and managers on non-native genetic issues, invasive species management and control techniques, and fish identification.	Central Valley – Sierra Nevada

Table F-3 SWAP Conservation Strategies and Actions by ISCC Strategic Framework Recommended Actions

ISCC Strategic Framework Recommended Action	SWAP Province
Design and conduct training for local CDFW staff, other agencies, NGOs, and consultants.	Deserts
Provide criteria on how to conduct eradication and/or control measures for invasive species.	Marine
OUTREACH AND PUBLIC ENGAGEMENT	
OPE-1. Develop and deliver a consistent outreach message based on stewardship.	
Provide outreach and education.	Klamath-North Coast
Provide education and outreach by educating the public on the development, status and need for BMPs and about invasive species.	Cascades-Modoc Plateau
Provide outreach and education: raise public awareness and support for native fish restoration projects, and educate the public on the risks of invasive species and the importance of aquatic biodiversity management plans.	Central Valley – Sierra Nevada
Provide outreach and education focused on improving vegetation structural diversity, reducing infestations of invasive species (for plants, specifically Arundo and tamarisk), and protecting functioning riparian habitat on private property.	South Coast
Develop and implement an outreach program on the impacts of invasive species.	Deserts

Source: ISCC 2011.

Table F-4 lists recommended actions from *Stopping the Spread*, the strategic framework for protecting California from invasive species (ISCC 2011).

Table F-4 Recommended actions from *Stopping the Spread.*

LEADERSHIP AND COORDINATION
LC-1. Secure adequate long-term funding to sustain effective invasive species programs. LC-2. Share responsibility for invasive species outreach more equally among ISCC agencies. LC-3. Formalize the ISCC and CISAC for longterm stability. LC-4. Review California laws and regulations affecting invasive species response. LC-5. Build a strong coalition of stakeholder groups. LC-6. Create an online clearinghouse for information on invasive species programs, laws, and research. LC-7. Create a working group to review public health risks of invasive species and their management.
PREVENTION AND EXCLUSION
PE-1. Identify and address new and existing pathways for entry and movement of invasive species. PE-2. Increase interagency communication to ensure coordinated prevention approaches. PE-3. Support uninterrupted high-risk inspection activities. PE-4. Develop and Implement Best Management Practices (BMPs) to prevent invasive species spread. PE-5. Partner with import industries to improve preventive screening. PE-6. Encourage individual actions to prevent entry of invasive species. PE-7. Maintain a list of invasive species that harm or could harm California. PE-8. Strengthen California's restrictions on live non-agricultural animal imports. PE-9. Adopt strong guidelines for biofuel production. PE-10. Include invasive species prevention in California Environmental Quality Act (CEQA) compliance.

Table F-4 Recommended actions from *Stopping the Spread.*

DETECTION AND RESPONSE

DR-1. Create a standing Rapid Response Working Group to guide response to new invasive species, supported by a Rapid Response emergency fund.
DR-2. Complete a Program Environmental Impact Report (PEIR) for response to new invasive species.
DR-3. Align regulatory processes to facilitate rapid response and eradication of newly discovered invasive species.
DR-4. Expand invasive species surveillance efforts, integrating new tools in risk assessment to set priorities.
DR-5. Formalize a standard rapid response plan.
DR-6. Train key individuals and organizations to detect new invasive species.
DR-7. Continue to train staff for rapid response.

ERADICATION AND MANAGEMENT

EM-1. Expand biological control efforts.
EM-2. Support regional collaborations and public-private partnerships.
EM-3. Increase the number of field biologists working on invasive species.
EM-4. Increase on-the-ground workforce and job training for invasive species management.
EM-5. Develop more effective management tools and restoration techniques.
EM-6. Establish standardized mapping and reporting protocols.
EM-7. Strengthen the state's invasive plant listing process and rating systems.
EM-8. Minimize invasive plant spread along roadsides and utility corridors.
EM-9. Develop and implement prioritization models for managing invasive species.
EM-10. Expand training programs for using Integrated Pest Management (IPM) principles and Best Management Practices (BMPs).

OUTREACH AND PUBLIC ENGAGEMENT

OPE-1. Develop and deliver a consistent outreach message based on stewardship.
OPE-2. Provide clear public health information for invasive species management.
OPE-3. Support inclusion of invasive species in environmental education curricula.
OPE-4. Establish activities to engage public participation.
OPE-5. Evaluate effectiveness of outreach and public engagement techniques.
OPE-6. Facilitate effective participation by volunteer groups.

FUNDAMENTAL AND APPLIED RESEARCH

FAR-1. Assess the ecological, agricultural and economic impacts of invasive species in California.
FAR-2. Study the biology of invasive species to support effective management.
FAR-3. Study restoration outcomes.
FAR-4. Study interactions of native species and invasive species.
FAR-5. Address invasive species in relation to climate change and other high-visibility issues.
FAR-6. Research new invasive species control methods and expedite the assessment of existing methods.

Source: ISCC 2011.

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Appendix G

Appendix G Climate Adaptation Strategies Cross-Reference Guide

California's climate adaptation strategies, described in Section 2.5, are also consistent with the strategic framework provided in the National Fish, Wildlife, and Plants Climate Adaptation Strategy (National Fish, Wildlife, and Plants Climate Adaptation Partnership 2012). Tables G-1 (Ecoregion Targets) and G-2 (Hydrologic Unit Targets) identify how the SWAP 2015 conservation strategies outlined in Chapters 4 and 5 align with these state and federal strategies and, thus, achieve important climate adaptation co-benefits.

Reference

National Fish, Wildlife and Plants Climate Adaptation Partnership. 2012. National Fish, Wildlife and Plants Climate Adaptation Strategy. Association of Fish and Wildlife Agencies, Council on Environmental Quality, Great Lakes Indian Fish and Wildlife Commission, National Oceanic and Atmospheric Administration, and U.S. Fish and Wildlife Service. Washington, DC.

Table G-1 Ecoregion Target Conservation Strategy Crosswalk to State and Federal Climate Adaptation Strategies

Targets and Strategies *(Targets are listed in bold)*	Statewide Conservation Category	California (C) and National (N) Climate Adaptation Strategies																									
		C1.1: Improve connectivity	C1.2: Implement adaptive management	C2: Enhance biodiversity monitoring	C3.1: Promote nature-based adaptation solutions	C3.2: Prioritization tools for conservation activities	C4.1: Habitat mapping	C4.5: Identify emissions reduction opportunities	C5.1: Create partnerships	C5.2: Public education and outreach	C5.3: Increase CC knowledge	N1.1: Identify connectivity	N1.2: Secure conservation status	N1.3: Restore habitat	N1.4: Improve connectivity	N2.1: Update management plans and practices	N3.1: Increase CC knowledge	N3.2: Coordinate actions	N3.3: Build legal capacity	N3.4: Build funding capacity	N4.2: Employ decision-support tools	N5.1: Identify research gaps	N5.2: Conduct research	N6.1: Increase public awareness	N6.3: Coordinate communication	N7.2: Reverse habitat degradation	N7.3: Manage invasive species
BAY DELTA AND CENTRAL COAST PROVINCE																											
Central California Coast Ecoregion																											
California Grassland, Vernal Pools, and Flowerfields									**X**		**X**					**X**	**X**	**X**					**X**	**X**	**X**		**X**
Acquire, conserve, and manage habitat for SGCN that inhabit grassland habitats by finalizing draft conservation plans and implementing completed NCCPs, HCPs, and Conservation Strategies and other opportunities.	Land Acquisition/ Easement/Lease															X											
Coordinate with fire agencies and local landowners to develop and implement fire management BMPs in grassland habitats.	Partner Engagement																	X							X		
Coordinate with Caltrans and county transportation agencies to use information on high-priority wildlife corridors in the design of wildlife-friendly transportation corridors.	Partner Engagement																	X							X		
Develop statewide strategies on renewable energy development location siting; identify renewable energy development zones and obtain their approval by the Renewable Energy Action Team (REAT).	Land Use Planning					X			X									X							X		

Table G-1 Ecoregion Target Conservation Strategy Crosswalk to State and Federal Climate Adaptation Strategies

Targets and Strategies *(Targets are listed in bold)*	Statewide Conservation Category	California (C) and National (N) Climate Adaptation Strategies																									
		C1.1: Improve connectivity	C1.2: Implement adaptive management	C2: Enhance biodiversity monitoring	C3.1: Promote nature-based adaptation solutions	C3.2: Prioritization tools for conservation activities	C4.1: Habitat mapping	C4.5: Identify emissions reduction opportunities	C5.1: Create partnerships	C5.2: Public education and outreach	C5.3: Increase CC knowledge	N1.1: Identify connectivity	N1.2: Secure conservation status	N1.3: Restore habitat	N1.4: Improve connectivity	N2.1: Update management plans and practices	N3.1: Increase CC knowledge	N3.2: Coordinate actions	N3.3: Build legal capacity	N3.4: Build funding capacity	N4.2: Employ decision-support tools	N5.1: Identify research gaps	N5.2: Conduct research	N6.1: Increase public awareness	N6.3: Coordinate communication	N7.2: Reverse habitat degradation	N7.3: Manage invasive species
Identify and conduct research on high-priority study questions for grassland habitat/conservation areas; conduct research to inform coordination with Caltrans and county transportation agencies on wildlife-friendly transportation corridors; implement and fund monitoring and research components of completed and draft NCCPs, HCPs, and Conservation Strategies.	Data Collection and Analysis										X						X						X				
Manage invasive species, with focus on controlling or eradicating them in grassland habitats in the Central California Coast Ecoregion.	Direct Management															X											X
Provide input on project planning and decision making processes; ensure that city and county planning departments consider the conservation of grassland and vernal pool habitat.	Land Use Planning																						X	X			
Coastal Sage Scrub; Northwest Coast Cliff and Outcrop; Coastal Dune and Bluff Scrub; North Coast Deciduous Scrub and Terrace Prairie		**X**	**X**	**X**					**X**	**X**	**X**		**X**		**X**	**X**	**X**	**X**	**X**				**X**	**X**	**X**		**X**
Collect biological and ecological data to address key information gaps on SGCN, habitats, and pressures.	Data Collection and Analysis			X							X						X						X				

Table G-1 Ecoregion Target Conservation Strategy Crosswalk to State and Federal Climate Adaptation Strategies

Targets and Strategies *(Targets are listed in bold)*	Statewide Conservation Category	California (C) and National (N) Climate Adaptation Strategies																									
		C1.1: Improve connectivity	C1.2: Implement adaptive management	C2: Enhance biodiversity monitoring	C3.1: Promote nature-based adaptation solutions	C3.2: Prioritization tools for conservation activities	C4.1: Habitat mapping	C4.5: Identify emissions reduction opportunities	C5.1: Create partnerships	C5.2: Public education and outreach	C5.3: Increase CC knowledge	N1.1: Identify connectivity	N1.2: Secure conservation status	N1.3: Restore habitat	N1.4: Improve connectivity	N2.1: Update management plans and practices	N3.1: Increase CC knowledge	N3.2: Coordinate actions	N3.3: Build legal capacity	N3.4: Build funding capacity	N4.2: Employ decision-support tools	N5.1: Identify research gaps	N5.2: Conduct research	N6.1: Increase public awareness	N6.3: Coordinate communication	N7.2: Reverse habitat degradation	N7.3: Manage invasive species
Conduct direct resource management.	Direct Management		X																								X
Designate conservation areas with emphasis on sites or landscapes that have unique and important value to wildlife.	Land Acquisition/ Easement/Lease												X														
Develop or influence law and policy that addresses vehicle emissions, timber harvest cumulative impacts, critical habitat, and marine species with ranges that overlap jurisdictional boundaries.	Law and Policy																		X								
Develop and implement management plans.	Management Planning		X															X									
Implement environmental review, with focus on the following: non-conservation oriented policies; projects and plans to help ensure impacts to wildlife are minimized and benefits maximized; infrastructure development projects to ensure they are designed and sited to avoid impacts on species and habitat; state highway plans; forest management plans; and plans for transmission corridor siting.	Environmental Review									X								X						X	X		
Establish and engage in partner relationships.	Partner Engagement								X									X									

Table G-1 Ecoregion Target Conservation Strategy Crosswalk to State and Federal Climate Adaptation Strategies

Targets and Strategies *(Targets are listed in bold)*	Statewide Conservation Category	California (C) and National (N) Climate Adaptation Strategies																									
		C1.1: Improve connectivity	C1.2: Implement adaptive management	C2: Enhance biodiversity monitoring	C3.1: Promote nature-based adaptation solutions	C3.2: Prioritization tools for conservation activities	C4.1: Habitat mapping	C4.5: Identify emissions reduction opportunities	C5.1: Create partnerships	C5.2: Public education and outreach	C5.3: Increase CC knowledge	N1.1: Identify connectivity	N1.2: Secure conservation status	N1.3: Restore habitat	N1.4: Improve connectivity	N2.1: Update management plans and practices	N3.1: Increase CC knowledge	N3.2: Coordinate actions	N3.3: Build legal capacity	N3.4: Build funding capacity	N4.2: Employ decision-support tools	N5.1: Identify research gaps	N5.2: Conduct research	N6.1: Increase public awareness	N6.3: Coordinate communication	N7.2: Reverse habitat degradation	N7.3: Manage invasive species
Protect priority habitats through fee title acquisition, permanent conservation easement, or other means; purchase land in a corridor connecting two protected areas to provide connectivity of habitat.	Land Acquisition/ Easement/Lease	X													X												
Provide input to land use planning decisions.	Land Use Planning															X											
American Southwest Riparian Forest and Woodland		**X**				**X**				**X**					**X**	**X**								**X**	**X**		**X**
Acquire, conserve and manage habitat for SGCN that inhabit riparian forest and woodland habitats by finalizing draft conservation plans and implementing completed NCCPs, HCPs, and Conservation Strategies and other opportunities.	Land Acquisition/ Easement/Lease	X													X												
Develop grazing BMPs.	Direct Management					X										X									X		
Develop riparian buffers along major rivers and streams.	Direct Management				X	X																					
Implement education and outreach to the public and local agencies regarding the value of riparian habitat, development of riparian buffers along major rivers and streams, and reducing encroachment of crops into riparian buffers.	Outreach and Education									X														X			

Table G-1 Ecoregion Target Conservation Strategy Crosswalk to State and Federal Climate Adaptation Strategies

Targets and Strategies *(Targets are listed in bold)*	Statewide Conservation Category	California (C) and National (N) Climate Adaptation Strategies																									
		C1.1: Improve connectivity	C1.2: Implement adaptive management	C2: Enhance biodiversity monitoring	C3.1: Promote nature-based adaptation solutions	C3.2: Prioritization tools for conservation activities	C4.1: Habitat mapping	C4.5: Identify emissions reduction opportunities	C5.1: Create partnerships	C5.2: Public education and outreach	C5.3: Increase CC knowledge	N1.1: Identify connectivity	N1.2: Secure conservation status	N1.3: Restore habitat	N1.4: Improve connectivity	N2.1: Update management plans and practices	N3.1: Increase CC knowledge	N3.2: Coordinate actions	N3.3: Build legal capacity	N3.4: Build funding capacity	N4.2: Employ decision-support tools	N5.1: Identify research gaps	N5.2: Conduct research	N6.1: Increase public awareness	N6.3: Coordinate communication	N7.2: Reverse habitat degradation	N7.3: Manage invasive species
Improve road maintenance on county and state roads to reduce sediment impacts to stream habitats.	Direct Management															X											
Manage dams and other barriers to allow for fish passage.	Direct Management	X													X												
Manage invasive species.	Direct Management																										X
Central California Coast Ranges Ecoregion																											
California Grassland, Vernal Pools, and Flowerfields						**X**					**X**					**X**	**X**	**X**					**X**		**X**		**X**
Acquire, conserve, and manage habitat for SGCN that inhabit grassland habitats by finalizing draft conservation plans and implementing completed NCCPs, HCPs, and Conservation Strategies and other opportunities.	Land Acquisition/ Easement/Lease															X											
Coordinate with fire agencies and local landowners to develop and implement fire management BMPs in grassland habitats.	Partner Engagement																	X							X		
Coordinate with Caltrans and county transportation agencies to use information on high-priority wildlife corridors in the design of wildlife-friendly transportation corridors.	Partner Engagement																	X							X		

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Develop statewide strategies on renewable energy development location siting; identify renewable energy development zones and obtain their approval by the Renewable Energy Action Team (REAT).	Land Use Planning					X			X									X							X		
Identify and conduct research on high-priority study questions for grassland habitat/conservation areas; conduct research to inform coordination with Caltrans and county transportation agencies on wildlife-friendly transportation corridors; implement and fund monitoring and research components of completed and draft NCCPs, HCPs, and Conservation Strategies.	Data Collection and Analysis										X						X						X				
Manage invasive species, with focus on controlling or eradicating them in grassland habitats in the Central California Coast Ranges Ecoregion.	Direct Management															X											X
Provide input on project planning and decision making processes; ensure that city and county planning departments consider the conservation of grassland and vernal pool habitat.	Land Use Planning																						X	X			

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American Southwest Riparian Forest and Woodland		**X**			**X**					**X**					**X**	**X**								**X**			**X**
Acquire, conserve and manage habitat for SGCN that inhabit riparian forest and woodland habitats by finalizing draft conservation plans and implementing completed NCCPs, HCPs, and Conservation Strategies and other opportunities.	Land Acquisition/ Easement/Lease	X													X												
Develop grazing BMPs.	Direct Management					X										X									X		
Develop riparian buffers along major rivers and streams.	Direct Management				X	X																					
Implement education and outreach to the public and local agencies regarding the value of riparian habitat, development of riparian buffers along major rivers and streams, and reducing encroachment of crops into riparian buffers.	Outreach and Education									X														X			
Improve road maintenance on county and state roads to reduce sediment impacts to stream habitats.	Direct Management															X											
Manage dams and other barriers to allow for fish passage.	Direct Management	X													X												
Manage invasive species.	Direct Management																										X

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CASCADES AND MODOC PLATEAU PROVINCE																											
Modoc Plateau Ecoregion																											
Big Sagebrush Scrub; Great Basin Dwarf Sagebrush Scrub; Great Basin Upland Scrub							**X**		**X**	**X**		**X**		**X**		**X**	**X**	**X**	**X**				**X**	**X**	**X**	**X**	**X**
Advocate for wildlife-friendly fire management.	Outreach and Education																	X									
Conduct controlled burns for fire/fuel reduction and habitat management in conifer/sagebrush areas (like those encroached by pinyon-juniper).	Direct Management																	X					X				
Conduct research (data management) on restoration to inform prioritization of potential restoration areas.	Data Collection and Analysis						X					X															
Develop BMPs for improved resource conservation.	Law and Policy															X											
Implement habitat restoration and enhancement.	Direct Management													X													
Implement management partnership/coordination.	Partner Engagement								X									X									
Manage invasive species.	Direct Management																										X
Obtain funding for resource management.	Economic Incentives																X								X		

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Provide economic incentives for improved resource management.	Economic Incentives																		X					X			
Provide education and outreach for the ranching public and CDFW staff; educate staff on rangeland science; and educate ranching public on the availability of existing BMPs, and the need and status of implementing those BMPs.	Outreach and Education									X														X			
Provide input on grazing management plans, including review and comment on California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) documents for grazing management plans to help slow or reverse habitat degradation because of the negative impacts of certain grazing practices.	Management Planning																									X	
Northwestern Basin and Range Ecoregion																											
Great Basin Pinyon-Juniper Woodland			**X**			**X**			**X**		**X**						**X**	**X**	**X**			**X**	**X**		**X**	**X**	**X**
Conduct research on climate change.	Data Collection and Analysis					X					X						X					X	X				

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Identify highest priority areas for restoration and rehabilitation to lower or eliminate fire risk; conduct controlled burns and managed thinning in areas of post-settlement (1860) pinyon-juniper and juniper expansion or old growth stands with high canopy cover and fire risk; protect old growth juniper and pinyon-juniper; and continue implementation of Bi-state Action Plan.	Direct Management		X																							X	
Identify highest priority areas for restoration and rehabilitation to protect from annual grass or weed invasion.	Direct Management		X																								X
Maintain partnerships through the Bi-state Action Plan, BLM, USFS, NPS, and U.S. Geological Service (USGS) to help coordinate data collection and implement a management plan.	Partner Engagement								X														X				
CASCADES AND MODOC PLATEAU PROVINCE																											
Western Upland Grasslands			**X**										**X**						**X**	**X**		**X**		**X**		**X**	**X**
Advocate for laws and policies by influencing land use policies and coordinating with federal agencies to reduce grassland conversion.	Law and Policy																		X								

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Baseline data collection and analysis on effect of natural fire on grasslands.	Data Collection and Analysis																					X					
Manage grazing.	Direct Management																									X	
Manage invasive species.	Direct Management		X																								X
Protect and restore land through acquisitions or conservation easements.	Land Acquisition /Easement/Lease												X														
Provide economic incentives by providing restoration grants, collaborating with federal agencies to identify opportunities to implement joint conservation actions, develop a habitat conservation plan or voluntary local program, or implement candidate conservation agreement to protect candidate species that are vulnerable.	Economic Incentives																			X							
Provide input on local planning regarding the conservation of natural resources.	Land Use Planning																							X			
North Coastal Mixed Evergreen and Montane Conifer Forests										**X**	**X**		**X**			**X**	**X**		**X**				**X**	**X**			
Advocate for laws and policies that protect natural resources.	Law and Policy																		X								

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Conduct research (data management) to identify areas with restoration potential to allow prioritization for protection and restoration. Work with other agencies doing restoration in sagebrush steppe habitat throughout the region. Map vegetation following standard protocol and fill information gaps into what has already been mapped. Prioritize for restoration areas of encroachment that have not crossed over to juniper woodland.	Data Collection and Analysis										X						X						X				
Develop management plans to improve existing fire management plans and identify high value wildlife habitat.	Management Planning Partner Engagement								X							X		X									

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Engage in decision-making process, through cooperation with federal agencies and private landowners on where controlled burns and forest thinning would be most beneficial to wildlife. Coordinate with state and federal agencies, tribal entities, the non-governmental organization community and other partners to establish a decision-making process to achieve shared objectives and broader coordination across overlapping areas.	Law and Policy Partner Engagement								X									X	X					X			
Protect land through acquisition and conservation easements.	Land Acquisition/ Easement/Lease												X														
Provide outreach and education for the conservation of natural resources.	Outreach and Education									X														X			
CENTRAL VALLEY AND SIERRA NEVADA PROVINCE																											
Great Valley Ecoregion																											
American Southwest Riparian Forest and Woodland		**X**			**X**					**X**	**X**		**X**			**X**	**X**						**X**	**X**			**X**
Acquire property and/or easements, including protection of land or water real property or rights through conservation easement.	Land Acquisition/ Easement/Lease	X			X								X														

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Acquire water rights focused on improving in-stream flow for fish and riparian habitat.	Land Acquisition/ Easement/Lease	X			X								X														
Conduct research focused on informing the development of new or updating of existing best management practices (BMPs) for invasive species, grazing, and water flow.	Data Collection and Analysis										X						X						X				
Develop and implement Habitat Conservation Plans (HCPs) (Central Valley Flood Protection Plan, South Sacramento HCP, San Joaquin County Multi-Species Habitat Conservation and Open Space Plan, Bay Delta Conservation Plan [BDCP], Yolo, Solano, Butte, and Yuba-Sutter HCPs).	Management Planning															X											
Improve effective law enforcement focused on: complying with water rights and Section 1600 agreements, eliminating illegal water diversions, and increasing Law Enforcement Division (LED) staffing levels.	Law and Policy																		X								
Manage invasive species.	Direct Management																									X	X
Manage water flows.	Direct Management															X											

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Provide education and outreach for the conservation of natural resources.	Outreach and Education									X														X			
Provide input on local planning ("Leading or participating in land use planning for rural, urban, or agricultural lands: e.g., Provide input on local land use plans; Develop county-wide zoning plans; Participate in workgroup regarding low impact development siting").	Management Planning																	X							X		
Freshwater Marsh										**X**			**X**			**X**			**X**	**X**				**X**			
Advocate for laws and policies.	Law and Policy																		X								
Development management plans.	Management Planning															X											
Provide economic incentives for improved resource management.	Economic Incentives																			X							
Provide outreach and education.	Outreach and Education									X														X			
Purchase land and conservation easements.	Land Acquisition/ Easement/Lease												X														

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Sierra Nevada Ecoregion																											
Alpine Vegetation				**X**		**X**		**X**	**X**	**X**						**X**		**X**					**X**	**X**		**X**	**X**
Develop economic incentives to reduce the impacts of climate change within California.	Economic Incentives							X																			
Develop or update management plans to integrate the effects of climate change.	Management Planning															X											
Engage urban citizens on climate change; expand conservation education programs (e.g., in grade schools) to include climate change.	Outreach and Education									X														X			
Establish partnerships to co-monitor alpine vegetation habitat on state and federal lands.	Partner Engagement								X									X									
Gather more information on alpine vegetation habitat, particularly on the physical and biological variables affected by climate change.	Data Collection and Analysis			X							X						X						X				
Manage grazing and invasive species, remove trails, restrict grazing and pack animal use of subalpine and alpine meadows on public lands, remove trail and campground use away from subalpine and alpine meadows, and treat and remove invasive species.	Direct Management Management Planning															X											X

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Provide training on science-based applications and tools for climate change and natural resources management.	Training and Technical Assistance					X																					
Restore subalpine and alpine meadows, including restoration/enhancement of degraded habitats, monitoring populations, and removing barriers to species movement.	Direct Management																									X	
North Coastal Mixed Evergreen and Montane Conifer Forests				**X**						**X**	**X**		**X**			**X**	**X**	**X**	**X**				**X**	**X**			
Advocate for laws and policies; coordinate with agencies to allow fires to burn when possible.	Law and Policy																		X								
Conduct research regarding effective target management.	Data Collection and Analysis			X							X						X						X				
Develop management plans and improve existing fire management plans.	Management Planning															X											
Engage in decision-making process to achieve shared objectives and broader coordination across overlapping area; cooperate with federal agencies and private landowners on where controlled burns and forest thinning would be most beneficial to wildlife.	Law and Policy																	X									

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Protect land through acquisition and conservation easements, including increasing the amount of key conifer areas protected through purchase or conservation easement. Key conifer areas include old-growth forest, watercourse zones, and nest sites.	Land Acquisition/ Easement/Lease												X														
Provide education and outreach for the conservation of natural resources.	Outreach and Education									X														X			
Pacific Northwest Subalpine Forest			**X**	**X**		**X**		**X**	**X**	**X**	**X**			**X**		**X**	**X**	**X**				**X**	**X**	**X**	**X**		
Collect data on climate-related impacts to species and habitats in the red fir/subalpine conifer zone, to better predict future distribution and viability and inform land acquisition and other strategies.	Data Collection and Analysis			X							X						X					X	X				
Collect data to evaluate effects of fuels treatments in the red fir zone, and whether treatments can partly offset climate-related increases in fire severity in the red fir zone.	Data Collection and Analysis		X																				X				
Develop economic incentives to reduce greenhouse gas emissions in California.	Economic Incentives							X																			

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Develop or update management plans to integrate the effects of climate change.	Management Planning		X													X											
Establish partnership to co-monitor target habitat on state and federal lands.	Partner Engagement								X																		
Implement fuels treatments in red fir forest, if determined to be effective (see "Data Collection and Analysis").	Direct Management													X													
Provide input on local land use plans to incorporate climate change; provide local assistance grant funds for participation in general plan updates favoring natural resource conservation and climate change.	Land Use Planning										X					X											
Provide science-based applications and tools for climate change and natural resources management.	Training and Technical Assistance					X																					
Review projects for potential increases in greenhouse gas emissions; require mitigation as needed.	Environmental Review							X		X								X						X	X		

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Wet Mountain Meadow; Western Upland Grasslands										**X**	**X**		**X**	**X**		**X**	**X**						**X**	**X**		**X**	**X**
Enhance habitat: improve water quality and temperature, coordinate water storage and timing of release to improve meadow hydrology, improve surface water recharge, reduce erosion and bank cutting, restore meadow hydrology, and improve resiliency of meadows to flood events.	Direct Management													X												X	
Gather and analyze data on wet meadows and wildlife: establish baseline inventory of wet meadows and research ecosystem services of wet meadows (e.g., carbon sequestration).	Data Collection and Analysis										X						X						X				
Implement grazing practices that benefit meadow ecosystems (conduct managed grazing).	Management Planning																									X	
Manage invasive species.	Direct Management																										X
Protect land through acquisition and conservation easements, with emphasis on restoring and protecting degraded wet meadow habitat and conserving high-quality wet meadow.	Land Acquisition/ Easement/Lease												X														

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Provide education and outreach to broad resource users on multiple-use policy and educate the public on the beneficial use of fire.	Outreach and Education									X														X			
Provide input on grazing management plans.	Management Planning															X											
Restore meadows impacted by roads and railroads: reduce sediment from existing and abandoned roads from entering meadows, restore hydrology altered by legacy roads and railroads, develop BMPs for road maintenance, and reduce the overall presence of roads and railroads in meadows (new and existing).	Direct Management													X													
Sierra Nevada Foothills Ecoregion																											
California Foothill and Valley Forests and Woodlands									**X**	**X**			**X**					**X**		**X**				**X**		**X**	**X**
Conduct ecologically sound controlled burns on CDFW lands.	Direct Management																									X	X
Conduct demonstration management, including providing public demonstrations of successful BMPs and scientifically documenting environmental change from implementation of BMPs.	Direct Management Outreach and Education									X														X			

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Establish partnership: develop partnerships with agencies and organizations to enhance opportunities (currently BLM, RCDs, UCD, Audubon, and Blue Ridge Berryessa Partnership [BRBP]).	Partner Engagement								X									X									
Protect land through conservation easements.	Land Acquisition/ Easement/Lease												X														
Provide education and outreach, including introduce landowners and leasee to new or existing BMPs for grazing; inform public of incentive programs available to them; educate recreation focused landowners on wildlife-BMP's; and keep CDFW staff current on relevant science (e.g., on restoration techniques, science).	Outreach and Education									X														X			
Provide economic incentives to landowners for managing grazing at to maintain appropriate levels of residual dry matter.	Economic Incentives																			X							
Purchase and provide long-term conservation of land.	Land Acquisition/ Easement/Lease												X														

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Chaparral; Desert Transition Chaparral; Montane Chaparral; California Foothill and Coastal Rock Outcrop Vegetation			**X**						**X**		**X**		**X**			**X**	**X**	**X**				**X**	**X**				**X**
Collect and analyze data regarding the target.	Data Collection and Analysis		X								X						X					X	X				
Conduct direct resource management.	Direct Management		X																								X
Engage conservation partners, including state and federal agencies, tribal governments, the non-governmental organization (NGO) community, and other partners to achieve shared objectives and broader coordination across overlapping areas. Establish partnership to co-monitoring species/habitats on federally managed lands. Establish decision-making processes with other public and private entities to determine or implement strategies. Convene an advisory committee to assist with implementation of strategies.	Partner Engagement								X									X									
Protect land through acquisition, easement, or lease.	Land Acquisition/ Easement/Lease												X														

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Work with partners on the development of large landscape conservation planning. Develop or update management plans to integrate the effects of climate change. Development of management plans for species, habitats and natural processes. Develop a management plan for SGCN or its habitat. Reintroduction, relocation, or stocking of native animals or plants to an area where they can better adapt. Translocate/breed in captivity a SGCN to establish new populations in suitable habitat. Restore SGCN to historically occupied habitats.	Management Planning															X											
DESERTS PROVINCE																											
Colorado Desert Ecoregion																											
Desert Wash Woodland and Scrub											**X**					**X**	**X**						**X**				
Develop BMPs for roads and railroads.	Land Use Planning															X											
Gather biological data and conduct research on SGCN and response to disturbance.	Data Collection and Analysis										X						X						X				

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Partner for joint advocacy, with focus on conservation of SGCNs that use railroad right-of-ways (ROW), and development of BMPs for ROW maintenance activities.	Partner Engagement																X										
Provide education, including to BLM and USFWS on impacts from operations and maintenance activities within railroad right-of-ways.	Outreach and Education																X										
Sparsely Vegetated Desert Dune			**X**	**X**					**X**							**X**		**X**					**X**				
Collect data on plant community and SGCN status within ecoregion through range-wide surveys, climate change studies, and monitoring invasive species population trends.	Data Collection and Analysis			X																			X				
Continue to provide input on local land use plans.	Land Use Planning															X											
Maintain partnership presence in the planning process of HCPs to ensure the conservation of this target.	Partner Engagement								X									X									

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Support implementation of existing habitat conservation plans (HCPs) to protect, restore, or enhance those areas of target habitat that are prioritized for such or have been degraded by invasive species or OHV; and enhance enforcement of existing HCPs, including illegal OHV use. Existing HCPs include Imperial Sand Dunes RAMP, Heber Dunes SVRA General Plan, Lower Colorado River MSCP, San Diego East County MSCP, Coachella Valley MSHCP, IID, and the DRECP.	Direct Management															X											
Support the development and implementation of ongoing/existing management plans.	Management Planning		X													X											
Mojave Desert Ecoregion																											
Shadscale-Saltbush Scrub									**X**	**X**	**X**		**X**			**X**	**X**	**X**					**X**	**X**			
Develop and implement an outreach program on the impacts of invasive species.	Outreach and Education									X														X			
Develop and implement management plans to guide maintaining or restoring connectivity for alkali desert scrub and SGCN.	Management Planning															X											

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Establish and develop co-management partnerships, use partnerships with desert land managers to manage invasive species on conserved lands, and integrate climate change considerations into management plans for species and habitats.	Partner Engagement								X							X		X									
Establish joint partnerships with desert land managers, including local governments such as the Town of Apple Valley, particularly to manage invasive species on conserved lands.	Partner Engagement								X							X		X									
Gather and analyze data, particularly on the distribution of invasive species and their impacts on shadscale-saltbush scrub.	Data Collection and Analysis										X							X					X				
Gather data and conduct research to better understand alkali desert scrub ecology (e.g., population size, distribution, habitat relationships), pressures, and climate change effects; and collect and analyze baseline assessment information for alkali desert scrub.	Data Collection and Analysis										X							X					X				

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Partner for joint advocacy, increase political awareness for conservation of alkali desert scrub in the Mojave ecoregion through education and outreach, and secure additional funding through grants or legislation; and ensure renewable energy development is consistent with DRECP conservation strategies.	Partner Engagement								X									X									
Protect high-quality alkali desert scrub habitat through acquisition and easements.	Land Acquisition/ Easement/Lease												X														
Provide outreach and education on resource conservation practices.	Outreach and Education									X														X			
Provide training on invasive species control and management.	Training and Technical Assistance																X										X

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Mono Ecoregion																											
Great Basin Pinyon-Juniper Woodland			**X**			**X**			**X**		**X**						**X**	**X**				**X**	**X**			**X**	**X**
Identify highest priority areas and manage for restoration and rehabilitation to lower or eliminate fire risk: conduct controlled burns and managed thinning in areas of post-settlement (1860) pinyon-juniper and juniper expansion or old growth stands with high canopy cover and fire risk; protect old growth pinyon-juniper and juniper; and continue implementation of Bi-State Action Plan.	Direct Management		X																							X	
Identify highest priority areas for restoration and rehabilitation to manage and protect from annual grass and weed invasion.	Direct Management		X																								X
Maintain partnerships through the Bi-state Action Plan, BLM, USFS, NPS, and USGS to help coordinate data collection and implement management plan.	Partner Engagement								X									X									
Research impacts of climate change on pinyon-juniper woodland viability and distribution.	Data Collection and Analysis					X					X						X					X	X				

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Big Sagebrush Scrub									**X**		**X**		**X**			**X**	**X**	**X**		**X**			**X**				**X**
Establish partnerships, coordinate efforts, and identify and combine funding sources with other agency funding, for protecting, restoring, and enhancing sagebrush habitat.	Partner Engagement								X									X									
Implement resource management to promote healthy sagebrush ecosystems through controlled burns (where appropriate and not in conflict with sage-grouse conservation), control of invasive species, and removal of pinyon-juniper.	Direct Management															X											X
Prioritize and coordinate sage-grouse research efforts with landowners and land managers, and monitor pinyon-juniper and cheatgrass invasions per the 2012 Bi-State Sage Grouse Action Plan.	Data Collection and Analysis										X						X						X				
Protect land through acquisition and easements. Identify land for protection of high-quality sagebrush habitat within the Desert Creek/Fales, Bodie, and South Mono sage-grouse population management units (PMUs) within the Bi-State DPS.	Land Acquisition/ Easement/Lease												X														

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Provide economic incentives and purchase leases, acquisitions, or conservation easements on important sage grouse habitat with various funding sources.	Economic Incentives																			X							
Sonoran Desert Ecoregion																											
Mojave and Sonoran Desert Scrub									**X**				**X**			**X**	**X**	**X**									
Conserve lands to maintain long-term viability of SGCN.	Land Acquisition/ Easement/Lease												X														
Develop HCP, NCCP, and management plans, with an emphasis on minimizing impacts of housing and urban growth.	Management Planning															X											
Establish co-management partnership.	Partner Engagement								X									X									
Partner for joint advocacy, increase political awareness for conservation of desert scrub in the Sonoran Desert ecoregion, secure additional funding through grants or legislation, and advocate for development consistent with strategy.	Outreach and Education Partner Engagement								X									X									

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Provide input on project planning and decision making process, and conserve stream habitats and flows through participation in the planning and decision making process.	Land Use Planning																	X									
Provide training to agency staff on renewable energy issues, including technology, relevant research, ecological impacts, and conservation strategies.	Training and Technical Assistance																X										
Southeast Great Basin Ecoregion																											
High Desert Wash and "Rangeland" Scrub, Great Basin Upland Scrub						**X**			**X**		**X**					**X**	**X**					**X**	**X**				**X**
Comment on and amend plans.	Management Planning															X											
Maintain and enhance partnerships, particularly with NPS; form a collaborative group for data collection and research, especially with BLM.	Partner Engagement								X													X					
Monitor and map invasive species, and study fire and climate-related effects on target habitats.	Data Collection and Analysis					X					X						X						X				
Restore and protect priority areas: identify highest priority areas for restoration, rehabilitation, and protection from fire, invasive species, or wild burros.	Direct Management					X																					X

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American Southwest Riparian Forest and Woodland									**X**		**X**						**X**	**X**					**X**				**X**
Engage in decision-making process, and share information and agency priorities.	Land Use Planning								X									X									
Establish co-management partnership to conserve target habitat.	Partner Engagement								X									X									
Identify critical or sensitive riparian habitats in areas that may require special protections.	Data Collection and Analysis										X						X						X				
Manage invasive species: control invasive and problematic vegetation, control invasive mammals (feral horse and burro), and prevent degradation of riparian habitat and springs from feral horses and burros.	Direct Management																										X
NORTH COAST AND KLAMATH PROVINCE																											
Klamath Ecoregion																											
Alpine Vegetation				**X**				**X**	**X**	**X**						**X**		**X**			**X**		**X**	**X**		**X**	**X**
Develop economic incentives to reduce greenhouse gas emissions within California.	Economic Incentives							X																			
Develop or update management plans to integrate the effects of climate change.	Management Planning															X											

Table G-1 Ecoregion Target Conservation Strategy Crosswalk to State and Federal Climate Adaptation Strategies

Targets and Strategies *(Targets are listed in bold)*	Statewide Conservation Category	California (C) and National (N) Climate Adaptation Strategies																									
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Engage urban citizens, educate grade school children on climate change, and expand conservation education programs to include climate change and solutions to reduce impacts such as reducing greenhouse gas emissions.	Outreach and Education									X														X			
Establish partnerships to co-monitor target on state and federally managed lands, to establish decision-making processes with other public and private entities to determine or implement strategies, convene an advisory committee to assist with implementation of strategies and engage university students in research.	Partner Engagement								X									X									
Gather more information on alpine habitat requirements and impacts of climate change on the plant community and its KEAs, specifically in the North Coast and Klamath Province.	Data Collection and Analysis			X																			X				

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Manage grazing and invasive species by removing trails, restricting grazing and pack animal use of subalpine and alpine meadows on public lands, removing campground use away from subalpine and alpine meadows, and removing invasive species.	Direct Management																										X
Provide training on science based applications and tools. Provide science-based applications and tools for climate change and natural resources management.	Training and Technical Assistance																				X						
Restore subalpine and alpine meadows, including restoration or enhancement of degraded habitats, monitoring populations, fencing for protection and removing barriers to species movement.	Direct Management																									X	
Montane Upland Deciduous Scrub									**X**	**X**	**X**			**X**			**X**	**X**	**X**				**X**	**X**	**X**		
Advocate for laws and policies that protect natural resources.	Law and Policy																		X								
Conduct comprehensive ecological assessment (research).	Data Collection and Analysis																						X				

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Conduct environmental review. Maintain devotion of staff to environmental review of CEQA projects. Enhance staffing levels to commit to environmental review of NEPA projects on federal lands.	Environmental Review									X								X						X	X		
Gather and analyze data about aspen meadows and wildlife.	Data Collection and Analysis										X						X						X				
Implement habitat restoration and enhancement for aspen meadows.	Direct Management													X													
Partner for joint advocacy with public and private sectors. Establish partnership for privately managed lands. Establish decision making processes with other public and private entities to determine or implement strategies. Creating and maintaining partnerships will ensure the coordinated development of conservation strategies or actions to reduce climate-related stresses to species and habitats.	Partner Engagement								X									X									
Provide outreach and education for the conservation of natural resources.	Outreach and Education									X														X			

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Subalpine Aspen Forests and Pine Woodlands										**X**	**X**			**X**			**X**	**X**	**X**				**X**	**X**	**X**		
Advocate for laws and policies that protect natural resources.	Law and Policy																		X								
Conduct comprehensive ecological assessment (research) on target, particularly aspen meadows.	Data Collection and Analysis										X						X						X				
Conduct environmental review, maintain devotion of staff to environmental review of CEQA projects, and enhance staffing levels to commit to environmental review of NEPA projects on federal lands.	Environmental Review									X								X						X	X		
Gather and analyze data on subalpine aspen forests and pine woodlands (mature conifer forest).	Data Collection and Analysis										X						X						X				
Implement habitat restoration and enhancement of aspen meadows.	Direct Management													X													
Partner for joint advocacy with public and private sectors.	Partner Engagement																								X		
Provide outreach and education.	Outreach and Education									X														X			

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Wet Mountain Meadow; Fen (Wet Meadow); Mountain Riparian Scrub and Wet Meadow; Subalpine Forests and Pine Woodlands; Western Upland Grasslands									**X**	**X**	**X**			**X**			**X**	**X**	**X**				**X**	**X**	**X**		
Advocate for laws and policies that protect natural resources.	Law and Policy																		X								
Conduct comprehensive ecological assessment (research) and evaluate climate effects on aspen meadows.	Data Collection and Analysis										X						X						X				
Conduct environmental review, maintain devotion of staff to environmental review of CEQA projects, and enhance staffing levels to commit to environmental review of National Environmental Policy Act (NEPA) projects on federal lands.	Environmental Review									X								X						X	X		
Gather and analyze data regarding aspen meadows and wildlife.	Data Collection and Analysis										X						X						X				
Implement habitat restoration and enhancement of aspen meadows.	Direct Management													X													

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Partner for joint advocacy by establishing partnership for privately managed lands and decision-making processes with other public and private entities.	Partner Engagement								X									X									
Provide outreach and education for the conservation of natural resources.	Outreach and Education									X														X			
Northern California Coast Ecoregion																											
North Coastal and Montane Riparian Forest and Woodland										**X**				**X**	**X**				**X**						**X**		**X**
Coordinate with Regional Conservation Districts (RCDs), flood control agencies, counties, cities, and watershed groups/councils.	Partner Engagement																								X		
Develop buffers along major rivers and streams.	Direct Management														X												
Develop CDFW Riparian Conservation Policy.	Law and Policy																		X								
Develop Riparian and Wetlands Task Force.	Partner Engagement																								X		
Habitat restoration and enhancement.	Direct Management													X													

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Implement Santa Rosa Plain Conservation Strategy and Draft Santa Rosa Plain Recovery Plan. Utilize potential and existing conservation lands, including banks, mitigation sites and other public and private lands to develop and implement conservation actions and management plans for SGCN that inhabit grassland habitats, vernal pools and associated habitats on the Santa Rosa Plain.	Land Acquisition/ Easement/Lease												X														
Improve implementation of grazing best management practices (BMPs).	Management Planning																										X
Provide outreach and education for the conservation of natural resources.	Outreach and Education									X															X		
Freshwater Marsh										**X**			**X**			**X**			**X**	**X**				**X**			
Advocate for laws and policies.	Law and Policy																		X								
Develop management plans.	Management Planning															X											
Provide economic incentives for improved resource management.	Economic Incentives																			X							
Provide outreach and education.	Outreach and Education									X														X			

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Purchase land and conservation easements.	Land Acquisition/ Easement/Lease												X														
Pacific Northwest Conifer Forests										**X**	**X**					**X**	**X**	**X**					**X**	**X**	**X**		**X**
Advocate for wildlife friendly fire management.	Management Planning															X											
Conduct research (data management) on conifer forest ecosystems and response to fire.	Data Collection and Analysis										X						X						X				
Develop management plans for the conservation of natural resources.	Management Planning															X											
Manage invasive species.	Direct Management																										X
Partner with USFS, NRCS, The Nature Conservancy (TNC), Western Klamath Restoration Partnership, Mendocino Firescape, and others for joint advocacy.	Partner Engagement																	X									
Provide input on project planning and decision making process, by leading or participating in land use planning for rural, urban, or agricultural lands (e.g., provide input on local land use plans), developing county-wide zoning plans, and participating in workgroup regarding low impact development siting.	Management Planning									X															X		

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Provide outreach and education.	Outreach and Education																							X			
Provide training on invasive species management.	Training and Technical Assistance																										X
Northern California Coast Ranges Ecoregion																											
Pacific Northwest Subalpine Forest			**X**	**X**		**X**		**X**	**X**	**X**	**X**			**X**		**X**	**X**	**X**		**X**			**X**	**X**	**X**		
Collect more information on climate-related impacts to species and habitats in the red fir/subalpine zone, to better predict future distribution and viability and inform land acquisition and other strategies.	Data Collection and Analysis			X							X						X						X				
Collect data to evaluate effects of fuels treatments in the red fir zone, and whether treatments can partly offset climate-related increases in fire severity.	Data Collection and Analysis		X																				X				
Develop economic incentives to reduce greenhouse gas emissions within California.	Economic Incentives							X												X							
Develop or update management plans to integrate the effects of climate change.	Management Planning		X													X											

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Establish partnership to co-monitor target habitat on state and federal lands.	Partner Engagement								X																		
Implement fuels treatments in red fir, if determined to be effective (see "Data Collection and Analysis").	Direct Management													X				X									
Provide input on local land use plans regarding the conservation of natural resources.	Land Use Planning										X					X											
Provide science-based applications and tools for climate change and natural resources management.	Training and Technical Assistance					X																					
Review projects for potential increases in greenhouse gas emissions; require mitigation as needed.	Environmental Review							X		X								X						X	X		
North Coastal and Montane Riparian Forest and Woodland										**X**				**X**	**X**			**X**	**X**						**X**		**X**
Coordinate with Regional Conservation Districts (RCDs), flood control agencies, counties, cities, and watershed groups/councils.	Partner Engagement																	X							X		
Develop buffers along major rivers and streams.	Direct Management														X												
Develop CDFW Riparian Conservation Policy.	Law and Policy																		X								

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Develop Riparian and Wetlands Task Force.	Partner Engagement																	X							X		
Habitat restoration and enhancement.	Direct Management													X													
Implement Santa Rosa Plain Conservation Strategy and Draft Santa Rosa Plain Recovery Plan. Utilize potential and existing conservation lands, including banks, mitigation sites and other public and private lands to develop and implement conservation actions and management plans for SGCN that inhabit grassland habitats, vernal pools and associated habitats on the Santa Rosa Plain.	Land Acquisition/ Easement/Lease												X														
Improve implementation of grazing best management practices (BMPs).	Management Planning																										X
Provide education and outreach for the conservation of natural resources.	Outreach and Education									X															X		
Northern California Interior Coast Ranges Ecoregion																											
California Foothill and Valley Forests and Woodlands									**X**	**X**			**X**					**X**		**X**				**X**			
Conduct ecologically sound controlled burns on CDFW lands.	Direct Management																										

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Conduct demonstration management, including providing public demonstrations of successful BMPs and scientifically documenting environmental change from implementation of BMPs.	Direct Management Outreach and Education									X														X			
Establish partnerships to enhance conservation opportunities.	Partner Engagement								X									X									
Protect land through conservation easements.	Land Acquisition/ Easement/Lease												X														
Provide economic incentives for improved resource management.	Economic Incentives																			X							
Provide outreach and education for the conservation of natural resources.	Outreach and Education									X														X			
Purchase and provide long-term conservation of land.	Land Acquisition/ Easement/Lease												X														

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SOUTH COAST PROVINCE																											
Southern California Coast Ecoregion																											
California Grasslands and Flowerfields		**X**								**X**	**X**		**X**				**X**					**X**	**X**	**X**	**X**		**X**
Acquire and conserve high-value grassland habitats.	Land Acquisition/ Easement/Lease	X											X														
Coordinate with U.S. Department of Fish and Wildlife (USFWS) and other agencies to assist local jurisdictions with conservation of grasslands (e.g., via the natural communities conservation plan/habitat conservation plan process) in light of increasing extent of vineyard development in grasslands.	Management Planning									X								X							X		
Gather and analyze data to establish baseline inventory of SGCN distribution.	Data Collection and Analysis										X						X					X	X				
Partner for joint advocacy for the conservation of natural resources.	Partner Engagement																							X			
Reduce extent and spread of invasive species, with emphasis on ecosystem function for SGCN.	Direct Management																										X

Table G-1 Ecoregion Target Conservation Strategy Crosswalk to State and Federal Climate Adaptation Strategies

Targets and Strategies *(Targets are listed in bold)*	Statewide Conservation Category	California (C) and National (N) Climate Adaptation Strategies																									
		C1.1: Improve connectivity	C1.2: Implement adaptive management	C2: Enhance biodiversity monitoring	C3.1: Promote nature-based adaptation solutions	C3.2: Prioritization tools for conservation activities	C4.1: Habitat mapping	C4.5: Identify emissions reduction opportunities	C5.1: Create partnerships	C5.2: Public education and outreach	C5.3: Increase CC knowledge	N1.1: Identify connectivity	N1.2: Secure conservation status	N1.3: Restore habitat	N1.4: Improve connectivity	N2.1: Update management plans and practices	N3.1: Increase CC knowledge	N3.2: Coordinate actions	N3.3: Build legal capacity	N3.4: Build funding capacity	N4.2: Employ decision-support tools	N5.1: Identify research gaps	N5.2: Conduct research	N6.1: Increase public awareness	N6.3: Coordinate communication	N7.2: Reverse habitat degradation	N7.3: Manage invasive species
American Southwest Riparian Forest and Woodland					**X**					**X**	**X**		**X**		**X**		**X**		**X**				**X**	**X**			**X**
Acquire and conserve high-functioning riparian areas that have the greatest ecological potential (e.g., Santa Clara, San Luis Rey, and Ventura River watersheds, followed by larger impaired systems and those that support SGCN), and functioning riparian habitat on private property.	Land Acquisition/ Easement/Lease												X														
Advocate for effective enforcement laws to reduce impacts of waste and disturbance on significant riparian areas.	Law and Policy																		X								
Engage in local planning to encourage the use of bio (soft)-engineering for flood control, retention of functional floodplains, and deterrence and capture of waste and pollution.	Management Planning				X																						
Gather and analyze data to establish baseline inventory of SGCN distribution, habitats, and pressures.	Data Collection and Analysis										X						X						X				

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Targets and Strategies *(Targets are listed in bold)*	Statewide Conservation Category	California (C) and National (N) Climate Adaptation Strategies																									
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Manage barriers to water movement, with focus on improving stream water volume, groundwater levels, vegetation age-class heterogeneity, channel pattern, and seasonal flow variation.	Direct Management														X												
Manage invasive species, with focus on reducing the extent of invasive species (particularly *Arundo* and tamarisk) and improving structural diversity of native vegetation.	Direct Management																										X
Provide outreach and education focused on improving vegetation structural diversity, reducing infestations of invasive species (for plants, specifically *Arundo* and tamarisk), and protecting functioning riparian habitat on private property.	Outreach and Education									X														X			
Freshwater Marsh										**X**			**X**			**X**			**X**	**X**				**X**			
Advocate for laws and policies.	Law and Policy																		X								
Develop management plans.	Management Planning															X											
Provide economic incentives for improved resource management.	Economic Incentives																			X							
Provide outreach and education.	Outreach and Education									X														X			

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Purchase land and conservation easements.	Land Acquisition/ Easement/Lease												X														
Southern California Mountain and Valley Ecoregion																											
American Southwest Riparian Forest and Woodland					**X**					**X**	**X**		**X**		**X**		**X**		**X**				**X**	**X**			**X**
Acquire and conserve high-functioning riparian areas that have the greatest ecological potential (e.g., Santa Clara, San Luis Rey, and Ventura River watersheds, followed by larger impaired systems and those that support SGCN), and functioning riparian habitat on private property.	Land Acquisition/ Easement/Lease												X														
Advocate for effective enforcement laws to reduce impacts of waste and disturbance on significant riparian areas.	Law and Policy																		X								
Engage in local planning to encourage the use of bio (soft)-engineering for flood control, retention of functional floodplains, and deterrence and capture of waste and pollution.	Management Planning				X																						
Gather and analyze data to establish baseline inventory of SGCN distribution, habitats, and pressures.	Data Collection and Analysis										X						X						X				

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Targets and Strategies *(Targets are listed in bold)*	Statewide Conservation Category	California (C) and National (N) Climate Adaptation Strategies																									
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Manage barriers to water movement, with focus on improving stream water volume, groundwater levels, vegetation age-class heterogeneity, channel pattern, and seasonal flow variation.	Direct Management														X												
Manage invasive species, with focus on reducing the extent of invasive species (particularly *Arundo* and tamarisk) and improving structural diversity of native vegetation.	Direct Management																										X
Provide outreach and education focused on improving vegetation structural diversity, reducing infestations of invasive species (for plants, specifically *Arundo* and tamarisk), and protecting functioning riparian habitat on private property.	Outreach and Education									X														X			
California Grasslands and Flowerfields		**X**								**X**	**X**		**X**				**X**					**X**	**X**	**X**	**X**		**X**
Acquire and conserve high-value grassland habitats.	Land Acquisition/ Easement/Lease	X											X														

Table G-1 Ecoregion Target Conservation Strategy Crosswalk to State and Federal Climate Adaptation Strategies

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		C1.1: Improve connectivity	C1.2: Implement adaptive management	C2: Enhance biodiversity monitoring	C3.1: Promote nature-based adaptation solutions	C3.2: Prioritization tools for conservation activities	C4.1: Habitat mapping	C4.5: Identify emissions reduction opportunities	C5.1: Create partnerships	C5.2: Public education and outreach	C5.3: Increase CC knowledge	N1.1: Identify connectivity	N1.2: Secure conservation status	N1.3: Restore habitat	N1.4: Improve connectivity	N2.1: Update management plans and practices	N3.1: Increase CC knowledge	N3.2: Coordinate actions	N3.3: Build legal capacity	N3.4: Build funding capacity	N4.2: Employ decision-support tools	N5.1: Identify research gaps	N5.2: Conduct research	N6.1: Increase public awareness	N6.3: Coordinate communication	N7.2: Reverse habitat degradation	N7.3: Manage invasive species
Coordinate with U.S. Department of Fish and Wildlife (USFWS) and other agencies to assist local jurisdictions with conservation of grasslands (e.g., via the natural communities conservation plan/habitat conservation plan process) in light of increasing extent of vineyard development in grasslands.	Management Planning									X															X		
Gather and analyze data to establish baseline inventory of SGCN distribution.	Data Collection and Analysis										X						X					X	X				
Partner for joint advocacy for the conservation of natural resources.	Partner Engagement																							X			
Reduce extent and spread of invasive species, with emphasis on ecosystem function for SGCN.	Direct Management																										X

Table G-2 Hydrologic Unit Target Conservation Strategy Crosswalk to State and Federal Climate Adaptation Strategies

Targets and Strategies *(Targets are listed in bold)*	Statewide Conservation Category	California (C) and National (N) Climate Adaptation Strategies																	
		C1.1: Improve connectivity	C3.1: Promote nature-based adaptation solutions	C5.1: Create partnerships	C5.2: Public education and outreach	C5.3: Increase CC knowledge	N1.2: Secure conservation status	N1.3: Restore habitat	N1.4: Improve connectivity	N2.1: Update management plans and practices	N2.2: Manage species for CC	N2.3: Conserve genetic diversity	N3.1: Increase CC knowledge	N3.2: Coordinate actions	N3.3: Build legal capacity	N5.2: Conduct research	N6.1: Increase public awareness	N7.2: Reverse habitat degradation	N7.3: Manage invasive species
BAY DELTA AND CENTRAL COAST																			
Central California Coastal HUC 1806																			
Coastal Lagoons		**X**				**X**	**X**		**X**		**X**		**X**		**X**	**X**			
Conduct baseline surveys for SCGN/habitat and pressures in at least 50 percent of coastal lagoons within the ecoregion.	Data Collection and Analysis					X							X			X			
Develop an interagency direct management plan for coastal lagoons.	Direct Management										X								
Influence the drafting of laws and policies that promote conservation of lagoon habitat.	Law and Policy														X				
Manage dams and other barriers to improve fish passage and stream ecosystem function.	Direct Management	X							X										
Protect riparian areas by acquiring land adjacent to lagoons, and reduce water diversion from the critical lagoons and tributary streams during late spring to summer.	Land Acquisition/Easement/Lease						X												
Provide training and technical assistance, including training interagency staff in fish identification and invasive species management/control techniques.	Training and Technical Assistance												X						
San Francisco Bay Conservation Unit																			
American Southwest Riparian Forest and Woodland		**X**	**X**		**X**		**X**	**X**	**X**	**X**	**X**	**X**		**X**			**X**	**X**	**X**
Acquire, conserve and manage habitat for SGCN that inhabit riparian forest and woodland habitats by finalizing draft conservation plans and implementing completed NCCPs, HCPs, and Conservation Strategies and other opportunities.	Land Acquisition/ Easement/Lease	X					X	X	X		X	X						X	X

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		C1.1: Improve connectivity	C3.1: Promote nature-based adaptation solutions	C5.1: Create partnerships	C5.2: Public education and outreach	C5.3: Increase CC knowledge	N1.2: Secure conservation status	N1.3: Restore habitat	N1.4: Improve connectivity	N2.1: Update management plans and practices	N2.2: Manage species for CC	N2.3: Conserve genetic diversity	N3.1: Increase CC knowledge	N3.2: Coordinate actions	N3.3: Build legal capacity	N5.2: Conduct research	N6.1: Increase public awareness	N7.2: Reverse habitat degradation	N7.3: Manage invasive species
Develop grazing BMPs.	Direct Management							X		X				X				X	
Develop riparian buffers along major rivers and streams.	Direct Management	X	X					X	X		X							X	
Implement education and outreach to the public and local agencies regarding the value of riparian habitat, development of riparian buffers along major rivers and streams, and reducing encroachment of crops into riparian buffers.	Outreach and Education				X												X		
Improve road maintenance on county and state roads to reduce sediment impacts to stream habitats.	Direct Management							X										X	
Manage dams and other barriers to allow for fish passage.	Direct Management	X							X									X	
Manage invasive species.	Direct Management																	X	X
Salt Marsh				**X**	**X**	**X**		**X**					**X**	**X**	**X**	**X**	**X**		**X**
Advocate for laws and policies, with a focus on the following: influence land use policies to reduce impacts on salt marsh habitat; streamline permitting process for restoration; enhance law enforcement capacity for protection of restoration sites; develop programmatic permits; and prepare for climate change.	Law and Policy														X				
Conduct research regarding effective salt marsh management and restoration.	Data Collection and Analysis					X							X			X			
Control invasive species.	Direct Management																		X
Implement education and outreach focused on educating local agencies and the public on the biological values of Bay Delta habitats and existing pressures that affect fish and wildlife, and promote effective and coordinated conservation strategies for the Bay Delta.	Outreach and Education				X												X		

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Implement integrated resource management.	Management Planning													X					
Partner for joint advocacy.	Partner Engagement													X					
Protect and restore land acquired through fee title or conservation easement, with focus on the following: acquire, protect, enhance, or restore salt marsh habitat; support the Delta Conservancy to establish restoration priorities; and increase connectivity among salt marsh habitats.	Land Acquisition/Easement/Lease						X	X											
Provide economic incentives for improved resource management.	Economic Incentives			X															
Freshwater Marsh																			
Advocate for laws and policies.	Law and Policy														X				
Development management plans.	Management Planning													X					
Provide economic incentives for improved resource management.	Economic Incentives			X													X		
Provide outreach and education.	Outreach and Education				X												X		
Purchase land and conservation easements.	Land Acquisition/ Easement/Lease						X	X											

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CASCADES AND MODOC PLATEAU																			
North Lahontan HUC 1808																			
Eagle Lake Native Fish Assemblage		**X**		**X**	**X**			**X**	**X**	**X**				**X**		**X**	**X**		**X**
Develop BMPs for water management and conservation in the Pine Creek watershed. Coordinate with USFS to create enhanced wetlands and multi-use management (wildlife, livestock, and fish) policy. Managed water could better be used for fish as there are alternative water sources for wildlife and livestock in the Pine Creek watershed.	Management Planning									X									
Develop or update grazing BMPs for managed grazing, including barriers to sensitive areas, fencing timing, and grazing rotations.	Law and Policy									X									
Encourage use of alternative water sources (wells if sufficient ground water is present), water conservation practices, and reduce the impacts of water loss at water treatment sites.	Direct Management							X											
Engage in decision-making process.	Partner Engagement			X										X					
Implement the Eagle Lake Rainbow Trout Conservation Strategy (ELRTCS), which was developed amongst the USFWS, USFS, and CDFW.	Direct Management							X											
Improve road maintenance to reduce sediment from roads entering streams.	Direct Management									X									
Manage dams and other barriers by installing control structures (gate or gate valve) to allow more bypass flows and fish passage.	Direct Management	X							X										
Manage grazing.	Direct Management							X											

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Manage invasive species.	Direct Management																		X
Prepare groundwater assessment.	Data Collection and Analysis															X			
Promote domestic water efficiency and conservation through reducing water use by increased efficiency from residence and businesses.	Management Planning				X														
Provide economic incentives for grazing on public lands to follow BMPs.	Economic Incentives			X															
Provide education and outreach by educating the public on the development, status, and need for BMPs and about invasive species.	Outreach and Education				X												X		
Sacramento HUC 1802																			
Goose Lake Native Fish Assemblage		**X**			**X**				**X**					**X**			**X**	**X**	**X**
Design and implement inventory and assessment of fish populations and fish habitat.	Data Collection and Analysis															X			
Develop or update grazing BMPs and conduct managed grazing.	Law and Policy				X									X					
Education and outreach; inform public of restoration plans and why treatment is necessary.	Outreach and Education				X												X		
Manage dams and other barriers.	Direct Management	X							X										
Manage invasive species.	Direct Management																		X
Reduce livestock access to natural water features with wells and alternative water sources.	Direct Management																	X	

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CENTRAL VALLEY AND SIERRA NEVADA																			
Central Lahontan HUC 1605																			
Carson River Native Fish Assemblage		X			X	X	X	X	X	X		X	X		X	X	X		
Conduct outreach; inform public of issues related to introduced genetic material, risks of invasive species, and importance of aquatic biodiversity management plants.	Outreach and Education				X												X		
Conduct research on SGCN; study the distribution and abundance of mountain whitefish and mountain sucker in the Carson River Basin, and the susceptibility of the Carson River Basin to invasive species.	Data Collection and Analysis					X							X			X			
Develop basin management plans.	Management Planning									X									
Enhance habitat, improve water quality and temperature consistent with the Basin Plan, and coordinate water storage and timing of release between CDFW and water agencies to benefit fish habitat and water users.	Direct Management							X											
Implement effective law enforcement related to: illegal water diversions, illegal fishing, and introduction of invasive species in the Carson River Basin; compliance with 1600 agreements; and compliance with water rights.	Law and Policy														X				
Manage dams and other barriers to fish passage.	Direct Management	X							X										
Provide training to staff and managers on non-native genetic issues, invasive species management and control techniques, and fish identification.	Training and Technical Assistance												X						

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Purchase land and/or acquire easements: acquire water rights by purchasing lands along the critical Carson River tributaries, acquire conservation easements to protect riparian areas in the Carson River Basin, acquire large mountain meadow ranches for conservation, and acquire water storage rights in the Carson River Basin.	Land Acquisition/Easement/Lease						X												
Reintroduce Lahontan cutthroat trout and Paiute cutthroat trout to their historic ranges.	Direct Management											X							
Restore native species; manage invasive species and restore/maintain native fish populations in target streams.	Direct Management											X							
Walker River Native Fish Assemblage		**X**		**X**	**X**	**X**			**X**		**X**		**X**	**X**	**X**	**X**	**X**		**X**
Collect data on the impacts of diversions, water management, water use, and the distribution of introduced genetic material on the native fish community.	Data Collection and Analysis					X							X			X			
Develop or update and implement grazing BMPs.	Direct Management										X								
Ensure that planning and decision-making processes support the conservation of stream habitats and flows as a result of CDFW input.	Management Planning													X					
Establish and develop co-management partnership to affect change in dams and/or water management and use following interagency agreement.	Partner Engagement			X										X					
Implement direct management activities to restore aquatic habitats and ensure that SGCN are maintained or enhanced.	Direct Management										X								
Implement effective enforcement of laws.	Law and Policy														X				
Manage water for beneficial uses by native aquatic species.	Direct Management										X								

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Provide outreach and education on native aquatic resource conservation efforts.	Outreach and Education				X												X		
Reduce impacts to native fish as a result of roads and railroads and invasive species through development and use of BMPs.	Management Planning										X							X	X
Remove introduced brook trout in the context of recovery of listed Lahontan cutthroat trout.	Direct Management										X								X
Translocate or reintroduce native fish species.	Direct Management										X								
Sacramento HUC 1802																			
Clear Lake Native Fish Assemblage				**X**	**X**		**X**			**X**				**X**			**X**	**X**	**X**
Control damage to creeks from OHV use.	Direct Management																	X	
Develop BMPs for increased spring/summer flows for improved lake and fish health, improved fish passage, and water diversions.	Direct Management									X									
Establish collaborative partnerships.	Partner Engagement			X										X					
Increase Law Enforcement Division (LED) staffing levels and implement effective law enforcement related to: illegal water diversions, illegal fishing, and invasive species introductions; compliance with 1600 agreements; and compliance with water rights.	Law and Policy									X									
Manage invasive species.	Direct Management																		X
Purchase land and/or acquire easements.	Land Acquisition/Easement/Lease						X												
Provide economic incentives for improved resource management.	Economic Incentives			X															
Provide outreach and education for the conservation of natural resources.	Outreach and Education				X												X		

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San Joaquin HUC 1804																			
San Joaquin Native Fish Assemblage			**X**		**X**			**X**	**X**						**X**	**X**	**X**		**X**
Advocate for effective enforcement of laws related to protection of significant riparian areas.	Law and Policy														X				
Control invasive species: assess, map, and develop control plans for invasive aquatic species.	Direct Management																		X
Gather and analyze data; establish baseline inventory of SGCN and habitat, and pressure distributions.	Data Collection and Analysis															X			
Improve fish passage: assess, prioritize, and remove/modify fish passage barriers.	Direct Management								X										
Protect and restore floodplain function; implement and maintain priority floodplain restoration projects.	Direct Management							X											
Provide input on local planning; engage in local planning to encourage the use of bio(soft) engineering for flood control, retention of functional floodplains, and deterrence and capture of waste and pollution.	Management Planning		X																
Provide outreach and education for the conservation of natural resources.	Outreach and Education				X												X		
Restore natural flows.	Direct Management								X										

Table G-2 Hydrologic Unit Target Conservation Strategy Crosswalk to State and Federal Climate Adaptation Strategies

Targets and Strategies *(Targets are listed in bold)*	Statewide Conservation Category	California (C) and National (N) Climate Adaptation Strategies																	
		C1.1: Improve connectivity	C3.1: Promote nature-based adaptation solutions	C5.1: Create partnerships	C5.2: Public education and outreach	C5.3: Increase CC knowledge	N1.2: Secure conservation status	N1.3: Restore habitat	N1.4: Improve connectivity	N2.1: Update management plans and practices	N2.2: Manage species for CC	N2.3: Conserve genetic diversity	N3.1: Increase CC knowledge	N3.2: Coordinate actions	N3.3: Build legal capacity	N5.2: Conduct research	N6.1: Increase public awareness	N7.2: Reverse habitat degradation	N7.3: Manage invasive species
Tulare - Buena Vista Lakes HUC 1803																			
Upper Kern River Native Fish Assemblage					**X**	**X**	**X**	**X**		**X**		**X**	**X**			**X**	**X**		
Conduct outreach; inform public of issues related to introduced genetic material, risks of invasive species, and importance of aquatic and riparian habitat restoration.	Outreach and Education				X												X		
Conduct research on SGCN; update genetic status for golden trout; refine distribution for hardhead and Kern River rainbow trout.	Data Collection and Analysis					X							X			X			
Develop new or revised management plans for native fish and implement existing Conservation Assessment and Strategy for golden trout.	Management Planning									X									
Purchase land and/or acquire easements.	Land Acquisition/Easement/Lease						X												
Reintroduce golden trout to its historic range.	Direct Management									X									
Restore and enhance meadow habitat; improve water quality and temperature consistent with the Basin Plan.	Direct Management							X											
Restore native species; manage invasive species, and remove non-native trout from target streams.	Direct Management											X							
Provide training to staff and managers on non-native genetic issues, invasive species management, and control techniques.	Training and Technical Assistance												X						

Table G-2 Hydrologic Unit Target Conservation Strategy Crosswalk to State and Federal Climate Adaptation Strategies

Targets and Strategies *(Targets are listed in bold)*	Statewide Conservation Category	California (C) and National (N) Climate Adaptation Strategies																	
		C1.1: Improve connectivity	C3.1: Promote nature-based adaptation solutions	C5.1: Create partnerships	C5.2: Public education and outreach	C5.3: Increase CC knowledge	N1.2: Secure conservation status	N1.3: Restore habitat	N1.4: Improve connectivity	N2.1: Update management plans and practices	N2.2: Manage species for CC	N2.3: Conserve genetic diversity	N3.1: Increase CC knowledge	N3.2: Coordinate actions	N3.3: Build legal capacity	N5.2: Conduct research	N6.1: Increase public awareness	N7.2: Reverse habitat degradation	N7.3: Manage invasive species
DESERTS PROVINCE																			
Central Lahontan HUC 1605																			
Walker River Native Fish Assemblage		**X**		**X**	**X**	**X**			**X**	**X**	**X**		**X**	**X**		**X**	**X**		**X**
Collect data on the impacts of diversions, water management, water use, and the distribution of introduced genetic material on the native fish community.	Data Collection and Analysis					X							X			X			
Develop, update, and implement grazing BMPs.	Management planning										X							X	X
Ensure that planning and decision-making processes support the conservation of stream habitats and flows as a result of CDFW input.	Management Planning													X					
Establish and develop co-management partnership to affect change in dams and/or water management and use following interagency agreement.	Partner Engagement			X										X					
Implement direct management activities to restore aquatic habitats and ensure that SGCNs are maintained or enhanced.	Direct Management										X							X	
Implement effective enforcement of laws.	Law and Policy													X					
Manage water for beneficial uses by native aquatic species.	Direct Management	X							X										
Provide outreach and education on native aquatic resource conservation efforts.	Outreach and Education				X												X		
Reduce impacts to native fish as a result of roads and railroads and invasive species through development and use of BMPs.	Management Planning										X							X	X
Remove introduced brook trout in the context of recovery of listed Lahontan cutthroat trout.	Direct Management										X								X
Translocate or reintroduce native fish species.	Direct Management									X									

Table G-2 Hydrologic Unit Target Conservation Strategy Crosswalk to State and Federal Climate Adaptation Strategies

Targets and Strategies *(Targets are listed in bold)*	Statewide Conservation Category	California (C) and National (N) Climate Adaptation Strategies																	
		C1.1: Improve connectivity	C3.1: Promote nature-based adaptation solutions	C5.1: Create partnerships	C5.2: Public education and outreach	C5.3: Increase CC knowledge	N1.2: Secure conservation status	N1.3: Restore habitat	N1.4: Improve connectivity	N2.1: Update management plans and practices	N2.2: Manage species for CC	N2.3: Conserve genetic diversity	N3.1: Increase CC knowledge	N3.2: Coordinate actions	N3.3: Build legal capacity	N5.2: Conduct research	N6.1: Increase public awareness	N7.2: Reverse habitat degradation	N7.3: Manage invasive species
Northern Mojave - Mono Lake HUC 1809																			
Anthropogenically Created Aquatic Features				**X**	**X**	**X**	**X**			**X**			**X**	**X**		**X**	**X**		**X**
Collect data on the distribution of invasive species and impacts to the target habitat, species utilization of anthropogenic waterways, and the distribution of temporary aquatic habitats associated with roads and railroads to inform management.	Data Collection and Analysis					X							X			X			
Develop and implement BMPs for managed grazing, maintenance of drains/canals, and road and railway maintenance.	Law and Policy									X									
Establish co-management partnerships and cooperative management plans with land management agencies, water agencies, private landowners, regional land trusts, environmental organizations, railroads, and transportation agencies.	Partner Engagement			X										X					
Manage invasive species to expand range of aquatic/semi-aquatic SCGN.	Direct Management																		X
Provide input on project planning and decision making process; conserve anthropogenic aquatic habitats through participation in the planning and decision making process.	Land Use Planning													X					
Provide outreach and education, with emphasis on improving public awareness, concern, and participation in resource conservation.	Outreach and Education				X												X		

Table G-2 Hydrologic Unit Target Conservation Strategy Crosswalk to State and Federal Climate Adaptation Strategies

Targets and Strategies *(Targets are listed in bold)*	Statewide Conservation Category	California (C) and National (N) Climate Adaptation Strategies																	
		C1.1: Improve connectivity	C3.1: Promote nature-based adaptation solutions	C5.1: Create partnerships	C5.2: Public education and outreach	C5.3: Increase CC knowledge	N1.2: Secure conservation status	N1.3: Restore habitat	N1.4: Improve connectivity	N2.1: Update management plans and practices	N2.2: Manage species for CC	N2.3: Conserve genetic diversity	N3.1: Increase CC knowledge	N3.2: Coordinate actions	N3.3: Build legal capacity	N5.2: Conduct research	N6.1: Increase public awareness	N7.2: Reverse habitat degradation	N7.3: Manage invasive species
Cienegas				**X**	**X**		**X**		**X**			**X**		**X**		**X**	**X**		
Establish and develop co-management partnerships.	Partner Engagement			X										X					
Gather and analyze data on impacts of water management and water use, renewable energy projects, groundwater use for farming and livestock, and invasive species on native species within cienegas.	Data Collection and Analysis															X			
Participate in interagency review of water management and use, particularly groundwater withdrawals.	Direct Management								X										
Protect high-quality cienegas through acquisition/easement/lease.	Land Acquisition/Easement/Lease						X												
Provide outreach and education about the need for resource management of cienegas.	Outreach and Education				X												X		
Translocate or reintroduce native aquatic SGCN and establish genetically viable populations.	Direct Management											X							
Springs and Spring Brooks		**X**		**X**	**X**	**X**			**X**		**X**		**X**	**X**		**X**	**X**		**X**
Establish and develop co-management partnerships.	Partner Engagement			X										X					
Manage dams and other barriers to control fish passage.	Direct Management	X							X										
Manage invasive species to expand range of native fishes.	Direct Management																		X
Protect high-quality springs and spring brooks through acquisition/easement/lease.	Land Acquisition/Easement/Lease						X												
Provide input on local planning decisions.	Management Planning													X					
Provide outreach and education, with emphasis on improving public awareness, concern, and participation in resource conservation that leads to improved conditions for native fish.	Outreach and Education				X												X		

Table G-2 Hydrologic Unit Target Conservation Strategy Crosswalk to State and Federal Climate Adaptation Strategies

Targets and Strategies *(Targets are listed in bold)*	Statewide Conservation Category	California (C) and National (N) Climate Adaptation Strategies																	
		C1.1: Improve connectivity	C3.1: Promote nature-based adaptation solutions	C5.1: Create partnerships	C5.2: Public education and outreach	C5.3: Increase CC knowledge	N1.2: Secure conservation status	N1.3: Restore habitat	N1.4: Improve connectivity	N2.1: Update management plans and practices	N2.2: Manage species for CC	N2.3: Conserve genetic diversity	N3.1: Increase CC knowledge	N3.2: Coordinate actions	N3.3: Build legal capacity	N5.2: Conduct research	N6.1: Increase public awareness	N7.2: Reverse habitat degradation	N7.3: Manage invasive species
Study and document impacts of invasive species, renewable energy projects, and dams and water management and use on spring ecosystems and associated species for future management actions.	Data Collection and Analysis					X							X			X			
Translocate or reintroduce native aquatic SGCN and establish genetically viable populations.	Direct Management										X								
Southern Mojave - Salton Sea HUC 1810																			
Anthropogenically Created Aquatic Features				**X**	**X**	**X**	**X**			**X**		**X**	**X**	**X**		**X**	**X**		**X**
Collect data on the distribution of invasive species and impacts to the target habitat, species utilization of anthropogenic waterways, and the distribution of temporary aquatic habitats associated with roads and railroads to inform management.	Data Collection and Analysis					X							X			X			
Develop and implement BMPs for managed grazing, maintenance of drains/canals, and road and railway maintenance.	Law and Policy									X									
Establish co-management partnerships and cooperative management plans with land management agencies, water agencies, private landowners, regional land trusts, environmental organizations, railroads, and transportation agencies.	Partner Engagement			X										X					
Manage invasive species to expand range of aquatic/semi-aquatic SCGN.	Direct Management																		X
Provide input on project planning and decision making process; conserve anthropogenic aquatic habitats through participation in the planning and decision making process.	Land Use Planning													X					
Provide outreach and education, with emphasis on improving public awareness, concern, and participation in resource conservation.	Outreach and Education				X												X		

Table G-2 Hydrologic Unit Target Conservation Strategy Crosswalk to State and Federal Climate Adaptation Strategies

Targets and Strategies *(Targets are listed in bold)*	Statewide Conservation Category	California (C) and National (N) Climate Adaptation Strategies																	
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Cienegas				**X**	**X**		**X**		**X**			**X**		**X**		**X**	**X**		
Establish and develop co-management partnerships.	Partner Engagement			X										X					
Gather and analyze data on impacts of water management and water use, renewable energy projects, groundwater use for farming and livestock, and invasive species on native species within cienegas.	Data Collection and Analysis															X			
Participate in interagency review of water management and use, particularly groundwater withdrawals.	Direct Management								X										
Protect high-quality cienegas through acquisition/easement/lease.	Land Acquisition/Easement/Lease						X												
Provide outreach and education about the need for resource management of cienegas.	Outreach and Education				X												X		
Translocate or reintroduce native aquatic SGCN and establish genetically viable populations.	Direct Management											X							
NORTH COAST AND KLAMATH PROVINCE																			
Klamath - Northern California Coastal HUC 1801																			
Native Aquatic Species Assemblages/Communities		**X**		**X**	**X**		**X**	**X**	**X**						**X**		**X**	**X**	
Acquire riparian areas. Protect stream ecosystems by riparian land purchase and conservation easements.	Land Acquisition/Easement/Lease						X												
Advocate for laws and policies. Develop, change, influence, and help implement formal legislation, regulations, and voluntary standards.	Law and Policy														X				

Table G-2 Hydrologic Unit Target Conservation Strategy Crosswalk to State and Federal Climate Adaptation Strategies

Targets and Strategies *(Targets are listed in bold)*	Statewide Conservation Category	California (C) and National (N) Climate Adaptation Strategies																		
		C1.1: Improve connectivity	C3.1: Promote nature-based adaptation solutions	C5.1: Create partnerships	C5.2: Public education and outreach	C5.3: Increase CC knowledge	N1.2: Secure conservation status	N1.3: Restore habitat	N1.4: Improve connectivity	N2.1: Update management plans and practices	N2.2: Manage species for CC	N2.3: Conserve genetic diversity	N3.1: Increase CC knowledge	N3.2: Coordinate actions	N3.3: Build legal capacity	N5.2: Conduct research	N6.1: Increase public awareness	N7.2: Reverse habitat degradation	N7.3: Manage invasive species
Develop buffers. Develop county stream buffer policy and guidelines in conjunction with ongoing regional efforts to develop riparian buffers. Adequate support and clear policy guideline are needed.	Direct Management							X											
Manage dams and other barriers by reviewing potential cost/benefit of modifying or removing dams that block access to significant amounts of high quality salmonid spawning and rearing habitat and modifying or removing Cape Horn Dam and Scott Dam from the upper Eel River, Dwinnel dam on the Shasta River, and dams from upper Klamath River.	Direct Management	X							X										
Promote water conservation measures by reducing the amount of land growing water intensive crops, considering less water intensive crops, providing incentives for water conservation, and encouraging public participation in enforcement of wasteful use of water (peer pressure).	Direct Management				X														
Provide economic incentives to private landowners to influence responsible stewardship of land/water and specific species and establish good stewardship recognition or payments to landowners practicing sound resource management that benefits stream ecosystems.	Economic Incentives			X															
Provide outreach and education. Outreach includes both formal (classroom) and non-formal education efforts to: (1) landowners to implement land management practices to benefit species; and (2) decision makers about impacts on at-risk quality standards for key water bodies and aquatic species.	Outreach and Education				X												X		

Table G-2 Hydrologic Unit Target Conservation Strategy Crosswalk to State and Federal Climate Adaptation Strategies

Targets and Strategies *(Targets are listed in bold)*	Statewide Conservation Category	California (C) and National (N) Climate Adaptation Strategies																	
		C1.1: Improve connectivity	C3.1: Promote nature-based adaptation solutions	C5.1: Create partnerships	C5.2: Public education and outreach	C5.3: Increase CC knowledge	N1.2: Secure conservation status	N1.3: Restore habitat	N1.4: Improve connectivity	N2.1: Update management plans and practices	N2.2: Manage species for CC	N2.3: Conserve genetic diversity	N3.1: Increase CC knowledge	N3.2: Coordinate actions	N3.3: Build legal capacity	N5.2: Conduct research	N6.1: Increase public awareness	N7.2: Reverse habitat degradation	N7.3: Manage invasive species
Reduce need for livestock access to streams and riparian corridors by providing and locating water supply to livestock in grazing areas away from streams (use wells and other off channel sources).	Direct Management							X										X	
Support effective law enforcement by increasing funding for federal and state enforcement resources and increasing public awareness.	Law and Policy														X				
SOUTH COAST PROVINCE																			
Southern California Coastal HUC 1807																			
South Coast Native Aquatic Herp Assemblage		**X**			**X**	**X**	**X**	**X**	**X**		**X**		**X**			**X**	**X**		**X**
Conduct research to identify causal mechanism for Chytrid fungus and prevent its spread in amphibian populations.	Data Collection and Analysis					X							X			X			
Manage flows, dams, and other barriers to best benefit aquatic herps and for fish passage.	Direct Management	X							X										
Manage invasive species to improve conditions for native fish and aquatic herps.	Direct Management																		X
Protect and restore habitat, and create riparian buffers adjacent to streams.	Direct Management							X											
Protect land in fee or with conservation easements, with focus on riparian habitats that have the greatest ecological potential such as larger impaired systems and those that support SGCN.	Land Acquisition/Easement/Lease						X												
Provide outreach and education.	Outreach and Education				X												X		
Reintroduce native species.	Direct Management										X								

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		C1.1: Improve connectivity	C3.1: Promote nature-based adaptation solutions	C5.1: Create partnerships	C5.2: Public education and outreach	C5.3: Increase CC knowledge	N1.2: Secure conservation status	N1.3: Restore habitat	N1.4: Improve connectivity	N2.1: Update management plans and practices	N2.2: Manage species for CC	N2.3: Conserve genetic diversity	N3.1: Increase CC knowledge	N3.2: Coordinate actions	N3.3: Build legal capacity	N5.2: Conduct research	N6.1: Increase public awareness	N7.2: Reverse habitat degradation	N7.3: Manage invasive species
Native Fish Assemblage			**X**		**X**	**X**	**X**	**X**	**X**			**X**	**X**			**X**	**X**		**X**
Collect and analyze data to establish a baseline inventory of SCGN distribution.	Data Collection and Analysis					X							X			X			
Control invasive species.	Direct Management																		X
Identify areas that may act as climate refugia.	Data Collection and Analysis		X					X			X		X			X			
Implement outreach.	Outreach and Education				X												X		
Improve fish passage by working with federal, state, and local agencies to identify and remove key fish barriers to fish movement and sediment flow, and keep priority areas barrier free.	Direct Management								X										
Protect and restore floodplain function.	Direct Management							X											
Protect and restore unarmored threespine stickleback (UTS) habitat within the Santa Clara River mainstem, Soledad Canyon, and Bouquet Canyon.	Land Acquisition/Easement/Lease						X												
Restore natural flows.	Direct Management								X										
Translocate species to increase current distribution; specifically, translocate Santa Ana sucker, Santa Ana speckled dace, and UTS into suitable habitat in the Big Tujunga, San Gabriel, and Santa Clara watersheds.	Direct Management											X							

Appendix H

Appendix H Offshore Islands

Prelude

Offshore Islands strategies have been created as a response to the public comments received during the SWAP 2015 public commenting period (May - July 2015). California Department of Fish and Wildlife (CDFW) will continue to develop new strategies as the need arises and if the additions are consistent with SWAP 2015 priorities. Any additional strategies will be shared through the SWAP public website.

Introduction

California's Offshore Islands, which include the Channel Islands and Farallon Islands and exclude coastal rocks within the Marine Province, are renowned for their high rates of endemism, biologically diverse flora and fauna, and significant nesting sites for sea birds and pinnipeds. The Channel Islands (and often the Farallones as well) are appropriately referred to as "*California's Galapagos*." Given their small area, they are home to more endemic taxa than anywhere else in California, with 110 Species of Greatest Conservation Need (SGCN) (Appendix C), found on the islands. California is a hotspot of biodiversity, and within the state, the offshore islands are a hotspot within a hotspot.

The global significance of these islands is underscored by their:

- designation as part of the United Nations' Man and the Biosphere program (Channel Islands Biosphere Reserve and Golden Gate Biosphere Reserve);
- designation as a State of California Area of Special Biological Significance;
- designation of five of the eight Channel Islands as Channel Islands National Park (National Park Service (NPS), with NPS having both acquired and now continuing to manage Santa Barbara Island, Anacapa Island, Santa Rosa Island, 24% of Santa Cruz Island, and San Miguel Island (which is owned by the US Navy);
- acquisition and continued management of 76% of Santa Cruz Island by The Nature Conservancy;
- acquisition and continued management of 88% of Santa Catalina Island by the Catalina Island Conservancy;
- designation of the Farallon Islands as a National Wildlife Refuge, managed by the U.S. Fish and Wildlife Service;
- portions designated as Wilderness;
- inclusion in the Channel Islands National Marine Sanctuary;
- inclusion in the Greater Farallones National Marine Sanctuary;
- inclusion in the University of California's Natural Reserve System;
- designation as a California State Channel Islands Reserve;
- designation as a University of Southern California Reserve; and

- strategic location for US Navy weapon testing operations, with the majority of the land managed for conservation (San Clemente and San Nicolas Islands).

The Channel Islands encompass two island groups, the Southern and Northern Channel Islands. The Southern Channel Islands are located due west of the stretch of the mainland coast from San Diego to Huntington Beach, and the Northern Channel Islands lie due south of the coast from Oxnard to Goleta. The Channel Islands are comprised of eight islands (Santa Cruz, Santa Rosa, Santa Catalina, San Clemente, San Nicolas, San Miguel, Anacapa, and Santa Barbara), totaling 906 km^2 (350 mi^2), and range from 193 to 753 m (635- 2470 ft.) in highest elevation. Vegetation communities include: island woodland, island chaparral, oak woodland, coastal scrub, bluff scrub, grassland (perennial and non-native annual), riparian woodland, riparian scrub, wetlands, badlands, beach and dune. Over 10% of the islands' flora, approximately 100 taxa, are endemic to the islands. The islands are home to a myriad of endemic wildlife that include: eight subspecies of island deer mouse, six subspecies of island fox, island spotted skunk, island scrub-jay, island loggerhead shrike, Santa Catalina Island shrew, Catalina California ground squirrel, island harvest mouse, island gopher snake, and Channel Islands salamander. Relatively unstudied compared to other wildlife, the islands are home to numerous endemic invertebrates such as: San Nicolas and San Clemente Island snails and Channel Islands sweat bee. Several of the islands provide critical nesting sites for sea birds and rookeries and haul-out areas for pinnipeds.

The Farallon Islands lie approximately 27 miles due west of San Francisco, and consist of the South, Middle and North Farallon islands totaling 211 acres (83 ha.). Smaller in size, the Farallones have a more limited flora and fauna compared to the larger Channel Islands but are still globally significant for several species. They are the largest U.S. seabird rookery south of Alaska, with over 300,000 breeding birds of thirteen species. The world's largest colonies of Ashy Storm-Petrels, Brandt's Cormorants and Western gulls occur there. Five species of marine mammals breed and haul out there, including Northern Elephant Seal, Northern Fur Seal, Harbor Seal, Northern Sea Lion, and California Sea Lion. While plant diversity is low, the Farallones support a unique plant community with Southeast Farallon Island supporting the majority of plant habitat.

All of the islands may be considered part of a single archipelago because they share the following attributes:

- Mediterranean-type/maritime climate characterized by a long summer period without rain and the presence of a "marine layer," which moderates temperatures and humidity relative to inland sites at the same latitude
- High levels of endemism
- Similar animal and plant communities found within the California Floristic Province
- Many species that are common to islands, but absent from the mainland
- Managed mostly for conservation
- Similar legacies of introduced species, and more recently, eradications

- Common threats and impacts (e.g., biological invasions, oil spills, climate change, increased fire frequency, limited species distribution, and soil erosion)
- Similarities in marine conditions
- A history of inter-island collaboration and information sharing

Historical over-grazing and browsing by a variety of introduced vertebrates, ranging from rabbits to feral sheep, feral pigs deer and elk, and considerable soil and habitat disturbance by these animals led to severe habitat degradation and adverse effects on native species. These impacts included the conversion of shrublands to grasslands, proliferation of non-native invasive species island-wide, and reductions of endemic plant populations. These affects combined with the loss of bald eagles from the area due to pesticide contamination of Southern California's waters, allowed a new top predator to move in, the golden eagle. Golden eagles feed more on terrestrial prey than bald eagles, and were subsidized with large populations of introduced vertebrates, but incidentally fed on island foxes which led to collapses of the fox populations across the Northern Channel Islands.

Most of the introduced vertebrates were successfully removed from the Farallons and Channel Islands over the past four decades, and island fox populations, as well as populations of other native animals and plants, have made remarkable comebacks as a result. The success of island managers and mainland partners in these endeavors is the product of substantial commitment, collaboration, and the investment of tens of millions of dollars from Federal, State, and local agencies, private foundations, and individuals.

Non-native invasive species pose a significant and increasing threat to native biota and unique ecosystems of islands worldwide. The breaching of biogeographic boundaries by the widespread, recent human transport of species has caused rapid and radical change in biological communities, including multiple extinctions. To minimize further extinctions and other ecological changes, the most important priority for the California islands is to reduce the risks of new invasions. After biosecurity (prevention), the next priority is to eradicate existing harmful invasive species, where this is possible. These aims are embodied in the United Nations Convention on Biological Diversity, which includes an objective to "prevent the introduction of, control or eradicate those alien [invasive] species which threaten ecosystems, habitats or species."

Land managers of California's offshore islands have an enviable and undisputable record of success eradicating invasive species from the islands. This work has demonstrated that with planning, informed technique and sustained effort, it is possible to eradicate many types of invasive species, especially in the early stages of an invasion, or where a population is confined to an island or limited habitat (Clout et. al 2001). These successes include:

- the eradication of feral sheep from Santa Cruz, Santa Rosa, San Miguel, and San Nicolas islands;
- the eradication of introduced feral pigs from Santa Catalina, Santa Cruz, and Santa Rosa islands;
- the removal of feral goats from San Clemente and Santa Catalina islands;
- the eradication of introduced mule deer from Santa Rosa Island;

- the eradication of introduced elk from Santa Rosa Island;
- the eradication of introduced donkeys from San Miguel Island;
- the removal of cattle and horses from Santa Catalina, Santa Cruz, and Santa Rosa islands;
- the removal of feral cats from Farallon, Santa Barbara, San Nicolas, and Santa Rosa islands;
- the removal of feral hares from Farallon Islands;
- the removal of feral rabbits from Santa Barbara Island;
- the eradication of black rats from Anacapa Island;
- the eradication of feral turkeys from Santa Catalina and Santa Cruz islands;
- the eradication of the European honey bee from Santa Cruz Island; and
- the capture and successful relocation of golden eagles from the islands (which has brought about a reduction in predation-related mortality of the endemic, and federally endangered, island fox).

More importantly, these eradications have resulted in resurgences in populations of native species on all of the islands, many of which had become rare, and others which were widespread elsewhere but increasingly uncommon on the islands.

Despite these successes, many native species, natural communities and ecological processes are still in the process of recovering from other negative effects of the roughly 150 years of intensive ranching on the Channel Islands. In some cases recovery is stalled and will require active intervention and restoration to resume. For example, many areas stripped of vegetation by grazers subsequently suffered massive erosion of soils and even of bedrock. Some of these areas, particularly in major watersheds, need to be restored to help reduce massive flows of smothering sediments into nearshore waters following heavy rainfall events. Climate change and other threats exacerbate this situation and add to the complexity of managing these unique and special islands.

The islands are also exemplary platforms for developing and testing innovative approaches needed to advance the science and practice of conservation and restoration. Indeed, the extraordinary scientific values of the California Islands were explicitly noted in the legislation that established Channel Islands National Park. The island managing entities have fostered highly productive conservation partnerships across the islands, resulting in the application and advancement of science-based approaches to pressing conservation challenges that face, not only the California Islands, but islands around the world. Many stakeholders have made important contributions to these projects. Other accomplishments resulting from these collective efforts include the eradication of feral avian and invertebrate species, the reintroduction of bald eagles to the islands, the first aerial eradication of black rats in North America, and progress toward the eradication of Argentine ants, house mice, mule deer, and approximately 50 species of non-native invasive plants. Lessons learned through these efforts have been published in scientific journals, textbooks, and popular media in order to disseminate techniques that can be used in other conservation projects and increase the impact of conservation and restoration investments.

Much of the conservation work conducted on the California Islands over the past four decades was reactive and addressed severe and urgent threats, most of which required the removal of non-native, invasive species. Fortunately, the successes of those efforts and the lessons learned along the way have positioned island managers to develop a new *proactive* management strategy for the conservation of the islands for the decade ahead.

Goals for Offshore Islands

The offshore islands share many similar goals and preventing the introduction of non-native invasive species through biosecurity strategies impacts all islands. The islands proximity to the mainland allows for increased visitation opportunities, but also increases the risk of invasive species introductions. Over time, a number of non-native organisms have been introduced to the islands, some of which have threatened the survival of the endemic island species, and even led to the extinction of others, such as the San Clemente Island Bewick's Wren and Santa Barbara Island Song Sparrow.

Moving forward, Island managers and transportation concessionaires agreed to strengthen biosecurity protocols to reduce the likelihood of non-native species entering and establishing populations on the Islands. The California Islands' managers have designed a new collaborative Biosecurity Program (Boser et al. 2012) and have hired a Biosecurity Manager to enact top priorities. Some of the most significant parts of the plan have yet to be fully developed and funded. Representatives from twelve organizations and agencies formed the California Islands Biosecurity Group, the first collaborative group in California devoted solely to biosecurity. Through this collaborative, island managers and mainland partners share resources and expertise with the objective of preventing the introduction and establishment of invasive species on the California Islands. This proactive approach to conservation could spare the islands and mainland conservation areas significant ecological stress and economic cost.

Now that most (but not quite all) of the urgent problems caused by invasive vertebrates on California's offshore islands have been addressed, conservation management is moving to a more pro-active phase. This phase is designed to anticipate climate change and bolster the biota's resilience and adaptation, and to restore native species, vegetation cover, and ecological processes whose recovery has stalled.

The list of shared goals among the island managers of the California Offshore Islands are:

- Identify and prioritize likely impacts to island resources due to climate change and develop management and adaptation strategies.
- Assess vulnerability of coastal resources to sea-level rise and prioritize management actions for archeological sites, seabird nesting areas/colonies, and rare plants.
- Identify any plant community dominants at high risk to climate change and scope possible actions to increase their resilience.
- Create a database and data management system to document occurrences of any new species, including migratory birds and other transients, on the islands.
- Develop criteria for management responses to any new colonizations or extinctions on the islands.

- Develop, curate, and archive important baseline datasets that are informative for present day management, and for longer-term responses to change.
- Support monitoring of the nearshore environment for effects of linkages between terrestrial and marine environments (e.g. effects of runoff following major storms on nearshore areas) and for effects of climate change.
- Assess and foster the adaptation of conservation and management policies that apply to the islands to ensure that they remain relevant and supportive of conservation decision-making in the context of climate change.
- Survey, or re-survey, and map each island's vegetation communities.
- Determine whether the areal coverage of any community should be significantly increased or decreased.
- Map areas of islands cleared for agriculture or grazing during the ranching era which are now dominated by bare ground or invasive annual grasses and apparently not succeeding to woody plant communities dominated by native species.
- Use paleo-botanical data to help determine the extent of vegetation communities during the Chumash and Tongva era on the islands, and how intensive was their management of the islands.
- Develop inventories for species or species groups that still lack information.
- Develop catastrophic wildfire risk reduction strategies.
- Map and assess effects of non-native snails on native snails and plants; then develop an eradication feasibility plan on San Nicolas Island.
- Assess denuded areas for revegetation and begin revegetation of the highest priority sites.
- Restore/rehabilitate native vegetation in select areas now dominated by non-native annual grasses and to areas in an apparently arrested state of succession to shrubland or woodland.
- Monitor and manage the Island fox populations to ensure those currently listed as endangered are delisted, provide with ongoing monitoring and management to ensure that these conservation-reliant populations remain viable for the long term following de-listing, and develop and implement a "conservation-reliant species" management and monitoring plan as part of the ESA de-listing or down-listing process.
- Monitor and manage bald eagle populations across the Channel Islands archipelago to ensure that they remain viable.
- Monitor and manage the island scrub-jay population on Santa Cruz Island to ensure it remains viable. Assess and implement, as appropriate, management strategies to reduce extinction risk, including vaccination, and other efforts to prevent the establishment of West Nile Virus and other diseases present on the mainland from reaching and decimating the population.
- Increase understanding of ecological relationships between the islands' terrestrial vertebrates and plant species.
- Increase understanding of ecological relationships between the islands' terrestrial and marine ecosystems.
- Update rare and listed plant species maps and plant taxa checklist.
- Ascertain the role of each of the populations of island endemic plant taxa have in each taxa's overall distribution (e.g. estimated percentage of the total population found on each island).

- Increase the resilience of listed plant species by identifying and reducing, or eliminating threats where possible, and by augmenting populations, increasing genetic diversity within populations, or establishing new populations as appropriate and permitted.
- Monitor and manage nesting seabird species.
- Support efforts to monitor and restore pinniped species.
- Foster seed banking of priority endemic and rare plant species.
- Strengthen and maintain a comprehensive biosecurity program to prevent, detect, and manage new invasions to the island, and to minimize other adverse impacts of visitation (e.g., disturbance, fire risk) to the island.
- Identify risks of invasion by diseases and pests by organisms known to cause great harm to native species and natural communities on the mainland (e.g., West Nile virus, sudden oak death, goldspotted oak borer) and include actions in the biosecurity program to reduce the likelihood that they will invade and establish, and to increase the likelihood that they will be quickly detected if they do.
- Eradicate harmful introduced non-native vertebrate and invertebrate species where possible and practical.
- Eradicate or control targeted invasive plant species.
- Prevent the expansion of widespread invasive plant species on the islands.
- Update island-specific management plans.
- Develop and use a decision framework to determine whether and how to manage each of the taxa which are present on an island and native to other parts of California but not to the island itself. Management options include eradication, containment, and no management.
- Systematically search suitable habitats for possible surviving individuals or populations of taxa presumed to have been extirpated from the islands since European settlement of California.
- Develop a re-introduction decision framework and implementation protocol for extirpated taxa on California’s offshore islands, which also can be applied generally to re-introductions of a wide variety of taxa and island systems.
- Foster and facilitate research on priority conservation planning and management questions.
- Develop and maintain a useful and spatially referenced (where applicable) online repository for island datasets, literature, photographs, and maps.
- Maintain a research priority list and disseminate it to the California Islands Research Forum and our academic partners.

Table H-1 Stresses and Pressures for Offshore Islands

Priority Pressures	Stresses											
	Climate Related Factors			Changes in Geophysical and Disturbance Regime		Changes in Hydrology and Water Characteristics			Ecosystem Changes			
	Change in temperature extremes	Change in annual average precipitation	Sea level rise and ocean acidification	Change in sediment erosion-deposition regime	Change in natural fire regime	Change in runoff and river flow	Change in water levels and hydroperiod	Change in flood occurrence, frequency, intensity, and area flooded	Change in spatial distribution of habitat types	Habitat fragmentation	Change in community structure or composition	Change in biotic interactions
Airborne pollutants											X	
Climate change	X	X	X		X				X		X	X
Dams and water management/use						X	X	X	X		X	X
Fire and fire suppression					X				X		X	X
Housing and urban areas											X	X
Introduced genetic material											X	
Invasive plants/animals									X	X	X	X
Livestock, farming, and ranching				X					X		X	X
Military activities									X			X
Mining and quarrying										X	X	X
Parasites/pathogens/diseases											X	X
Recreational activities									X		X	X
Roads and railroads										X	X	X
Tourism and recreation areas									X			X
Utility and service lines										X	X	X

Table H-2 Focal Species of Conservation Strategies Developed for Offshore Islands

Common Name	Scientific Name
Invertebrates	
Santa Barbara shelled slug*	*Binneya notabilis*
Santa Catalina lancetooth*	*Haplotrema catalinense*
San Nicolas island snail*	*Micrarionta feralis*
San Clemente island sna*il	*Micrarionta gabbi*
Pricklypear island snail*	*Micrarionta opuntia*
Shepard's snail*	*Pristiloma shepardae*
San Clemente Island blunt-top snail*	*Sterkia clementina*
Bicolor cactus snail*	*Xerarionta tryoni*
Channel Island sweat bee*	*Lasioglossum channelense*
Reptiles	
Loggerhead sea turtle (North Pacific)*	*Caretta caretta**
Green sea turtle*	*Chelonia mydas**
Leatherback sea turtle*	*Dermochelys coriacea**
Olive ridley sea turtle*	*Lepidochelys olivacea**
Island night lizard*	*Xantusia riversiana**
Two-striped gartersnake*	*Thamnophis hammondii**
Birds	
Black storm-petrel*	*Oceanodroma melania**
Ashy storm-petrel*	*Oceanodroma homochroa**
Catalina California quail*	*Callipepla californica catalinensis**
California brown pelican*	*Pelecanus occidentalis californicus**
Pelagic cormorant*	*Phalacrocorax pelagicus*
Brandt's cormorant*	*Phalacrocorax penicillatus*
Northern harrier*	*Circus cyaneus*
Bald eagle*	*Haliaeetus leucocephalus*
Snowy plover (coastal population)*	*Charadrius nivosus*
Black oystercatcher*	*Haematopus bachmani*
Short-eared owl*	*Asio flammeus*
Burrowing owl*	*Athene cunicularia*
Island scrub-jay*	*Aphelocoma insularis**
Vaux's swift*	*Chaetura vauxi*
Olive-sided flycatcher*	*Contopus cooperi*
Island loggerhead shrike*	*Lanius ludovicianus anthonyi* *
San Clemente loggerhead shrike*	*Lanius ludovicianus mearnsi*
Least Bell's vireo*	*Vireo bellii pusillus*
Catalina Hutton's vireo*	*Vireo huttoni unitti*
San Clemente Island Bewick's wren*	*Thryomanes bewickii leucophrys*

Table H-2 Focal Species of Conservation Strategies Developed for Offshore Islands

Common Name	Scientific Name
Santa Cruz Island rufous-crowned sparrow*	*Aimophila ruficeps obscura*
Grasshopper sparrow*	*Ammodramus savannarum*
Channel Island song sparrow*	*Melospiza melodia graminea*
San Clemente spotted towhee*	*Pipilo maculatus clementae*
Tricolored blackbird*	*Agelaius tricolor*
Pigeon guillemot*	*Cepphus columba*
Tufted puffin*	*Fratercula cirrhata*
Cassin's auklet*	*Ptychoramphus aleuticus*
Guadalupe murrelet*	*Synthliboramphus hypoleucus*
Scripps's murrelet*	*Synthliboramphus scrippsi*
Common murre*	*Uria aalge*
Mammals	
Guadalupe fur seal*	*Arctocephalus townsendi**
Southern sea otter*	*Enhydra lutris nereis**
Steller (=northern) sea-lion*	*Eumetopias jubatus**
Channel Islands spotted skunk*	*Spilogale gracilis amphialus**
Anacapa deer mouse	*Peromyscus maniculatus anacapae*
Santa Catalina Island shrew*	*Sorex ornatus willeti**
Pallid bat*	*Antrozous pallidus**
Townsend's big-eared bat*	*Corynorhinus townsendii**
Fringed myotis*	*Myotis thysanodes**
Santa Catalina Island fox*	*Urocyon littoralis catalinae**
San Clemente Island fox*	*Urocyon littoralis clementae**
San Nicolas Island fox*	*Urocyon littoralis dickey**
San Miguel Island fox*	*Urocyon littoralis littoralis**
Santa Cruz Island fox*	*Urocyon littoralis santacruzae**
Santa Rosa Island fox*	*Urocyon littoralis santarosae**
Plants	
San Clemente Island bird's-foot trefoil*	*Acmispon argophyllus var. adsurgens**
Santa Cruz Island bird's-foot trefoil*	*Acmispon argophyllus* var. *niveus**
San Clemente Island lotus*	*Acmispon dendroideus* var. *traskiae**
Santa Rosa Island manzanita*	*Arctostaphylos confertiflora**
Trask's milk-vetch*	*Astragalus traskiae**
Island barberry*	*Berberis pinnata ssp. Insularis**
Hoffmann's rockcress*	*Boechera hoffmannii**
Round-leaved filaree*	*California macrophylla**
San Clemente Island paintbrush*	*Castilleja grisea**
Soft-leaved paintbrush*	*Castilleja mollis**
Catalina Island mountain-mahogany*	*Cercocarpus traskiae**

Table H-2 Focal Species of Conservation Strategies Developed for Offshore Islands

Common Name	Scientific Name
Island rush-rose*	*Crocanthemum greenei**
Trask's cryptantha*	*Cryptantha traskiae**
San Clemente Island larkspur*	*Delphinium variegatum ssp. Kinkiense**
Thorne's royal larkspur*	*Delphinium variegatum ssp. Thornei**
Catalina grass	*Dissanthelium californicum*
Beach spectaclepod*	*Dithyrea maritime**
Blochman's dudleya*	*Dudleya blochmaniae ssp. Blochmaniae**
Santa Rosa Island dudleya*	*Dudleya blochmaniae ssp. Insularis**
Munchkin dudleya*	*Dudleya gnoma**
Santa Cruz Island dudleya*	*Dudleya nesiotica**
Santa Barbara Island dudleya*	*Dudleya traskiae**
Catalina Island dudleya	*Dudleya virens ssp. Hassei*
Island green dudleya	*Dudleya virens ssp. Insularis*
Bright green dudleya	*Dudleya virens ssp. Virens*
Santa Barbara Island buckwheat*	*Eriogonum giganteum var. compactum**
San Nicolas Island buckwheat*	*Eriogonum grande var. timorum**
Box bedstraw*	*Galium buxifolium**
San Clemente Island bedstraw*	*Galium catalinense ssp. Acrispum**
Hoffmann's slender-flowered gilia*	*Gilia tenuiflora ssp. Hoffmannii**
Island mallow*	*Lavatera assurgentiflora ssp. Assurgentiflora**
Southern island mallow*	*Lavatera assurgentiflora ssp. Glabra**
San Clemente Island woodland star*	*Lithophragma maximum**
Island lomatium	*Lomatium insular*
Santa Catalina Island desert-thorn*	*Lycium brevipes var. hassei**
San Clemente Island bush-mallow*	*Malacothamnus clementinus**
Santa Cruz Island bush-mallow*	*Malacothamnus fasciculatus var. nesioticus**
San Nicolas Island malacothrix	*Malacothrix foliosa ssp. Polycephala*
Santa Cruz Island malacothrix*	*Malacothrix indecora**
Junak's malcothrix*	*Malacothrix junakii**
Island malacothrix*	*Malacothrix squalida**
Lyon's pentachaeta*	*Pentachaeta lyonii**
Northern Channel Islands phacelia*	*Phacelia insularis var. insularis**
Nuttall's scrub oak*	*Quercus dumosa**
Santa Cruz Island winged-rockcress*	*Sibara filifolia**
Wallace's nightshade*	*Solanum wallacei**
Santa Cruz Island fringepod*	*Thysanocarpus conchuliferus**

*Denotes a species on the SGCN list. Non-asterisked species are not SGCN but are identified as important species by island managers.

Related Conservation Plans and Strategies

California Islands Biosecurity Program. 2013.

Catalina Island Fox Epidemic Response Plan. 2014

Channel Islands National Park Fox Epidemic Response Plan. 2015

Channel Islands National Park Statement for Management. 1991.

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Integrated Natural Resources Management Plan. Naval Base Ventura County, San Nicolas Island, California. December 2010.

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Recovery Strategy for Island Foxes (*Urocyon littoralis*) on the Northern Channel Islands. Channel Islands Nation Park. 2003.

San Clemente Island Fox Epidemic Response Plan. 2014

San Clemente Island Integrated Natural Resources Management Plan (INRMP)

Santa Cruz Island Primary Restoration Plan. Final Environmental Impact Statement. Channel Islands National Park. 2002.

Santa Cruz Island Weed Management Strategy. 2007.

Santa Rosa Island Resource Management Plan for Improving Water Quality and Conserving Rare Species and their Habitats. Final Environmental Impact Statement. 1997.

Santa Rosa Vegetation Classification (in progress).

Thirteen Plant Taxa from the Northern Channel Islands Recovery Plan. U.S. Fish and Wildlife Service. 2000.

TARGET: OFFSHORE ISLANDS

Goals:

- By 2025, acres of Offshore Islands are maintained from 2015 acres.
- By 2025, acres where native species are dominant are increased by at least 10% from 2015 acres.
- By 2025, population or acres of key and endemic Offshore Islands plant species is increased by at least 10% from 2015 population
- By 2025, acres connected are maintained from 2015 acres.
- By 2025, acres with fragmented habitat are more connected by 10% from 2015 acres.
- By 2025, fire regime frequency or enabling conditions are decreased from 2015 levels by 25%.
- By 2025, acres with desired soil sediment deposition are increased by 10% from 2015 acres.

Conservation Strategy 1 (Direct Management): Stewardship of habitats and/or natural processes to maintain species populations or restore ecological functions

Objective(s):

- Restore disturbed sites (eroded, past farming, heavily invaded) to 1) reestablish vegetative cover to decrease soil erosion, 2) manage invasive plant species that alter ecosystem processes, impact rare plant populations, or are eradicable, 3)provide habitat for wildlife such as sea birds, island fox, invertebrates, 4) restore habitat types that are preferred by rare and endemic plant species.
- Remove or reduced introduced mainland vertebrates and/or feral livestock that impact native species, specifically endemic species, and ecosystem function.
- Restore decommissioned roads, improve ecological maintenance of roadways and decrease soil erosion.
- Reduce risk of anthropogenic fire ignition. Allow for natural fire frequency.
- Manage recreational activities to decrease the risk of new invasions, impact to vegetation, wildlife, and soil structure.
- Prohibit Quarrying and Dams

Target pressure(s): All pressures.

Conservation Strategy 2 (Partner Engagement): Engaging state, federal, and local agencies, NGOs, Mexican island entities, and other partners to achieve shared objectives and broader coordination across overlapping areas such as: invasive plant management, biosecurity, sea bird and pinniped management, botanical management issues within the California Floristic Providence.

Objective(s):

- Strengthen relationships, partnerships, and collaboratives between island managers and mainland partners across the California Islands including those within the California Floristic Providence in Mexico.
- Develop a California Islands Invasive Plant Management Network by the end of 2016 developing an MOU to share expertise, resources, and joint funding sourcing.

- Island botanist to meet annually to address management issues of rare plant, endemic, and invasive plant species, vegetation, extirpated plant reintroductions, and joint database.
- Collaborate among island managers and mainland partners to monitor and manage sea bird and pinniped issues.

Target pressure(s): All pressures.

Conservation Strategy 3 (Training and Technical Assistance): Share professional expertise, technical assistance, and training to island managers, key stakeholders or others to facilitate improved or new management activities and techniques, including stand-alone training or demonstration projects.

Objective(s):

- Share expertise and technical assistance regarding endemic plant propagation, native plant nursery development, island restoration, invasive plant treatment, biosecurity, road maintenance, island fox management, invertebrate treatment, and biological monitoring through professional trainings, demonstration projects, workshare, volunteer opportunities, and handbook development.

Target pressure(s): All pressures.

Conservation Strategy 4 (Outreach and Education): Outreach and education efforts targeted to specific groups, communities, resource users, policy makers, stakeholders and/or the public to improve awareness and change knowledge, attitudes, and behaviors; Includes both formal (classroom) and non-formal education efforts.

Objective(s):

- Share methods, techniques, and strategies developed on the islands to tackle conservation issues with resource managers on the California Islands, islands elsewhere, and the mainland.
- Develop biosecurity outreach materials and education programs to address the threat that non-native species pose to the islands.
- Publish and/or present the lessons learned and outcomes of conservation initiatives that will benefit the resource management community in professional journals, conferences, and/or symposia.

Target pressure(s): All pressures.

Conservation Strategy 5 (Data Collection and Analysis): Collecting data about species, habitats, ecosystems, threats, processes, and interactions to fill information needs; includes compilation, management, synthesis, analysis, and reporting of spatial and non-spatial data. Stand-alone research conducted to fill basic knowledge gaps.

Objective(s):

- Develop an island all taxa database to house, track, and share information regarding the taxa of the California Islands.
- Conduct extirpated taxa specific surveys, evaluate taxa for reintroduction.
- Collect and analyze data on development of soil crusts.
- Analyze vegetation community data across all islands, prioritize invasive plants on each island and across the archipelago for eradication. Conduct island wide invasive plant surveys of San Miguel, San Clemente, San Nicolas, and Santa Catalina.
- Collect data on island skunk populations decline due to suspected competition with island foxes and reduced food availability (island deer mouse) due to drought conditions.
- Collect distribution, abundance, and demographic data on endemic and listed taxa.
- Collect data on sea bird populations to better understand their distribution, abundance, and reproductive success

Target pressure(s): All pressures.

Conservation Strategy 6 (Management Planning): Development of management plans for species, habitats and natural processes.

Objective(s):

- Develop or update management plans to integrate the effects of climate change.
- Develop a decision tree, species specific survey protocols, and guidelines to evaluate extirpated taxa candidates for reintroduction back to the California Islands.
- Develop a California Islands Flora for the offshore islands within the California Floristic Province.
- Develop a California Islands Weed Management Plan.
- Develop a Santa Barbara Island Restoration Strategy.
- Develop a Santa Cruz Island Central Valley Restoration Plan.
- Develop a rare plant taxa management work plan

Target pressure(s): All pressures.

Table H-3 Conservation Goals and Strategies for the Offshore Islands

Target	Goals	Key Ecological Attributes (KEAs)	Pressures[1]	Strategy Categories
Offshore Islands	● By 2025, acres of Offshore Islands are maintained from 2015 acres. ● By 2025, acres where native species are dominant are increased by at least 10% from 2015 acres. ● By 2025, population or acres of key and endemic Offshore Islands plant species is increased by at least 10% from 2015 population ● By 2025, acres connected are maintained from 2015 acres. ● By 2025, acres where fragmented are more connected from 2015 acres by 10%. ● By 2025, fire regime frequency or enabling conditions are decreased from 2015 levels by 25% from 2015 acres. ● By 2025, acres where desired soil sediment deposition is occurring is increased by 10% from 2015 acres.	● Area and extent of community ● Fire regime ● Connectivity among communities and ecosystems ● Community structure and composition ● Key species population levels ● Endemic diversity ● Native versus non-native diversity ● Soil and sediment deposition regimes	● Climate change ● Fire and fire suppression ● Mining and quarrying ● Invasive plants/animals ● Roads and railroads	● Data Collection and Analysis ● Partner Engagement ● Direct Management ● Management Planning ● Training and technical assistance ● Outreach and education

[1] Pressures can be positive or negative depending on the intensity, timing, and duration of the action on the target habitat.

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Appendix I

California
State Wildlife Action Plan

Implementation Evaluation
2005-2014

Evaluation Report

PREPARED BY BLUE EARTH CONSULTANTS, LLC
JANUARY 2015

BLUE EARTH
CONSULTANTS

Photograph:

Adapted from Shutterstock/Thomas, Michael J

DISCLAIMER: *While we have made every effort to ensure that the information contained in this report is accurate, complete, and obtained from reliable sources, Blue Earth Consultants, LLC makes no guarantee of the completeness and accuracy of information provided by all project sources.*

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List of Acronyms

ABMP	Area Based Management Plan
AFWA	Association of Fish and Wildlife Agencies
BCAG	Butte County Association of Governments
BIOS	Biogeographic Information and Observation System
Blue Earth	Blue Earth Consultants, LLC
CA LCC	California Landscape Conservation Cooperative
Caltrans	California Department of Transportation
CBC	California Biodiversity Council
CDFW	California Department of Fish and Wildlife
CNRA	California Natural Resources Agency
DWR	Department of Water Resources
ESA	Endangered Species Act
FGC	California Fish and Game Commission
HCP	Habitat Conservation Plan
HUC	Hydrologic Unit Code
MLPA	Marine Life Protection Act
MPA	Marine Protected Area
MSHCP	Multi- Species Habitat Conservation Plan
NCCP	Natural Community Conservation Plan
NGO	Non-governmental Organization
OPC	California Ocean Protection Council
Open Standards	Open Standards for the Practice of Conservation
RAMP	Regional Advanced Mitigation Program
RCA	Regional Conservation Authority
SGCN	Species of Greatest Conservation Need
SWAP	State Wildlife Action Plan
SWAP 2005	California's SWAP; California Wildlife Conservation Challenges: California's Wildlife Action Plan
SWAP 2015	2015 revised and updated California SWAP
SWAP 2005 Stressors	Stressors identified under "major wildlife stressors identified by region" in the SWAP 2005

SWG	State Wildlife Grant
UCD	University of California Davis
U.S.	United States of America
USDA-FS	United States Department of Agriculture -Forest Service
USFWS	United States Fish and Wildlife Service
2014 Water Bond	Proposition 1 Water Bond
WCB	California Wildlife Conservation Board
Wildlife TRACS	Wildlife Tracking and Reporting on Actions for Conservation of Species

SWAP 2005 Background and SWAP 2015 Update Process

SWAP 2005 Background

In 2000, Congress enacted the State Wildlife Grant (SWG) program to support state government projects that broadly benefit wildlife and habitats, but particularly species of greatest conservation need (SGCN).[1] As a trustee agency focused on safeguarding natural resources in California, the California Department of Fish and Wildlife (CDFW) manages funding from the Federal SWG program. To receive funding from this program, the United States Fish and Wildlife Service (USFWS) requires each state government to develop a comprehensive wildlife conservation strategy outlined in a State Wildlife Action Plan (SWAP). Each state wildlife agency was required to submit the first SWAP to the USFWS by October 2005.[2]

The CDFW, in partnership with the Plan Development Team at the University of California Davis (UCD), led development of the California SWAP titled *California Wildlife Conservation Challenges: California's Wildlife Action Plan* (SWAP 2005). The plan also relied on consultation with wildlife professionals, stakeholders, and the public. The SWAP 2005 highlights California's commitment to conserving key species and includes recommended conservation actions at a statewide scale as well as at nine regional scales (*Text Box 1; See Appendix 1 and 2 for maps of the CDFW and SWAP 2005 regions*).

Text Box 1: SWAP 2005 Regions

- Mojave Desert
- Colorado Desert
- South Coast
- Central Coast
- North Coast–Klamath
- Modoc Plateau
- Sierra Nevada and Cascades
- Central Valley and Bay-Delta
- Marine

The CDFW oversaw the development of the plan and its implementation because "it has public trust responsibility and jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and habitat necessary for biologically sustainable populations of those species."[3] As part of the USFWS requirements for developing a SWAP, the CDFW set out to address three primary questions in the plan:

- What are the species and habitats of greatest conservation need?
- What are the major stressors affecting California's native wildlife habitats? (see *Appendix 3 for a complete list of identified stressors)*

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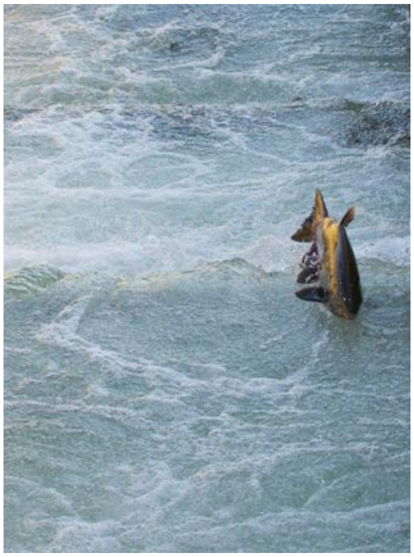
[1] The CDFW defines the SGCN list as identifying "those species that are deemed most rare, imperiled and in need of conservation actions." For more information on SGCN please visit: CDFW, "State Wildlife Action Plan: Species of Greatest Conservation Need," California Department of Fish and Wildlife, 29 Jan. 2015 http://www.dfg.ca.gov/SWAP/SGCN/.

[2] David Bunn, et al., "California Wildlife Conservation Challenges: California's Wildlife Action Plan," University of California Davis Wildlife Health Center, California Department of Fish and Wildlife, 2007, 29 Jan. 2015 http://www.dfg.ca.gov/SWAP/2005/.

[3] *Ibid*.

- What are the actions needed to restore and conserve California's wildlife, thereby reducing the likelihood that more species will approach the condition of threatened or endangered?

SWAP 2015 Update



Photography Perspectives

In accordance with the USFWS requirement to update SWAP at least every 10 years, the CDFW began the update process in 2012 to meet the deadline of submission on October 1, 2015 (SWAP 2015).[4] Specific objectives the CDFW outlines for the SWAP 2015 update are:

- Create a vision for fish and wildlife conservation in California;
- Track and record accomplishments;
- Analyze impacts and stressors by United States Department of Agriculture Forest Service (USDA-FS) ecoregions, hydrologic unit code (HUC) 4 watersheds, and Marine Life Protection Act (MLPA) marine study regions;
- Incorporate climate change impacts and adaptation strategies;
- Update species at risk, vulnerable species, and SGCN lists; and
- Recommend conservation actions consistent with and that compliment planning documents developed by other agencies.[5]

Each SWAP update must address eight required elements, provided in *Text Box 2*. The elements include sharing a set of appropriate measures to monitor, evaluate, and share State government's effectiveness in implementing SWG funded projects and the SWAP, changes in species and habitat health, and adaptive management with the USFWS, stakeholders, and the public.

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[4] The term SWAP 2005 or SWAP 2005 planning document refers to the document titled "California Wildlife Conservation Challenges: California's Wildlife Action Plan," which was developed to fulfill requirements for accessing USFWS SWG program funding. SWAP 2005 implementation refers to implementation of SWAP 2005 recommended conservation actions and implementation of SWG funded conservation grants to meet the recommended conservation actions outlined in the SWAP 2005.The SWG program provides Federal funds for developing and implementing programs that benefit wildlife and their habitats at risk, including species not listed under Federal or State Endangered Species Act (ESA). State wildlife agencies, such as the CDFW, with approved SWAPs apply for SWG grant funding from the SWG program to implement projects that address conservation needs identified within a State's SWAP. For more information on the California SWAP and the SWAP 2015, please see: CDFW, "State Wildlife Action Plan: A Plan for Conserving California's Wildlife Resources while Responding to Environmental Challenges," California Department of Fish and Wildlife, 29 Jan. 2015 http://www.dfg.ca.gov/SWAP/.

[5] CDFW, "State Wildlife Action Plan: A Plan for Conserving California's Wildlife Resources while Responding to Environmental Challenges," California Department of Fish and Wildlife, 22 Oct. 2014 http://www.dfg.ca.gov/SWAP/.

Text Box 2: SWAP Eight Required Elements[6]

According to the AFWA, "Congress identified eight required elements to be addressed in each State's wildlife action plan." The eight required elements described on the AFWA's Teaming with Wildlife website are:

1. "Information on the distribution and abundance of species of wildlife, including low and declining populations as the State fish and wildlife agency deems appropriate, that are indicative of the diversity and health of the State's wildlife;
2. Descriptions of extent and condition of habitats and community types essential to conservation of species identified in (1);
3. Descriptions of problems which may adversely affect species identified in (1) or their habitats, and priority research and survey efforts needed to identify factors which may assist in restoration and improved conservation of these species and habitats;
4. Descriptions of conservation actions proposed to conserve the identified species and habitats and priorities for implementing such actions;
5. Proposed plans for monitoring species identified in (1) and their habitats, for monitoring the effectiveness of the conservation actions proposed in (4), and for adapting these conservation actions to respond appropriately to new information or changing conditions;
6. Descriptions of procedures to review the plan at intervals not to exceed 10 years;
7. Plans for coordinating the development, implementation, review, and revision of the plan with Federal, State, and local agencies and Indian tribes that manage significant land and water areas within the state or administer programs that significantly affect the conservation of identified species and habitats; and
8. Broad public participation is an essential element of developing and implementing these plans, the projects that are carried out while these plans are developed, and the species in greatest need of conservation."

In addition, the Association of Fish and Wildlife Agencies' (AFWA) Teaming With Wildlife Committee's Best Practices Working Group developed a guiding document titled *Best Practices for State Wildlife Action Plans: Voluntary Guidance to States for Revision and Implementation*, which suggests a wide range of best practices to develop SWAP documents and meet the required eight elements. Examples of best practices identified include utilizing Open Standards for the Practice of Conservation (Open Standards) for strategic planning, engaging partners, and adopting threat and habitat classification standards that are consistent with requirements established by USFWS for the SWAP, the Wildlife Tracking and Reporting on Actions for Conservation of Species (Wildlife TRACS) reporting system, and the framework for measuring the effectiveness of SWG.[7]

As part of implementing these best practices in California, the CDFW employed the Open Standards process for the 2015 update and moving forward will utilize the USFWS Wildlife TRACS system for reporting on USFWS Wildlife and Sport Fish Restoration program grants.[8] In addition, the CDFW commissioned this evaluation to inform the SWAP 2015 update and help improve future SWAP implementation. The evaluation assessed SWAP implementation and SWG funded projects, key accomplishments, challenges encountered, and lessons learned. It also provides recommendations for how to improve the SWAP 2015 design and implementation effectiveness. Blue Earth Consultants, LLC (Blue Earth) performed a neutral, third party independent evaluation that addresses the update objectives above and evaluation outcomes outlined in the section *Purpose and Methodology* below.

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[6] AFWA, "State Wildlife Action Plans (SWAPs) Overview," Teaming With Wildlife, Association of Fish & Wildlife Agencies, 2004, 24 Oct. 2014 http://www.teaming.com/state-wildlife-action-plans-swaps. Photo adapted from Flickr/USCDyer.

[7] *Ibid.*

One required element, and a CDFW update objective, supports and encourages coordination and alignment with other partners and groups throughout the State that manage or administer programs affecting conservation of identified species and habitats. The need for broader engagement and alignment provides an opportunity to leverage the SWAP for broader coordination and collaboration across agencies, organizations, partners, and the public. With this in mind, the CDFW partnered and engaged other agencies and groups throughout the update process, which helped them seek greater alignment with other ongoing efforts. To address and go beyond this requirement, the CDFW chose to develop nine sector specific companion plans. Development of nine companion plans will help ensure greater SWAP 2015 implementation engagement of key sectors (Text Box 3). Each plan will supplement the SWAP 2015 by elaborating on how the recommended conservation strategies and conservation actions could be implemented, prioritizing specific actions and strategies, and developing key action steps with support from relevant sectors. Other examples of ways to increase collaboration include reviewing and aligning with other wildlife and management strategies and plans (such as, the Department of Water Resources (DWR) Water Plan environmental stewardship and resource management strategies) as well as participation in multi-agency collaboratives such as the California Biodiversity Council, Strategic Growth Council, Ocean Protection Council (OPC), and California Landscape Conservation Coalition.

Text Box 3: Companion Plan Sectors

Agriculture • Consumptive and Recreational Uses • Energy Development • Forests and Rangelands • Land-use Planning • Transportation Planning • Tribal Lands • Water Management • Marine Resources

The SWAP 2015 and future companion plans will outline prioritized strategies for conservation and restoration efforts throughout California and within each region based on broad agency and partner engagement.[9] Because of this cooperation and the need for alignment across the California, the SWAP 2015 and associated companion plans could help set the context and strategic direction of habitat and wildlife conservation and restoration efforts more broadly and help inform use of funding to support these efforts for the State government, as well as among partners. For example, the SWAP 2015 and associated companion plans could inform how the Proposition 1 Water Bond (2014 Water Bond) funds, Wildlife Conservation Board (WCB), or other sources of funding are allocated.

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[8] For more information on Wildlife TRACS: USFWS, "About TRACS," US Fish and Wildlife Service, 29 Jan. 2015 https://tracs.fws.gov/wiki/display/AT/About+TRACS.

[9] Please note, the SWAP 2015 region boundaries do not align with CDFW regions or the SWAP 2005 region boundaries.

Evaluation Purpose and Methodology

Evaluation Purpose and Evaluation Outcomes

Based on the recommendations and best practices AFWA identified, the CDFW commissioned an evaluation of SWAP 2005 implementation and SWG portfolio to inform the SWAP 2015 update process. To provide a neutral assessment, the CDFW hired Blue Earth to perform a third party, independent evaluation of SWAP implementation during the period of 2005 to 2014. The evaluation assessed a wide range of criteria that measured the progress and effectiveness of SWAP implementation; identified major outcomes, key challenges, and areas for improvement; and, delivered recommendations to inform the development of the SWAP 2015 update and its later implementation. The evaluation is critical in that the results will help the CDFW's strategic-planning and alignment of its conservation efforts to achieve intended outcomes expressed in the SWAP with high efficacy. This report shares findings from research conducted for this evaluation and provides an opportunity to reflect on accomplishments, identifies areas of improvement, and recommends adjustments to improve design and implementation of the SWAP 2015. The overarching goal of the evaluation and Blue Earth's role was to perform a robust evaluation of SWAP 2005 implementation between 2005 and 2014 and produce a report that presents evaluation findings for each of the following evaluation outcomes:

- **Evaluation Outcome 1**: Progress and results of the SWAP 2005 implementation from 2005-2014.[10]
- **Evaluation Outcome 2**: Analysis of SWG portfolio spending between 2005- 2014 by region, taxa, and conservation action category (see *page 8* for more detail on conservation action categories).
- **Evaluation Outcome 3**: Assess State government's effectiveness in implementing SWAP 2005 actions, including the human and financial capacity, ability to leverage additional human and financial resources, efficiency, strengths, opportunities for improvement, and gaps and obstacles for effective implementation.
- **Evaluation Outcome 4**: Describe overarching SWAP 2005 implementation challenges and identify areas where improvement could be made.
- **Evaluation Outcome 5**: Provide recommendations for the SWAP 2015 update and steps forward.

Blue Earth recognizes that the SWAP 2005 was an ambitious plan that recommended many conservation actions at a statewide scale as well as for each region described in the plan.[11] Although the plan was ambitious, we provide a comprehensive assessment of the SWAP 2005 and SWG implementation between 2005 and June 2014 below.

Evaluation Audience

The consultant team developed this report for multiple audiences, both with and without jurisdictional authority for implementing the SWAP 2005 and SWAP 2015. These audiences include CDFW leadership team and staff, California Fish and Game Commission (FGC), cooperating State, Federal, and local government agencies and organizations, California tribes and tribal governments, and partners (such as non-governmental organizations (NGOs) and academic or research institutions).

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[10] Please note the SWAP 2005 evaluation covers the period between 2005 and June 2014.

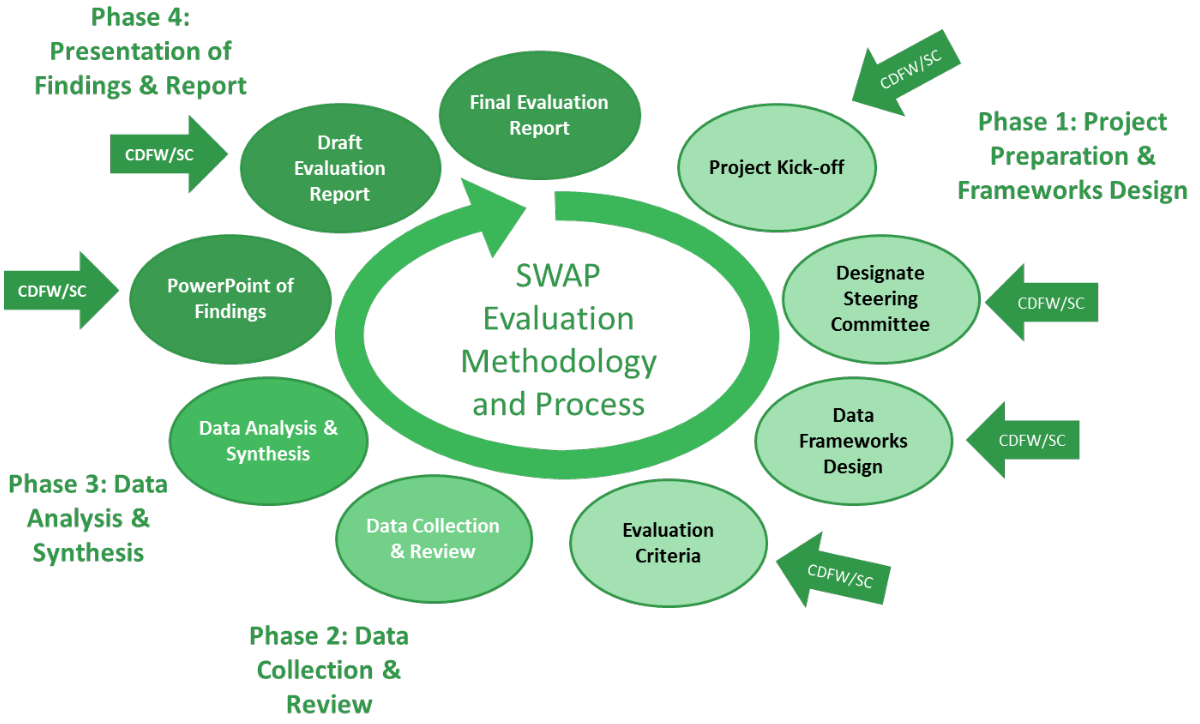
[11] The SWAP 2005 regions did not align to the CDFW jurisdictional boundaries and thus Blue Earth performed analysis on both the CDFW and SWAP 2005 regions for the SWG funded grants.

Methodology

Blue Earth undertook five primary activities to inform the evaluation. These activities included **1) convened an evaluation steering committee**, **2) reviewed SWG documents**, **3) conducted interviews with key interviewees**, **4) conducted additional web-based research and document review**, and **5) synthesized and analyzed gathered information**. The consultants utilized this information to draw the conclusions and recommendations provided throughout this report.

Figure 1 illustrates the evaluation process that consists of four overarching phases and sub-activities, as well as key points that the CDFW and steering committee were engaged, noted by grey arrows. The evaluation commenced in June 2014 and ended in late 2014.

Figure 1: SWAP Evaluation Phases and Tasks


Phase 4: Presentation of Findings & Report
Final Evaluation Report
Draft Evaluation Report
CDFW/SC
PowerPoint of Findings
CDFW/SC
Data Analysis & Synthesis
Phase 3: Data Analysis & Synthesis
Data Collection & Review
Phase 2: Data Collection & Review
Evaluation Criteria
CDFW/SC
Data Frameworks Design
CDFW/SC
Designate Steering Committee
CDFW/SC
Project Kick-off
CDFW/SC
Phase 1: Project Preparation & Frameworks Design
SWAP Evaluation Methodology and Process

Convened Evaluation Steering Committee

To help inform the SWAP evaluation, Blue Earth and the CDFW convened an evaluation steering committee. The committee was comprised of members from the California Biodiversity Council;

California Natural Resources Agency (CNRA); CDFW; FGC; California Landscape Conservation Cooperative (CA LCC), Pacific Southwest Region USFWS; DWR; and National Fish and Wildlife Foundation (member names and titles may be found in *Appendix 4)*. Steering committee members participated in three steering committee meetings held in August, October, and November 2014. Steering committee membered helped:

- **Refine the evaluation key questions, scale, methodology, and approach**,
- **Review and provide input on the evaluation preliminary findings and SWAP 2015 recommendations and considerations, and**
- **Provide feedback on the draft evaluation report**.

Reviewed State Wildlife Grant Documents

Blue Earth reviewed SWG funded documents for 81 grants provided by the CDFW that includes grant proposals, mid-term and final reports, financial reports, and amendments. SWG documents provided information and insights to address Evaluation Objectives 1 and 2, as well as gain background information, examine progress and results of implementation, and assess spending by region (CDFW and SWAP 2005), taxa, and key SWAP 2005 action topics.

Conducted Interviews

Between August and September 2014, Blue Earth staff conducted semi-structured phone interviews using the survey tool provided in *Appendix 5*.[12] Blue Earth interviewed 51 interviewees (28 CDFW staff including SWG recipients, five NGO representatives, five non-CDFW government staff, four non-CDFW proposal partners, four SWAP evaluation steering committee members, four private funders, and one tribal member). Semi-structured interviews provided insights on Evaluation Objectives 1, 3, 4, and 5.

Conducted Additional Web-based Research and Document Review

Blue Earth performed web-based research and reviewed documents identified during semi-structured interviews to bolster information gathered during SWG document review and interviews. Examples of web-based research and documents reviewed include identification of key Habitat Conservation Plans (HCPs), Natural Community Conservation Plans (NCCPs), Water Plan drafts, and publications from research, as well as identifying linkages between SWG efforts and conservation outcomes.[13]

Synthesized and Analyzed Gathered Information

To develop this evaluation, Blue Earth synthesized information gathered from four information sources: SWG documents, semi-structured interviews with key interviewees, web-based research, and documents identified during semi-structured interviews. Unless otherwise stated, we used all four of these information sources to develop the evaluation findings and recommendations presented in this report.

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[12] By semi-structured, we mean that the consultants tailored the multiple-choice and open-ended questions in the survey for each interviewee based on their knowledge of the SWAP 2005 document, SWAP 2005 implementation, SWAP 2015 update, SWG, or conservation efforts implemented in the State; see *Appendix 6* for the full list of interviewees. Again, informants were not asked all questions outlined in the survey, rather were asked targeted questions outlined in *Appendix 5* and then additional follow-up questions based on their responses.

[13] We define "outcomes" as achievements that can be measured in terms of changes in behavior, management action, policy, and ecosystem or species health. We define "outputs" as what an organization does (activities) and delivers (outputs) in the short-term to achieve outcomes.

Conservation Action Categories Used to Evaluate SWAP Implementation Progress

The SWAP 2005 identified statewide and regional conservation actions based on stressors found at the statewide and regional scales (see *Text Box 1 above for* a list of SWAP 2005 regions). To determine if the CDFW achieved specific conservation actions, Blue Earth synthesized both regional and statewide stressors into 14 overarching conservation action categories as found below (*Appendix 7* provides examples for each type of conservation action category).

Policies and Management Actions includes activities such as facilitating integration of wildlife conservation needs into local or regional land-use planning, developing agricultural and rangeland best management practice protocols that are compatible with ecosystem needs, assisting in the implementation of best management practices on working landscapes, and implementing conservation actions recommended in management plans and policies.

Enforcement includes activities such as increasing funding and staffing (CDFW and non-CDFW agencies) to enforce regulations that protect or prevent negative impacts to natural resources. Please note: Although we include the enforcement category in our assessment of the SWAP 2005 implementation, for SWG analyses we do not include this category because SWG funding cannot be utilized for enforcement activities.

Infrastructure, Land-use, and Permitting includes activities such as permitting agencies, county planners, and land management agencies working together to ensure infrastructure and development projects avoid or minimize negative impacts on native species and habitats.

Habitat Conservation and Restoration involves securing, restoring, or enhancing sensitive wildlife habitats or preserving key habitat linkages. Examples include restoring groundwater levels to support riparian vegetation as well as protecting and restoring critical habitat linkages that assist wildlife movements or vegetation distribution shifts due to climate change.

CalPhotos/Howard Orman Clark Jr.

Species Conservation and Restoration involves protecting and recovering sensitive species. Examples include the CDFW and other agencies and organizations working together to implement region-wide recovery plans.

Coordination, Collaboration, and Stakeholder Engagement involves partners working together to conserve natural resources and implement recommended conservation actions. Examples include securing co-funding for priority conservation actions, streamlining permitting processes, supporting data sharing, or implementing aligned management plans together to directly protect and restore wildlife and habitats.

Addressing Conservation Priorities and Stressors in the SWAP 2005 includes efforts to address identified SWAP 2005 recommended conservation action priorities and emerging stressors directly. Examples of stressors identified under "major wildlife stressors identified by region" in the SWAP 2005 (SWAP 2005 stressors) include Growth and Development, Climate Change, Invasive Species, and Water Management Conflicts (for a full list of stressors identified in the SWAP 2005 please see *Appendix 3*).[14] Examples include coordinated control and eradication of invasive species and implementation of conservation plans that incorporate best management practices for addressing growth and development.

Education, Outreach, and Capacity-building includes offering education on wildlife and habitat conservation, building capacity to implement conservation actions through staff training and new hires, and assisting local agencies and landowners in their planning and implementation of wildlife and habitat conservation efforts. Please note that the SWG program sets limitations on funding activities under this category, meaning only a small portion of SWG funding can be used to address Education, Outreach, and Capacity-building activities.

Wildlife Resource Assessment involves scientific activities, for example, gathering baseline information on species or habitats, and identifying critical wildlife corridors to prioritize activities for habitat connectivity enhancement.

Conservation Planning/ Plans involves planning efforts and plans to conserve species, habitats, and ecosystem functions. Examples include development and implementation of regional plans such as HCPs, NCCPs, and species and habitat recovery plans.

Funding and Leveraged Funding includes allocating adequate funding for conservation activities or working together to co-fund and/or leverage funding for shared priority projects to conserve natural resources.

Knowledge to Implement SWAP 2005 involves activities performed that increase relevant and applied science and information relevant to effective SWAP 2005 implementation. For example, conducting scientific studies to perform restoration activities and increasing available information for improving management efforts to recover species addressed under SWAP 2005. Many past activities focused on gathering baseline information on wildlife and associated habitats to support development of species and habitat conservation plans. Please note that this category also includes science and information collected through wildlife resource assessments.

Monitoring and Evaluation involves having evaluation processes and tools in place for collecting relevant data and analyzing information to assess and understand trends in natural resource conditions and effectiveness of SWAP implementation. For example, Federal, State, and local agencies continue to collect and evaluate monitoring information to inform conservation action plans and decision-making.

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[14] Please note, in the SWAP 2015 the term stressors will not be utilized and will be replaced with the terms stress or pressure.

Adaptive Management involves having processes in place for strategically adjusting activities, conservation priorities, expectations, management activities, and decision-making to address SWAP 2005 recommended conservation actions more effectively as new information is acquired. For example, State and Federal wildlife agencies and land managers seek to select the most scientifically defensible projections of climate change impacts, identify responses to adapt their program activities, and achieve their program goals based on these adaptations.

Enabling Conditions and Implementing Actions

Conservation action categories can be further separated into enabling conditions and implementing actions (see *Table 1* below). Although some conservation action categories may address both enabling conditions and implementation actions, we have grouped them based on the category with which they most align.

Table 1: Classification of Conservation Action Categories as Enabling Conditions or Implementation Actions

Theme	Conservation Action Category
Enabling Conditions	• Coordination, Collaboration, and Stakeholder Engagement • Education, Outreach, and Capacity-building • Wildlife Resource Assessment • Funding and Leveraged Funding • Knowledge to Implement the SWAP 2005
Implementation Actions	• Policies and Management Actions • Enforcement • Infrastructure, Land-use, and Permitting • Habitat Conservation and Restoration • Species Conservation and Restoration • Addressing Conservation Priorities and Stressors in the SWAP 2005 • Conservation Planning/Plans • Monitoring and Evaluation • Adaptive Management

Evaluation Limiting Factors

During the SWAP 2005 implementation evaluation, specific information gaps arose that complicated the assessment process. Below we share a few overarching challenges that affected the completeness of the SWAP 2005 implementation and SWGs that we base our recommendations.

Lack of Prioritized Goals, Objectives, and Metrics to Measure Progress in the SWAP 2005

One of the greatest challenges encountered during the evaluation was the absence of clearly described and prioritized 10-year goals, objectives, and metrics to measure progress in the SWAP 2005 as well as SWG funded project proposals. Rather, the SWAP 2005 presented steps for developing a monitoring and evaluation program to support adaptive management. Steps included identifying conservation goals and objectives, developing a management-oriented conceptual model, and creating a strategy for implementing monitoring; however, those items were never developed for SWAP 2005.

The SWAP 2005 also outlined recommended conservation actions, but the descriptions were broad and without specific priorities or steps to achieve those recommendations. Thus, evaluating the implementation of the SWAP 2005 proved difficult and relied heavily on perception, assessment of SWAP 2005 stated recommended conservation actions, and review of SWG funded grant implementation. For example, to assess SWG funded grants, we reviewed information that was provided in SWG proposals and reports; however, SWG proposals and reports, like the SWAP 2005, often lacked set objectives and metrics with which to evaluate progress. Similarly, when interviewees identified progress and success, they consistently referenced the lack of goals, objectives, and metrics to measure progress as a key challenge for effectively evaluating the implementation of the SWAP 2005.

Interviewee Challenges Differentiating SWAP 2005 Recommended Conservation Actions and CDFW Day-to-Day Actions

Because recommended conservation actions were broad, most activities that the CDFW or other partners could take to support wildlife conservation and restoration for SGCN fit within the broad scope of actions described in the SWAP 2005. Interviewees highlighted that it was difficult to distinguish between SWAP specific actions and general actions the CDFW undertakes as part of addressing their mandate. In addition, interviewees highlighted that other organizations perform work that is complementary to the SWAP 2005, but not guided by the SWAP 2005. They also highlighted that despite this lack of guidance, the work performed by others helped and continues to help advance specific conservation actions or conservation action categories.

Inadequate and Inconsistent SWG Proposal and Reporting Documentation

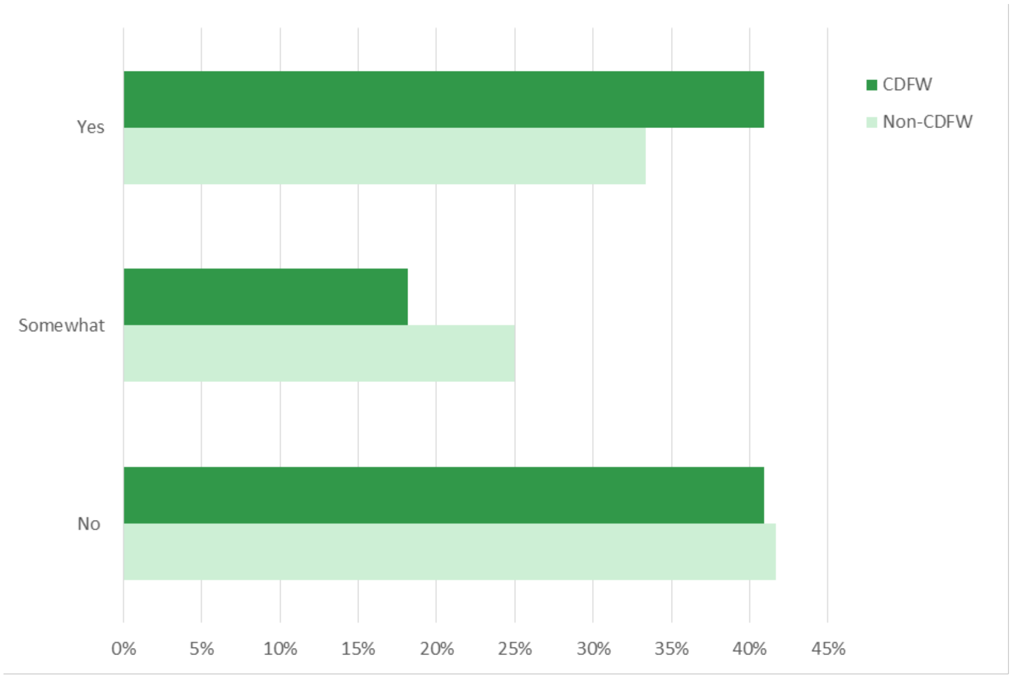
Blue Earth received and reviewed documentation on 81 SWG projects for this evaluation. Sixty-nine of these grants were completed and the remainder are still being executed. When evaluating the SWG proposals and reports, the consultant team identified limitations in the SWG documentation such as, variations in the level of information provided, and for some grants, little or no information (e.g., gaps in financial information, proposals, or reports). Moreover, SWG documentation appears to have not only changed proposal and reporting requirements, but also changed how grants are labeled, stored, and recorded on the CDFW’s servers over the course of the SWAP 2005’s implementation. Therefore, the consultant team could not verify whether we received all grant documents. Although the consultant team recognizes there are gaps (e.g., missing proposals, mid-term and final reports), SWG information presented in the evaluation reflects all information provided to the consultant team during document collection, review, and follow-up requests. Since 2013, the cloud-based USFWS Wildlife TRACS system has been used for tracking and reporting on USFW Wildlife and Sport Fish Restoration program grants.

Moving forward, CDFW is committed and required to provide its reports to the USFWS through this system.

Lack of SWAP Awareness Across CDFW and non-CDFW Staff and Partners

Blue Earth interviewed 51 interviewees, predominantly from within the CDFW. Interviewees' understanding and awareness of the SWAP 2005 and implementation of its recommended conservation actions varied significantly; nearly 60% stated they were familiar or somewhat familiar with the SWAP 2005 (*Figure 2* presents more detail on the percent of CDFW and non-CDFW interviewees' awareness). In addition, more regional interviewees (CDFW and non-CDFW) indicated familiarity with the SWAP 2005 and its recommended conservation actions than statewide interviewees (CDFW and non-CDFW). Interviewees indicated that they had infrequently utilized the SWAP 2005 as a reference for SWG funded grant proposals. Although interviewees used the SWAP document for the development of SWG proposals, interviewees mentioned the limited education regarding the importance of the SWAP 2005, implementation of its recommended conservation actions, its use, its connection to the SWG program, and connection to the CDFW's priorities and daily activities for internal staff and external contractors and partners. Confusion also exists regarding the presence of a SWAP program; if and where the SWAP program or staff are housed (e.g., within which CDFW division or branch); what mandate the CDFW, SWAP program, or SWAP staff had for implementing the SWAP 2005 recommended conservation actions; and what granting or funding processes supported the implementation of the SWAP 2005 recommended conservation actions. Some interviewees identified SWAP 2005 related implementation progress as implementation of the SWG funded grants, while others asked if it was a program with staff that operated beyond implementation of SWG funded grants. Together, lack of awareness and understanding about the SWAP 2005's implementation, staffing, mandate, and funding limited CDFW and non-CDFW interviewee understanding and perception of progress.

Figure 2: Interviewee Familiarity with SWAP 2005 and Its Conservation Actions



Limited Information Available on Funds Leveraged for SWAP 2005 Implementation

Although Blue Earth based funding calculations on SWG funding and CDFW State government match provided for implementing SWG funded grants, clear linkages regarding funding leveraged from other partners and State government for SWAP implementation activities could not be identified. Furthermore, unless interviewees mentioned funding from sources other than the SWG program funds, we did not perform separate research to quantify or assess the level to which these other sources contributed to the SWAP 2005 implementation. We do recognize that other sources of funding supported the overall implementation of the SWAP 2005 and led to progress; however, they are not quantified in this evaluation because their contribution to SWAP implementation has not been directly linked or clearly articulated.

Lack of Explicit Descriptions of SWG Outcomes in Grant Documents

It was often difficult to assess SWG outcomes based on annual and final grant performance report narratives, as well as interviewee responses. Current grantee reporting typically identified project outputs (e.g., numbers of surveys, publications, reports written, etc.) rather than project outcomes (e.g., changes in policies, management actions, behavior, or ecosystem and species health); therefore, strong connections between implementation of SWG funded activities and SWAP-relevant outcomes could not always be identified through reviewing grant reports and interviewee responses. In addition to our analysis of outcomes stated in grant documents and interviews, we performed deeper web-based research on select species and multi-year grants. Finding from this research are presented in later sections in the form of case studies.

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SWAP 2005 Evaluation Results

This section provides an overview of the SWAP 2005 implementation at the statewide and regional scales based on interviewee perspectives, review of grants, web-based information, and other documents. Because the information below reflects themes gleaned from interviewees and documents, it does not necessarily reflect the opinions of the CDFW. Furthermore, any misconceptions or incomplete understanding of the SWAP 2005, SWAP planning, SWAP related work, and SWG on the part of some interviewees may have led to suggestions that do not reflect the CDFW's actual progress to date. Below we provide findings based on each of the evaluation outcomes. We first share information on progress and results at the statewide and regional scales focused on categories described by the SWAP 2005 recommended conservation actions, conservation capabilities, and monitoring and evaluation. Following the overall progress and results, we present findings regarding State government's effectiveness implementing the SWAP 2005 including strengths, areas of improvement, opportunities, and challenges.

Throughout this section, we provide general introductory paragraphs to introduce the topic discussed in each evaluation outcome sub-section below.

Evaluation Outcome 1: SWAP 2005 Implementation Progress and Results

This section shares our findings on key achievements, impact, and overall progress and results of implementing the SWAP 2005, which is based on document review, interviews, and web-based research. The key achievements, impacts, and other findings provided below were informed by interviewee perceptions and SWG funded grant report information. See *Text Box 4* at the end of this section for a summary of key findings presented in this section.

Key Achievements and Impacts

Through our research and analysis interviewee responses and documents, we identified and highlight below the most significant outcomes and achievements realized through the implementation of the SWAP 2005. This section describes the overall SWAP 2005 implementation achievements and presents case studies to illustrate outcomes.

Table 2 shows SWAP 2005 implementation progress according to CDFW (internal) and non-CDFW (external) statewide and regional interviewees. Together, interviewees identified examples of progress for each conservation action category; however, interviewees identified the least amount of progress for Monitoring and Evaluation and Adaptive Management. Blue indicates that interviewees indicated conservation action category **progress**; yellow indicates **some progress**, and orange indicates little or **no progress**.

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Table 2: Perceived SWAP 2005 Implementation Progress by Conservation Action Category

Conservation Action Category	Interviewees Indicated Progress	
	Statewide	**Regional**
Policies And Management Actions	🟨	🟧
Enforcement	🟧	🟨
Infrastructure, Land-use, Permitting	🟧	🟨
Habitat Conservation and Restoration	🟦	🟦
Species Conservation and Restoration	🟨	🟨
Coordination, Collaboration, and Stakeholder Engagement	🟦	🟦
Addressing Conservation Priorities and Stressors in the SWAP 2005	🟦	🟨
Education, Outreach, and Capacity-building	🟧	🟨
Wildlife Resource Assessment	🟨	🟨
Conservation Planning/ Plans	🟦	🟨
Funding and Leveraged Funds	🟧	🟨
Knowledge to Implement SWAP 2005	🟦	🟦
Monitoring and Evaluation	🟧	🟧
Adaptive Management	🟧	🟧

Key: Blue indicates **progress made**; yellow indicates **some progress made**, and orange indicates **little or no progress made**.

Alignment of SWAP 2005 and SWG Stated Objectives and Perceived Progress

To assess the level of progress made towards implementing the SWAP 2005 recommended conservation actions and how the progress has been perceived, Blue Earth reviewed three components:

- Recommended conservation actions in the SWAP 2005 to determine the overall focus of stated actions,
- Objectives of SWG funded projects, and
- Interviewees' perceptions on progress made.

For each, we analyzed collected data using the conservation action categories described above (see *page 8* for more detail).[15] *Figure 3* shows the level of alignment (and discrepancy) among these three analyses.

The two categories most closely aligned with interviewee perceived progress were Coordination, Collaboration, and Stakeholder Engagement (highlighted in 59% of the SWAP 2005 recommended conservation actions, 78% of CDFW, and 28% of non-CDFW interviewees indicated progress) and Habitat Conservation and Restoration (highlighted in 63% of the recommended conservation actions, 72% of CDFW, and 11% of non-CDFW interviewees indicated progress).

When averaging interviewee responses regarding specific recommended conservation actions, both CDFW and non-CDFW interviewees indicated that overall progress had been limited and they did not consistently attribute successes to the SWAP 2005 implementation. Typically, CDFW interviewees indicated more progress made in all 13 categories (excluding Enforcement) than non-CDFW interviewees did. Interviewees identified the most progress for Conservation Planning/Plans; Coordination, Collaboration, and Stakeholder Engagement; and Habitat Conservation and Restoration. Non-CDFW staff expressed more progress made in Coordination, Collaboration, and Stakeholder Engagement; Wildlife Resource Assessment; and Conservation Planning/Plans than in other conservation action categories.

In addition, the highest alignment found between progress identified by interviewees, conservation action categories identified in the SWAP 2005, and SWG projects occurred for the following categories:

- Coordination, Collaboration, and Stakeholder Engagement
- Conservation Planning/Plans
- Addressing Conservation Priorities and Stressors in the SWAP 2005

The most misalignment between the focus of SWG funded grants (more than 74%) and SWAP 2005 stated recommended conservation actions (less than 10%) was Knowledge to Implement SWAP 2005.

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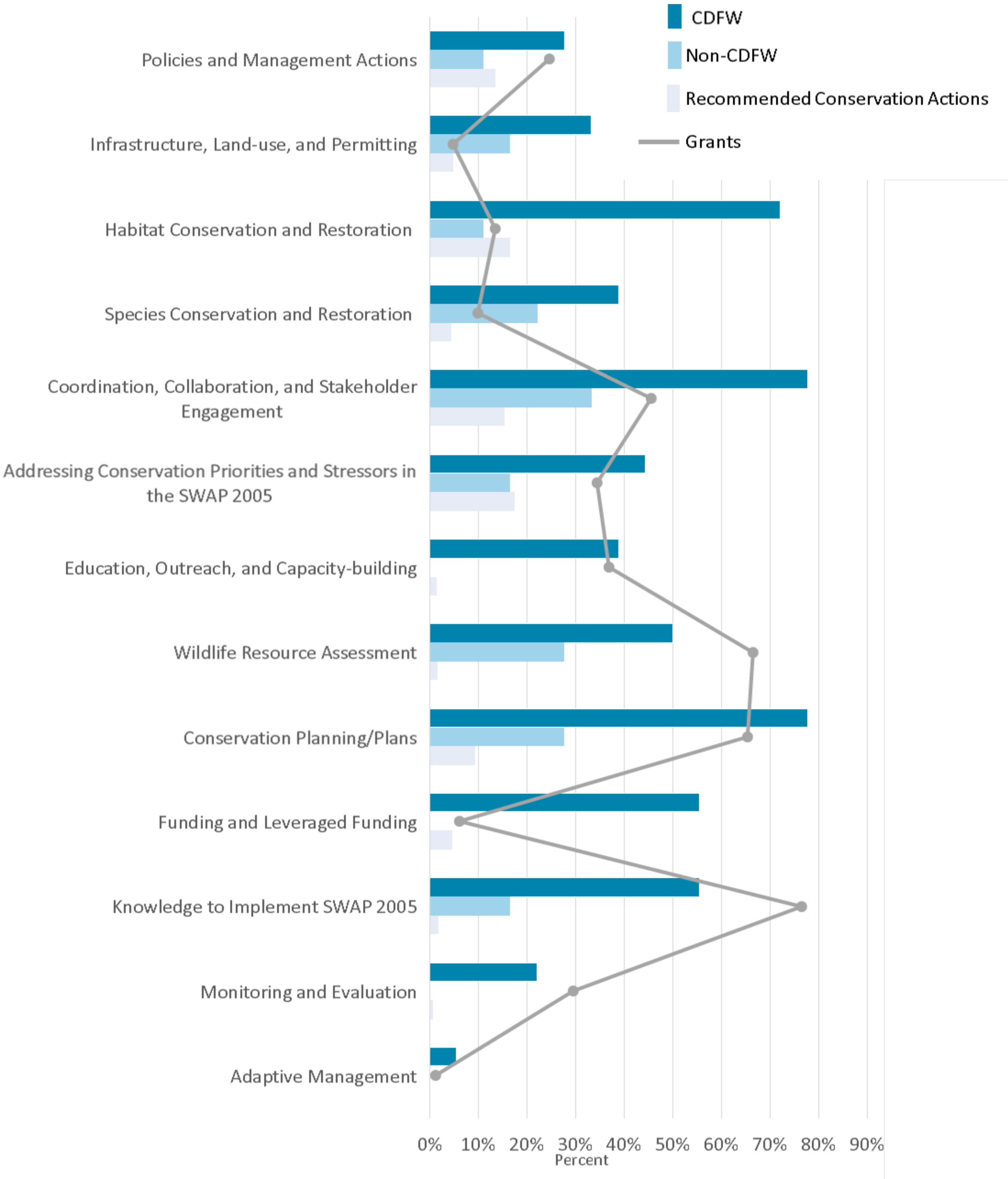
[15] Please note, some recommended conservation actions and grant objectives address more than one of the conservation action categories that Blue Earth developed.

Figure 3: Comparison between Percent Interviewees Indicating Progress, Percent Focus of SWAP 2005 Conservation Actions, and Percent of SWG Funded Grants by Conservation Action Category



Progress Towards Implementing Statewide and Regional Conservation Actions

Although interviewees identified results in each conservation action category, most interviewees identified progress in three categories: Coordination, Collaboration, and Stakeholder Engagement; Conservation Plans/Planning; and Knowledge to Implement SWAP 2005. Below we present regional and statewide examples of progress from CDFW interviewees, non-CDFW interviewees, and SWG funded grants.

- **Policies and Management Actions:** Interviewees indicated progress made with regard to policies, but could not identify specific examples of policies resulting from SWAP 2005 implementation and SWG funded projects. Moreover, despite budget constraints, interviewees indicated management action progress has occurred, specifically in the Bay Delta system where management efforts including conservation and restoration relied on money provided through Proposition 84, The Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006, funding. Interviewees also highlighted the WCB's financial support for land acquisition and restoration and mentioned progress made at the statewide scale, but were uncertain which efforts were tied to the SWAP 2005 implementation. Out of the 69 grants active between 2005-2014, nine, or 13% of, SWG funded grants, emphasized results related to policy and management actions. For example, one grant informed major revisions to the draft Pleasant Valley Ecological Reserve management plan. In addition, results from some grants inform ongoing management of human activity in NCCP reserves and support future decisions regarding public access.

- **Enforcement:** Few SWAP 2005 recommended conservation actions focused on enforcement and SWG funding cannot support enforcement actions, hence it was not included in *Figure 3* above. Despite significant staffing shortages, interviewees generally identified progress within the CDFW to strengthen enforcement efforts statewide. Although not directly a result of SWG funding, one interviewee highlighted the Memorandum of Understanding signed between the CDFW and the United States Coast Guard as a key enforcement success that also highlighted collaboration for increasing marine protected area enforcement. Also, one SWG funded grant mentioned enforcement and increasing compliance by specifically enhancing security to reduce off-road vehicles, trash, and debris dumping.

- **Infrastructure, Land-use, Permitting:** Interviewees indicated progress for permitting through increased capacity and streamlining and simplification of the conservation and permitting processes. Additionally, interviewees cited connections to HCP/NCCPs and the guidelines that these documents outlined with regard to development. SWG funded grants mentioned progress towards Infrastructure, Land-use, and Permitting in just 10, or 14% of, SWG funded grants. Progress included installing and repairing fences to control the spread of invasive plants, installing pitfall traps to trap adult California tiger salamanders, and purchasing equipment and native vegetation rootstock to plant visual barriers that minimize disturbances to roosting sandhill cranes.

- **Conservation and Restoration:**
    - *Habitat:* Over the last 10 years, there has been a gradual increase in funds for State government to acquire more land for the purpose of protection. Interviewees highlighted collaborative efforts between Federal, State, and local agencies, NGOs, and landowners for conservation and restoration efforts, specifically those in the Bay Area and the San Joaquin Valley. Interviewees also highlighted leveraged funding from the Coastal Conservancy for coastal restoration work and the WCB for riparian restoration. Just four, or 6% of, SWG funded grants mentioned habitat conservation or restoration as an outcome. For example, one grant included habitat enhancement for the desert pupfish by clearing vegetation in and around springs on CDFW lands.

    - *Species:* Interviewees highlighted, increased species conservation and restoration efforts. Specific species highlighted include the riparian brush rabbit, which has almost been delisted, as well as the fisher, marten, sage grouse, salmon species such as Chinook and Coho, and red-legged frog. One interviewee mentioned that foundation money directed towards species conservation increased over the past 10 years; although, the interviewee did not indicateby how much. Similar to habitat conservation, five, or 7% of, SWG funded grants mentioned direct species conservation outcomes. One example of a SWG funded grant included conservation of mountain yellow-legged frog populations through the removal and translocation of predatory fish at six project sites (Inland Desert CDFW region – Matlock and Slim lakes restoration area; Badger lakes restoration area; Gable lakes restoration area; Eastern Brook lakes restoration area; Tamarack; and Ralston and Cagwin restoration within North Central CDFW region).

- **Coordination, Collaboration, and Stakeholder Engagement:** CDFW and non-CDFW interviewees highlighted the CDFW's increased focus on coordination, collaboration, and stakeholder engagement. Interviewees cited greater engagement with landowners, ranchers, farmers, Federal agencies, State agencies, local agencies, and NGOs. For example, one interviewee mentioned the successful mapping of habitat corridors in the Sierra Foothills, which included significant collaboration and engagement with private landowners, ranchers, county government, and other local, State, and Federal agencies. Interviewees also mentioned the engagement in the Landscape Conservation Cooperatives, SWAP update process, and future SWAP companion plans as key examples of increased engagement and focus on collaboration. Forty-eight percent of, or 33, SWG funded grants highlighted coordination, collaboration, and stakeholder engagement results. For example, one project involved coordination with non-profit reserve managers on annual activities including habitat restoration and invasive species treatments, as well as coordination with local agencies to conduct vegetation management and debris removal.

- **Addressing Conservation Priorities and Stressors in the SWAP 2005**: Interviewees indicated progress towards addressing emerging stressors; however, they also emphasized the significant difficulties associated with addressing such big issues. Interviewees generally cited progress and increased focus on climate change (including the CNRA *Safeguarding California: Reducing Climate Risk An Update to the 2009 California Climate Adaptation Strategy*) and water management conflicts (including new water regulations for changing how water transfers occur), as well as progress addressing forest management conflicts and livestock grazing. Thirty percent of, or 21, SWG funded grants made progress towards addressing SWAP 2005 stressors. Progress towards climate change was the most frequently mentioned stressor and appeared in 10 SWG funded grants.

- **Education, Outreach, and Capacity-building***:* Interviewees mentioned that the CDFW has an education and outreach program; however, the program was viewed as grossly underfunded. Despite limited resources, interviewees indicated that there had been progress towards education, outreach, and capacity-building over the last 10 years, specifically related to direct involvement with public stakeholders. Twenty-three percent of, or 16, SWG funded grants mentioned progress towards education, outreach, and capacity-building. Examples include training on deployment of automated bird song recorders; public outreach through a website, monthly newsletters, web-ready public scoping information, and development and maintenance of a list serve; and presentation of work at annual meetings, such as the Western Section of The Wildlife Society.

Progress Towards Improving Conservation Capabilities

Three conservation actions categories were also defined as conservation capabilities including: Wildlife Resource Assessments, Conservation Planning/Plans, and Funding and Leveraged Funds. The SWAP 2005 described conservation capabilities as fundamental for implementing effective conservation, restoration, and management. Below we provide examples of progress made towards each conservation capability.

- **Wildlife Resource Assessment**: Interviewees indicated a significant use of SWG funding for wildlife resources assessment. Interviewees highlighted successful wildlife resource assessments in the Sierra Nevada, specifically related to monitoring of the yellow-billed cuckoo, burrowing owl, and the American pica, as well as long-term video monitoring projects that are now expanding to additional CDFW regions. Forty-eight percent of, or 33, SWG funded grants implemented wildlife resource assessment activities. Specific examples include conducting surveys and field research in the Sierra National Forest, conducting camera trapping surveys in the Mojave Desert and Sierra Nevada and Cascades regions.

- **Conservation Planning/ Plans**: Interviewees indicated that the most progress made of any recommended conservation action occurred through conservation planning and plan development, while 22, or 32% of, SWG funded grants identified outcomes related to Conservation Planning/Plans. The progress made towards such plans is directly related to information gathered through the conservation action categories Wildlife Resource Assessment and Knowledge to Implement SWAP 2005. Interviewees and SWG reports indicated specific progress related to Conservation Planning/Plans including incorporating knowledge and learning into the development and implementation of HCP/NCCPs throughout the State. Interviewees indicated that the CDFW has incorporated information, research, and knowledge into regional plans such as the San Joaquin Multi-Species HCP, Placer County HCP/NCCP, Yolo County HCP/NCCP, Butte County HCP/NCCP, Bay- Delta HCP/NCCP, Yuba-Sutter HCP/NCCP, and Western Riverside County Multi-species HCP.

- **Funding and Leveraged Funding**: Specific progress related to funding and leveraging funds was associated with an increase in external partnerships, which have substantially increased the

CDFW's ability to perform assessments and increase scientific knowledge about sensitive habitats. Interviewees identified specific funding from the WCB and ESA Section 6 grants, as well as other parallel efforts of NGOs such as The Nature Conservancy and Audubon Society. Twelve percent of, or eight, SWG funded grants mentioned results related to Funding and Leveraged Funding through the Imperial Irrigation District, Pasadena Audubon, USDA-FS, State of California Off Highway Vehicle Fund, and Federal Assistance funds.

Monitoring and Adaptive Management

In addition to the conservation action categories highlighted above, the SWAP 2005 included information on the steps for developing and implementing a monitoring and evaluation system that not only would track habitat and species health, but would also help assess progress and adaptive management. Although the system was not implemented between 2005 and 2014, interviewees highlighted increases in relevant science and identified a growing interest in tracking adaptive management outcomes.

- **Knowledge to Implement SWAP 2005**: Interviewees in the Northern and North Central regions, indicated progress for research and assessment. In the North Central region, interviewees shared that scientific data and information has helped identify species conservation needs. In addition, interviewees also highlighted increases in the relevant science for desert tortoise, bank swallow, burrowing owl, Swainson's hawk, and tiger salamander. Furthermore, numerous interviewees identified a successful collaborative wildlife connectivity identification and mapping effort between the California Department of Transportation (Caltrans) and the CDFW to inform transportation planning including the California Transportation Plan 2035 and regional transportation plans.[16] Results related to Knowledge to Implement SWAP 2005 were most frequently mentioned in SWG funded grants, appearing in 39, or 57% of, SWG grants. Results include digitization of previously hand drawn maps, surveys to identify native populations of arroyo chub, and use of remotely triggered digital cameras to survey multiple species.
- **Adaptive Management**: Interviewees indicated that they were aware that greater support for adaptive management exists, but could not identify specific examples of adaptive management implementation or monitoring. In addition, because the SWAP 2005 lacked defined metrics to measure progress, interviewees indicated it was difficult to assess progress. One interviewee did mention that monitoring efforts focused on adaptive management were gradually increasing and being incorporated in conservation plans across the State. Twenty-two percent of, or 15 SWG funded grants highlighted results related to adaptive management, which included refining survey protocols and testing auditory monitoring protocols at the same locations to detect changes in bird communication and inform management decisions.

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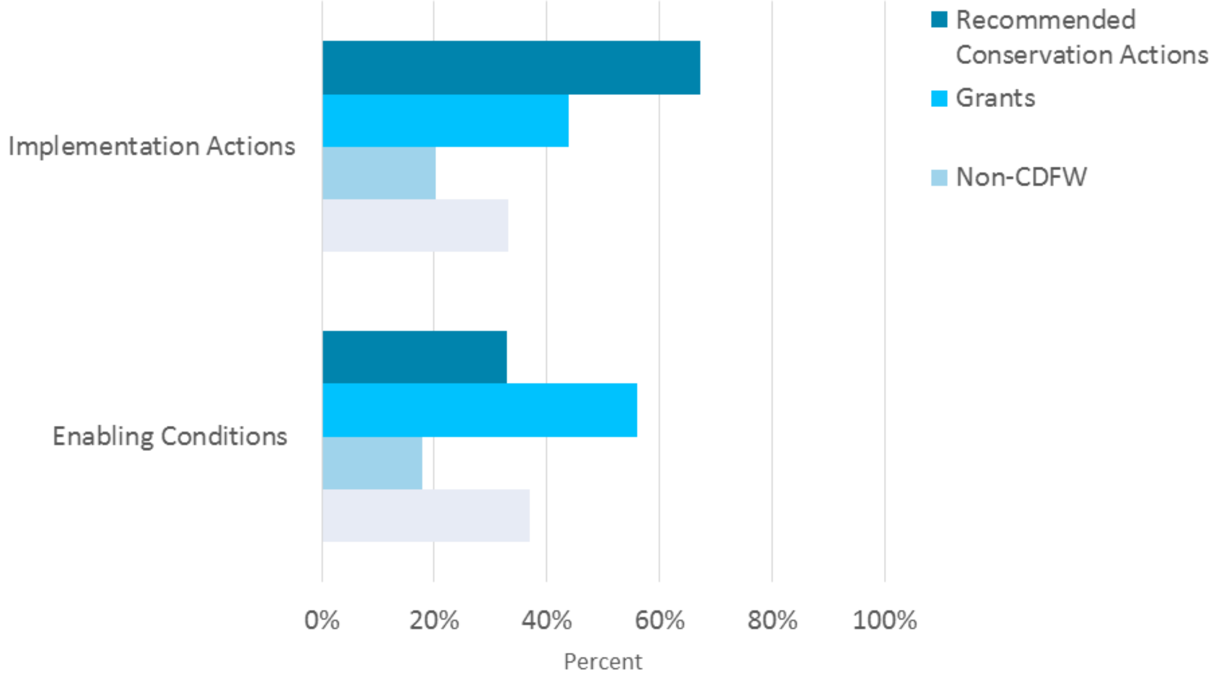
[16] In the PowerPoint *California Essential Habitat Connectivity Project: Multidisciplinary Team Meeting Four*, the habitat mapping project and its legislative, planning, key collaborations, approach, and results are described. Dangermond Group, SC Wildlands, and Conservation Biology Institute, "California Essential Habitat Connectivity Project: Multidisciplinary Team Meeting Four," California Department of Fish and Wildlife and California Department of Transportation, Feb. 2010, 29 Jan. 2015 http://www.dot.ca.gov/hq/env/bio/files/ppt_mdtmtg4.pdf.

Progress Towards Enabling Conditions, Implementation Actions, and Reducing Wildlife Stressors

As described above, SWAP 2005 recommended conservation actions can be grouped into two high-level categories: enabling conditions and implementation actions (see *Table 1* to review how conservation action categories are classified). Enabling conditions are conditions that support or strengthen implementation of the SWAP 2005, for example having sufficient scientific information to inform decision-making or collaboration with other partners to ensure sufficient resources are in place to support implementation. Implementation actions include those actions that are more direct, such as conservation and restoration of species or habitat, enforcement, and implementation of conservation plans.

To compare interviewee perception, stated SWAP 2005 recommended conservation actions, and SWG funded grants' focus, *Figure 4* combines findings from each of these three information sources using the **enabling condition** (e.g., human and financial resources available to implement activities or collection of baseline data and information available to inform decisions) and **implementation action** (e.g., Policies and Management Activities, Habitat Conservation and Restoration, or Adaptive Management) classification that were shared above. *Figure 4* presents the percentage of interviewees indicating progress for enabling conditions and implementation actions, alongside the percent of SWG funded grants that mention enabling conditions and implementation actions (please note some grants address more than one category) and the focus of recommended conservation actions mentioned in the SWAP 2005. In general, both CDFW and non-CDFW interviewees indicated progress made towards enabling conditions and implementation actions. The difference between CDFW and non-CDFW interviewees typically resulted from a lack of non-CDFW interviewee's awareness of how results could be directly linked to the SWAP 2005 implementation. To implement effectively, enabling conditions must be in place. The discrepancy identified between SWG grant implementation and SWAP 2005 recommended conservation actions may reflect the need for California to set the stage for success by focusing most of the 2005-2014 funding on enabling conditions.

Figure 4: Comparison between Perceived Progress, SWG Funded Activities, and SWAP 2005 Recommended Conservation Actions by Enabling Conditions and Implementation Actions



We also examined the types of stressor addressed during SWAP 2005 implementation. Twenty-eight out of 81 grants sought to address SWAP 2005 stressors. SWG grant proposals identified nine different SWAP 2005 stressors, shown in *Table 3*. The most commonly addressed stressors were climate change (directly mentioned in 10 grants), growth and land development (directly mentioned in six grants), and water management conflict and invasive species, which were both directly mentioned in four grants.

Table 3: SWAP 2005 Stressors Addressed in SWG Funded Grants

28 Grants out of 81 Addressed SWAP 2005 Stressors
Climate Change (10)
Growth and Land Development (6)
Water Management Conflict (4)
Invasive Species (4)
Multiple uses conflicting with wildlife on public lands (3)
Altered Fire Regimes (2)
Forest Management Conflicts (2)
Recreational Pressures (2)
Excessive Livestock Grazing (1)

Text Box 4: Evaluation Outcome 1 Summary: SWAP Implementation Progress and Results

Evaluation Outcome 1 Summary: SWAP Implementation Progress and Results

- More regional interviewees indicated familiarity with the SWAP 2005 and its recommended conservation actions than statewide interviewees.
- Interviewees indicated and evaluators found limited overall progress towards conservation action categories.
- Both statewide and regional interviewees specified progress made towards three categories in particular: Habitat Conservation and Restoration; Coordination, Collaboration, and Stakeholder Engagement; and Increasing Knowledge to Implement SWAP 2005.
- Forty-five percent of CDFW and non-CDFW interviewees highlighted progress towards enabling conditions.
- The most common stressor addressed under the SWAP 2005 was climate change followed by growth and land development.
- CDFW staff indicated more progress made in all 13 categories (excluding Enforcement) than non-CDFW staff, with the most progress made in the following three categories: Conservation Planning/Plans; Coordination, Collaboration, and Stakeholder Engagement; and, Habitat Conservation and Restoration.
- Most SWAP 2005 recommended conservation actions related to the category Addressing Conservation Priorities and Stressors in the SWAP 2005. However, only 44% of CDFW staff and 17% of non-CDFW staff indicated progress made for this category.

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State Wildlife Grant Case Studies

Below we share two case studies to help illustrate the linkage between SWG funded grants, SWAP 2005 identified wildlife stressors, and overall progress outcomes and outputs. To develop the first case study we identified a taxa type that received significant SWG focus between 2005-2014 (birds) and identified a key taxa species, which received multiple single species grants in the same period. For the second case study, we identified multi-species, multi-year grants that specifically sought to address key statewide stressors. For both case studies, we not only reviewed the key outputs and outcomes that were identified in the grant reports, but also integrated interviewee insights where relevant and sought to find linkages with other statewide or regional planning efforts (HCP/NCCPs), mapping, and policy changes through follow-up web-based research and literature review. Although we sought to make strong linkages between SWG funded grants and outcomes, some linkages were not clearly defined (please see section *Correlation of SWG Funding Amount to SWG Outputs and Outcomes* on *page 33* below for more detail, as well as *Appendix 8*, which lists publications identified as outputs in SWG grant documents and *Appendix 9*, which presents outputs described in 15 final grant performance reports). In addition to these two case studies, in the *Evaluation Outcome 2* section below we provide three additional case studies focused on single grants for species representing three taxa addressed most often by SWG funded grants—mammals, birds, and reptiles.

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Case Study 1—SWAP 2005 Implementation Outcome Synthesis for Western Burrowing Owl [17]

Number of Single and Multi-species Grants: Two single species grants (nine multi-species grants)

Total Value of Single Species and Multi-species Grants for the Western Burrowing Owl: $671,398 in grants supporting specifically Western burrowing owl projects (Total value of Western burrowing owl-specific grants and multi-species grants that included the Western burrowing owl, $14,020,797. Multi-species grants addressed more than 20 additional species and all taxa types.)

Objectives: Project objectives varied, with some of the most common themes including the following:

- Knowledge to implement SWAP 2005 (nine grants)
- Wildlife resource assessments (nine grants)
- Coordination, collaboration, and stakeholder engagement (eight grants)
- Develop conservation plans (eight grants)
- Education, outreach, and capacity-building (eight grants)

SWAP 2005 Stressors Addressed:

- Growth and land development (urban, residential, and agricultural)
- Climate change
- Inappropriate off-road vehicle use
- Water management

Examples of Western Burrowing Owl Grants with Direct Conservation Action:

Yolo County HCP/NCCP – Research on Western burrowing owl habitat and the impacts of human encroachment, degradation of native habitats, and fragmentation of habitats performed by Gervias et al. 2008 through SWG used in development of the Yolo County Natural Heritage Program (NHP) Plan first administrative draft in 2013. A CDFW 2012 staff report on Western burrowing owl mitigation also informed the NHP Planning and Preconstruction surveys for the Western burrowing owl.

Butte County HCP/NCCP – CDFW data on the Western burrowing owl was used to inform conservation efforts within the "Butte Regional Conservation Plan, Preliminary Public Draft. November 30, 2012." Specifically, 2012 CDFW information helped update the current guidance on impact assessments, as well as Western burrowing owl avoidance and mitigation actions of covered activities. Moving forward the Butte County Association of Governments (BCAG) Board of Directors (the Implementing Entity of the conservation plan) will also coordinate the design of practicable techniques for improving habitat availability for the Western burrowing owl with the CDFW (and the USFWS and species experts).

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[17] In addition to the publications listed in the text box, other documents referenced in grant reports were not publically available.

Other HCP/NCCP plans that SWG grants informed regarding burrowing owl include:

- Bay - Delta HCP/NCCP
- East Contra Costa HCP/NCCP
- Natomas Basin HCP
- Sacramento Municipal Utility District HCP
- San Joaquin Multi-Species HCP
- Santa Clara HCP/NCCP
- South Sacramento HCP
- Yuba-Sutter HCP/NCCP

Key Grant Outcomes:

- A conservation strategy was drafted, and an existing CDFW Western burrowing owl conservation guidance document was revised
- CDFW worked with the Burrowing Owl Conservation Network, Defenders of Wildlife, and USFWS to integrate science into the species conservation strategy
- Added 233 new Western burrowing owl California Natural Diversity Database records collected, which have been integrated into State planning tools, including a statewide distribution map
- Described the numbers of Western burrowing owls on a breeding bird survey route in California increased significantly from 1968-2004
- Identified that in addition to substantial populations existing in the Western Mojave Desert, Palo Verde Valley in the Sonoran Desert region, and eastern San Luis Obispo County, large populations persist in agricultural areas
- Assisted in developing and implementing appropriate Western burrowing owl conservation strategies into HCP and NCCP documents (e.g., San Joaquin, Placer, Yolo HCP/NCCPs)
- Grant reports included recommendations, such as creating artificial burrows, conserving large tracts of grassland, controlling off-road vehicles, creating buffer zones around habited burrows, including private land-owners in conservation efforts, and protecting man-made structures that Western burrowing owls are using for habitat

Publications: More than 22 publications produced in connection with 11 grants, including:

- Gervais JA, Rosenberg DK, Comrack LA. 2008. *II - Species Accounts – Burrowing Owl (Athene cunicularia)*. Studies of Western Birds 1: 218-226.
- California Department of Fish and Wildlife. 2008. *Guidance for Burrowing Owl Conservation*. Habitat Conservation Planning Branch, Wildlife Branch, and Bay Delta Region. Sacramento, CA. 25 pages.
- Wilkerson, R. L., and R. B. Siegel. 2010. *Assessing changes in the distribution and abundance of Burrowing Owls in California, 1993-2007*. Institute for Bird Populations: Bird Populations 10: 1-36.
- Wilkerson, R. L., and R. B. Siegel. 2011. *Distribution and Abundance of Western Burrowing Owls (Athene cunicularia hypugaea) in Southeastern California*. The Southwestern Naturalist 56: 378-384.

Case Study 2—SWAP 2005 Implementation Multi-Species, Multi-Year Grant Addressing Statewide Stressors

Grant Title: Colonial Waterbirds a multi-partner, statewide and regional assessment to inform conservation of a suite of wetland-dependent species (Grant #: F10AF00647)

Grant Period: January 19, 2010 – September 30, 2013

Location of Work: Statewide

Grant Value: Total: $200,000 (*SWG Funds: $100,000, State Government Match: $100,000)*

Part of a Larger Project: USFWS coordinated a comprehensive survey of colonial-nesting waterbirds throughout 11 of the U.S.'s Western states. The survey's short-term goals were to document the species composition, size, and location of waterbird colonies throughout this region and to produce an atlas of colonies. These surveys were intended to establish a baseline for the development of a long-term monitoring program to track population size, trends, and locations of colonial waterbirds in the Western United States. The CDFW's project contributed to this larger USFWS project by completing an inventory of waterbird species in the State of California.

Species Addressed: The 17 species of colonial waterbirds nesting in California include: eared grebe, Western grebe, Clark's grebe, American white pelican, double-crested cormorant, great blue heron, great egret, snowy egret, cattle egret, black-crowned night-heron, white-faced ibis, Franklin's gull, ring-billed gull, California gull, Caspian tern, black tern, and Forster's tern.

Objective: To serve the conservation needs of colonial waterbirds by:

1. Conducting comprehensive surveys of 17 species of colonial waterbirds throughout their breeding ranges in California;
2. Documenting the size, location, and broad-scale habitat parameters of all breeding colonies;
3. Estimating the minimum State population size of each species;
4. Contributing data to a regional database and atlas for 11 Western states and thereby enabling easy access to information pertinent to conservation planning; and
5. Leveraging stakeholder efforts.

SWAP 2005 Stressors Addressed: Because colonial waterbirds breed statewide, they are subject to the overarching stressors of human growth and development, water management conflicts, invasive species, and the effects of climate change. In the more populated regions of the State, additional major stressors, including pollution, urban or agricultural runoff, recreation pressure and human disturbance. To attempt to counteract these stressors, colonial waterbird surveys will serve to identify the important stressors for particular colonies, foraging habitats, and roost sites and remedies to identified stressors. For example, these surveys help address the climate change needs expressed in Boere et al. 2007, specifically "There is a need for wide-scale planning, at landscape and flyway scales, to reduce or mitigate the impacts on waterbird populations and their habitats. Research that explores a range of potential future scenarios will be required to underpin this planning and will need data from long-term monitoring and surveillance."

Project Outcomes:

Report Period, January 19, 2010 – June 29, 2011: Indicated that the grant was meeting its objectives. CDFW coordinated with the USFWS to set overall goals and objectives, to develop a project methodology for the field season, and to prepare a scope of work. Also, a CDFW grant was developed and awarded to Point Blue Conservation Science.

Reports Period, July 1, 2011 – June 30, 2012: Fieldwork during this period focused on the Sacramento Valley and greater Central Valley Delta, including foothill drainages of the adjacent Coast Range, Sierra Nevada, coastal slope, and outer Coast Ranges of northern and central California (Del Norte County south through San Luis Obispo County).

Sacramento Valley and Delta

- Surveyed 142 active colonies in 2011.

Coastal Northern California

- Surveyed 134 active colonies on the coastal slope in 2011.

Reports Period, July 1, 2012 – June 30, 2013: Fieldwork during this period focused on the southern portion of the State, including the San Joaquin Valley, the coastal slope of southern California, and the Salton Sea and other desert sites.

Salton Sea and Adjacent Imperial Valley

- Surveys conducted for the following target species: Western grebe, Clark's grebe, double-crested cormorant, great blue heron, great egret, snowy egret, cattle egret, black-crowned night-heron, white-faced ibis, California gull, Caspian tern, and Forster's tern.

Coastal Southern California

- Target species included cattle egret, snowy egret, great egret, great blue heron, black-crowned night-heron, and double-crested cormorant.
- 2012 work provided the first-ever comprehensive surveys on the coastal slope of Southern California, which focused on the target species, including the cattle egret, snowy egret, great egret, great blue heron, and black-crowned night-heron.
- Leveraged project funds with other stakeholder efforts including surveys funded by the Imperial Irrigation District and Pasadena Audubon.
- Intend to incorporate all survey results into the USFWS' database and contributed to the inventory of 11 Western U.S. states.

Publications:

- Cooper, D. and D. Shuford. 2012. Memo from Cooper, D. and D. Shuford to Pasadena Audubon Society regarding completion of work on colonial waterbird surveys in coastal southern California in 2012, 3 pp.
- Molina, K. and D. Shuford. 2013. Memo from Molina, K. and D. Shuford to Imperial Irrigation District regarding completion of work on colonial waterbird surveys at the Salton Sea and adjacent Imperial Valley in 2012, 11 pp.

Evaluation Outcome 2: State Wildlife Grant Implementation

This section presents Blue Earth's analysis of SWG portfolio spending between 2005-2014 by region (SWAP 2005 and CDFW), ecosystem and associated topics, taxa, and conservation action categories. CDFW staff provided Blue Earth with documentation for 81 different SWG proposals and projects implemented during the SWAP 2005 implementation. Grants amounted to nearly $37 million dollars in SWG funds and were matched with approximately $19 million in State government funds between the 2005-2014 evaluation period. The average grant amount per year per grant for the 81 grants analyzed was $193,100, while the average grant amount per grant was $729,500. See *Text Box 5* at the end of this section for a summary of key findings presented in this section.

Correlation of SWG Funding Amount to SWG Outputs and Outcomes

We could locate just 15 final performance reports for the 69 completed grants provided to Blue Earth that documented grant outcomes, outputs, and publications. Of these 15 grants, one grant did not report any outcomes and four grants did not provide total funding amounts. Grant funding amounts ranged from $88,001 to $3,314,000 and grant length varied from one to six years. Regardless of funding level and length, reported grant outputs and outcomes varied significantly. Below we provide examples of low, medium, and high-level outputs for four- or five-year grants (please see *Appendix 9* for more detailed examples of other grants and outputs stated in their final performance reports).

- **Low-Level Outputs**: A five-year, $413,075 grant. No reported outputs in its final performance report.

- **Medium-Level Outputs**: A four-year, $182,116 grant. Reported outputs included two draft management plans; development, coordination, and planning of four additional management plans with the USDA-FS and USFWS; consultation of three USDA-FS trout removal projects conducted in the CDFW North Central region; and development and implementation of monitoring plans.

- **High-Level Outputs**: A five-year, $655,000 grant. Reported outputs included conducting an inventory, distribution, and status assessment of 146 covered species on accessible conserved land; conducting surveys for all taxa covered under the Multi-Species HCP (MSHCP); developing survey protocols; testing and refining long-term monitoring protocols; developing and implementing a long-term monitoring strategy; providing data for an adaptive management program; hosting a monthly meeting with land managers, representatives from affiliates, partner organizations, and other wildlife agencies; and developing a summary report of all surveys conducted.

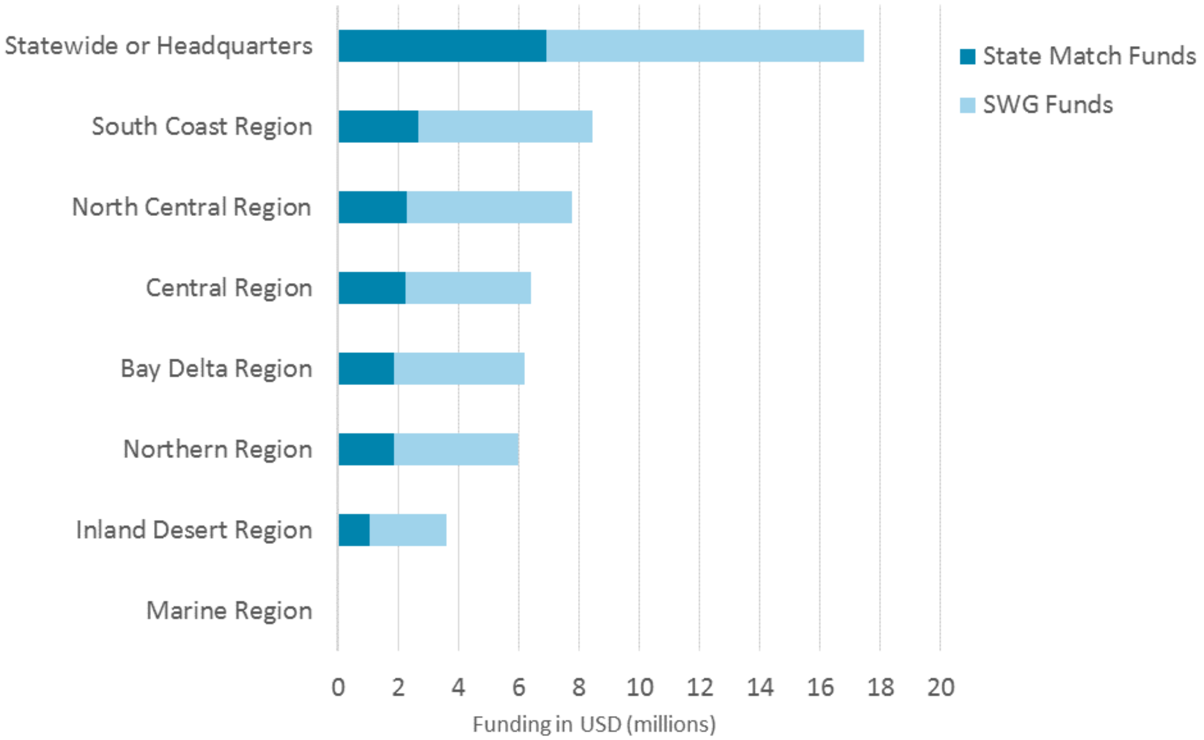
Grant Analysis by Region

Over the last 10 years, SWG funds have been used to support conservation efforts throughout the State. For the regional grant analysis, we present both the CDFW region analysis and the SWAP 2005 region analysis. The SWAP 2005 regions did not align to the CDFW jurisdictional boundaries. According to the SWAP 2005, "these regional divisions were based on the state's physiographic characteristics (i.e., watersheds and vegetation communities) coupled with consideration of wildlife and natural resources management areas of responsibility."[18]

CDFW Region Analysis

The CDFW divides the State of California into seven regions: Northern, North Central, Bay Delta, Central, South Coast, Inland Deserts, and Marine. *Figure 5* shows the amount of SWG funds and State government match allocated to CDFW regions for the 81 grants. When grants addressed more than one region, we divided the amount of funding evenly among regions since SWG funded grant budgets did not specify allocations to each region.

Figure 5: SWG and State Government Match Funding by CDFW Region



During the evaluation period, most CDFW region grants supported Statewide or Headquarters interventions, which accounted for 27 grants and totaled $16,261,983 in funding. These grants include statewide grants, as well as grants carried out through the CDFW headquarters in Sacramento and at laboratories and universities such as UCD. Furthermore, the Northern region received 24 grants, the highest number of grants (aside from the Statewide or Headquarters CDFW regions); however, the Northern region received approximately $90,000 less per grant than the majority of the other CDFW regions. The South Coast CDFW region on the other hand received the highest amount of funding (aside from the Statewide or Headquarters CDFW regions), despite being allocated 30% fewer grants than the

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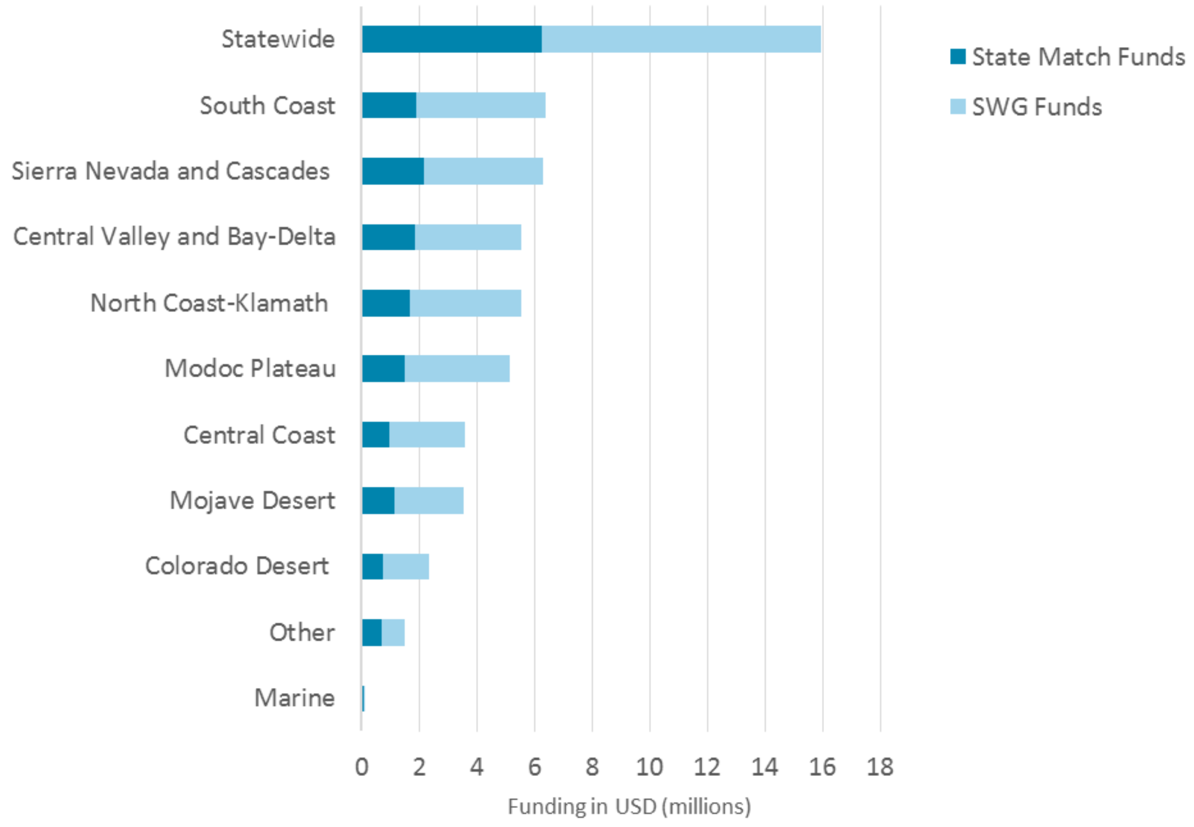
[18] David Bunn, et al., "California Wildlife Conservation Challenges: California's Wildlife Action Plan," University of California Davis Wildlife Health Center, California Department of Fish and Wildlife, 2007, 29 Jan. 2015 http://www.dfg.ca.gov/SWAP/2005/.

Northern region. On average, the South Coast region received $244,000 more per grant than the Northern region. Conversely, few grants supported the SWAP 2005 Marine region.

SWAP 2005 Region Analysis

The SWAP 2005 divided the State into nine regions: Mojave Desert, Colorado Desert, South Coast, Central Coast, North Coast-Klamath, Modoc Plateau, Sierra Nevada and Cascades, Central Valley and Bay-Delta, and Marine. *Figure 6* shares the amount of SWG funds and State government match allocated to each SWAP 2005 region. The SWAP 2005 region to receive the most funding was the Statewide region, while the Sierra Nevada and Cascades region received funding for the most number of grants. The Marine region received the fewest grants and funding.

Figure 6: SWG and State Match Funding by SWAP 2005 Region



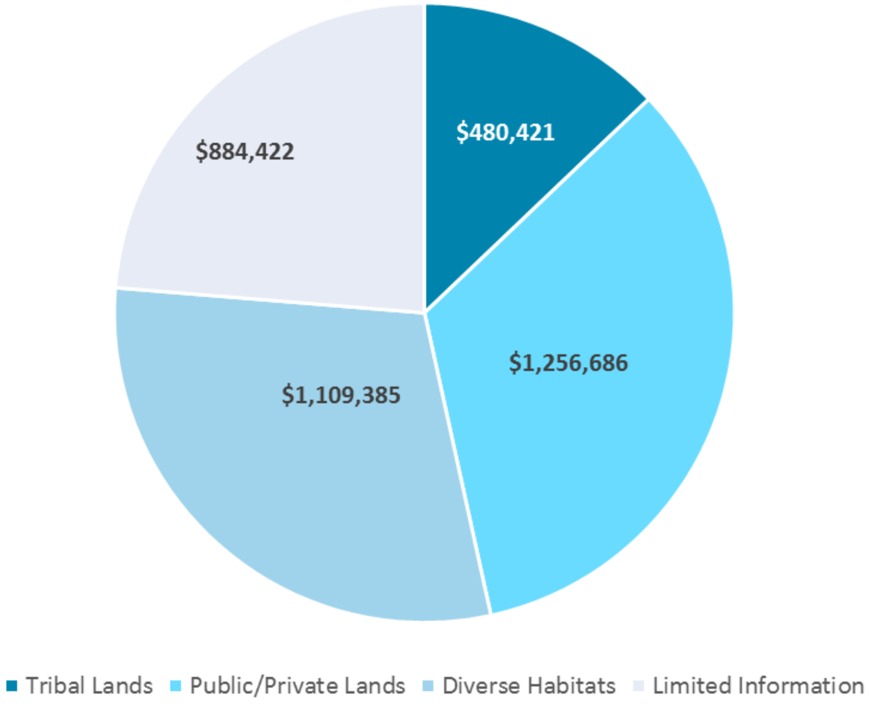
During the evaluation time period, the Sierra Nevada and Cascades region received funding for 26 grants, the highest number of grants, despite receiving almost $10 million less in funding than Statewide grants. It is important to note that the SWAP 2005 Sierra Nevada and Cascades region overlaps with four CDFW regions, specifically the Northern region, the North Central region, the Central region, and the Inland Deserts region. Additionally, the South Coast region received a similar level of funding to that of the Sierra Nevada and Cascades region, but received eight fewer grants, meaning on average Sierra Nevada and Cascade region grants received less funding than South Coast region grants. Based on the

SWAP 2005 Marine region, which differs from the CDFW Marine region, the SWAP 2005 Marine region received two grants, one specifically focused on the SWAP 2005 Marine region for $90,000 and the other within a larger statewide project. The SWAP 2005 Colorado Desert region, which received the second lowest amount of regional funding, received over $2 million dollars more than the SWAP 2005 Marine region.

Grant Analysis by Ecosystem Category

In the following sub-section, we provide grant analysis by a number of ecosystem categories developed by CDFW staff for this evaluation. Ecosystem categories include habitat type, management unit, landscape type, natural community base, biodiversity, ecosystem function, climate change, and invasive species. Grant documents do not always specify ecosystem information; therefore, Blue Earth relied on CDFW staff support to identify and provide information on each grant. When grant information was limited or when information addressed multiple categories, CDFW staff identified grants as addressing “various” or indicated that the grant had “Limited Information.”

Figure 7: SWG Funding by Habitat Land-use Types



Habitat Type

Figure 7 shares habitat land-use types broadly classified by CDFW staff as Tribal Lands, Public and Private Lands, Diverse Habitats, and Limited Information.[19] *Figure 8* presents the amount of grant funding allocated by habitat type across California.[20] On average, each of these listed habitat types received approximately $2,921,777 in funding over the last 10 years.

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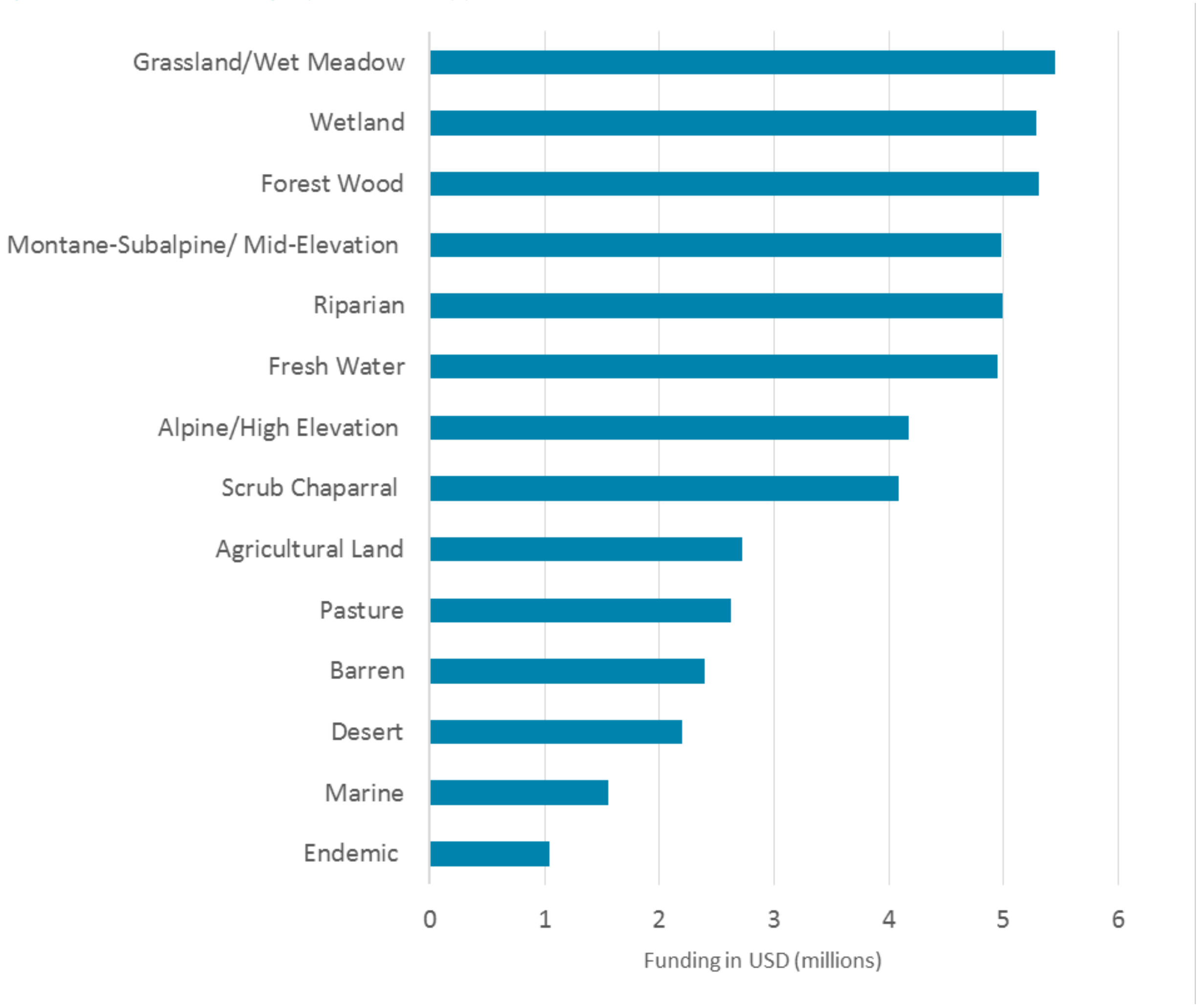
[19] Grants activities addressed a number of land use types including Tribal Lands (lands owned or managed by California’s tribes and tribal governments), Public and Private Lands (lands under multiple classifications including private and public management), Diverse Habitats (project inclusive of diverse types of habitats beyond CDFW’s typical classification, e.g., caves), and those with limited Information (lands which could not be defined by the information shared in a grant).

[20] Please note some grants classified as marine related under habitat type are not necessarily categorized as “marine” for the CDFW and SWAP 2005 regions. For more detailed information on each habitat type, please refer to the following sources, which describes each habitat type in more detail: NatureServe Explorer, “Ecological Classifications,” NatureServe, 2014, 29 Jan. 2015 http://explorer.natureserve.org/classeco.htm; Michael Barber, et al., 3rd ed. Terrestrial Vegetation of California (University California Press, 2007), 29 Jan. 2015 http://www.ucpress.edu/book.php?isbn=9780520249554; CNPS, “Manual of California Vegetation,” California Native Plant Society, 2009, 29 Jan. 2015 http://www.cnps.org/cnps/vegetation/manual.php.

Figure 8: SWG Funding by Habitat Type



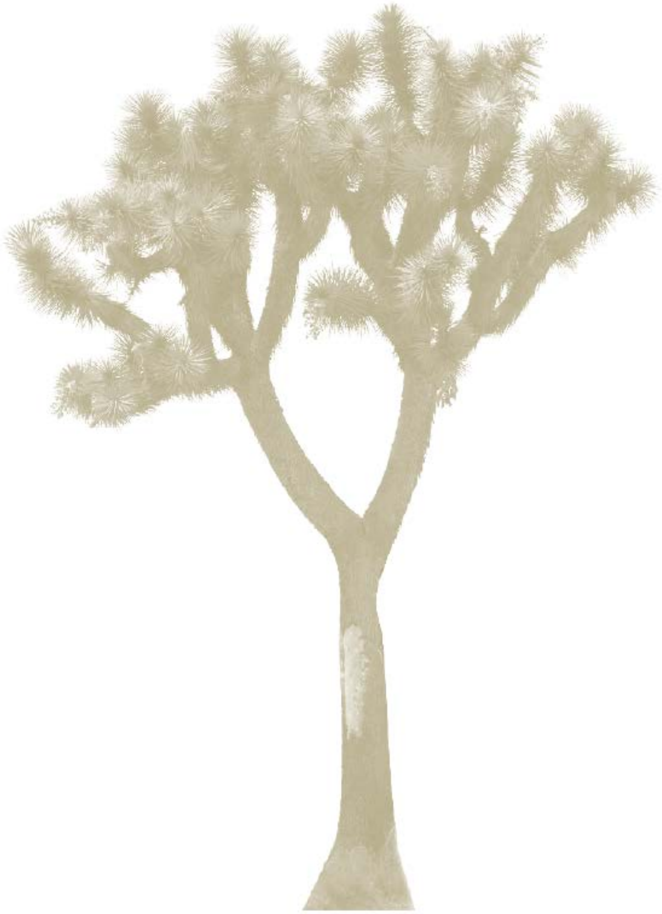
Management Unit

CDFW staff also indicated that grants addressed either Single (managed by one entity) or Multiple Management Units (managed by more than one entity). The vast majority of grants are Multiple Management Units, 94%, with 5% Single Management Unit, and 1% Not Related to a management unit classification.

Landscape Type and Natural Community Base

CDFW staff also categorized grants as Regional, Watershed, or Landscape based, which coincide with differing spatial scales of the grant activities. Ninety-two percent of the 81 grants were Regional, Watershed, or Landscape oriented. Six grants, or 7%, did not address one of these larger scale landscape types; five proposed in 2010 or earlier and another proposed in 2014. The change in focus may indicate a trend towards more regional, watershed, and landscape-based interventions rather than site-specific activities. Additionally, five grants did not have sufficient information to be classified.

CDFW staff indicated that the majority of grants, 83%, had a Natural Community Base, while 17% did not. Four of the grants that did not have Natural Community Base, also were not Regional, Watershed, and Landscape oriented (31%).

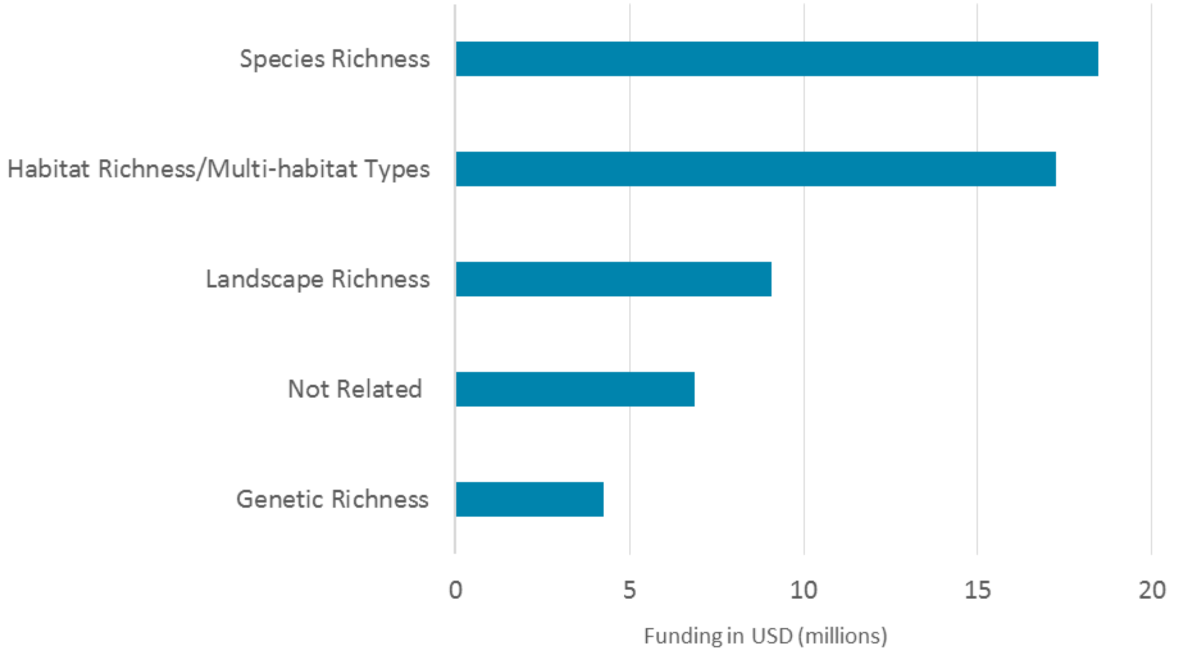


Wikimedia/Wattewyl

Biodiversity

Figure 9 shows the amount of funding by each of the biodiversity categories CDFW staff identified.[21] These two categories together account for roughly 64% of the total funding allocated between 2005 and 2014. Although only six grants were Not Related to biodiversity classifications, this category received roughly 30% more funding than Genetic Richness, which had 35 grants.

Figure 9: SWG Funding by Biodiversity Category



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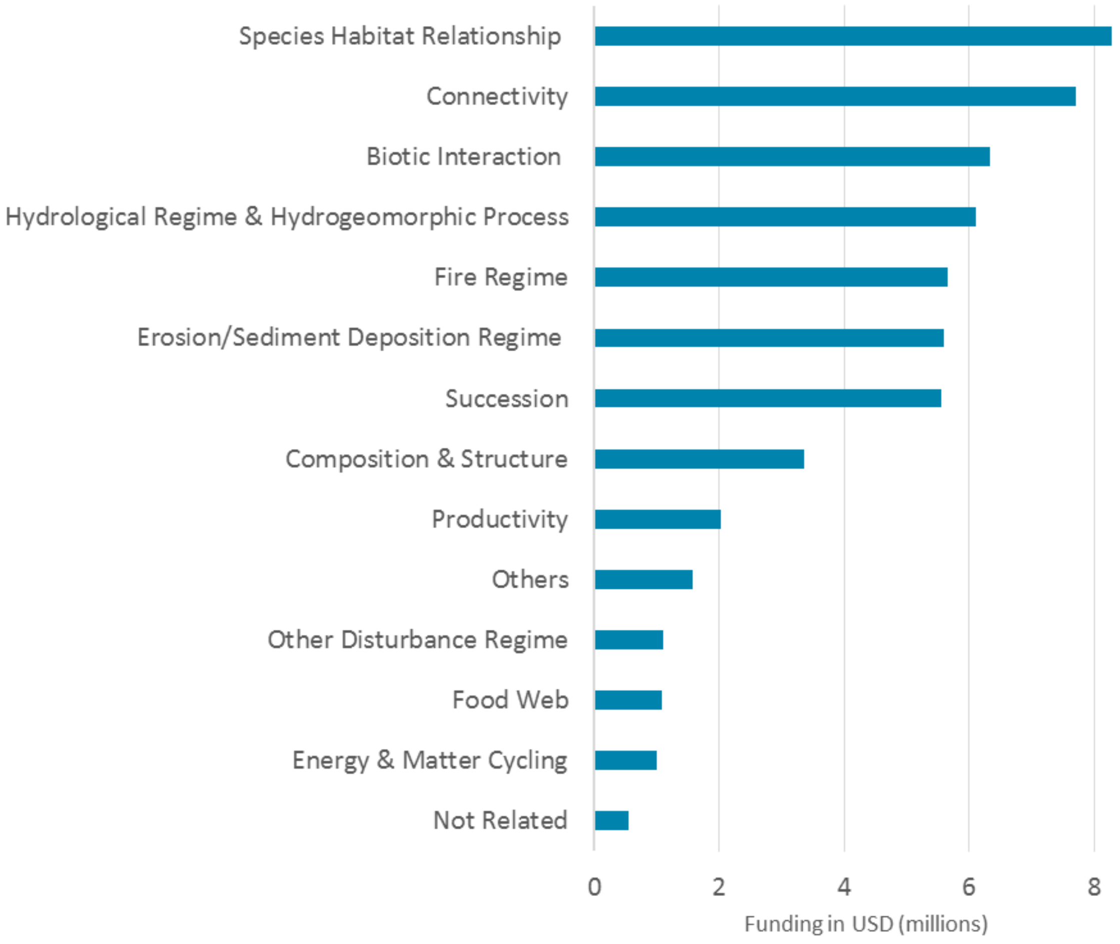
[21] According to Biology Online, ecosystem function can be defined as "The collective intraspecific and interspecific interactions of the biota, such as primary and secondary production and mutualistic relationships. The interactions between organisms and the physical environment, such as nutrient cycling, soil development, water budgeting, and flammability". Biology Online, "Ecosystem Function," Biology Online: Answers to All Your Biology Questions, 2005, 29 Jan. 2015 http://www.biology-online.org/dictionary/Ecosystem_function. In addition, CDFW broadly defined each component of Biodiversity as: **Species Richness**-how many species occur in a specific unit of concern; **Habitat Richness/Multi-habitat Types**-the habitat diversity often expressed within a specific management unit such as structural heterogeneity found within a riparian vegetation or intermingled vegetation within a wetland system; **Landscape Richness**-the level of diversity of divergent communities at a regional scale (e.g., a county or larger) often distinguishable in a satellite image, such as grassland, forest, dune and so on; **Genetic Richness**-the diversity and variation at the genomic level within a species or taxa group; and **Not Related**-grants did not refer to one of the biodiversity components.

Ecosystem Function

Figure 10 shows the amount of funding by ecosystem function, process, and condition categories developed by CDFW staff.[22] Although, the funding level for Composition and Structure is a modest $3,361,161, every 2014 grant touched on this category.

Figure 10: SWG Funding by Ecosystem Function, Process, and Condition Category



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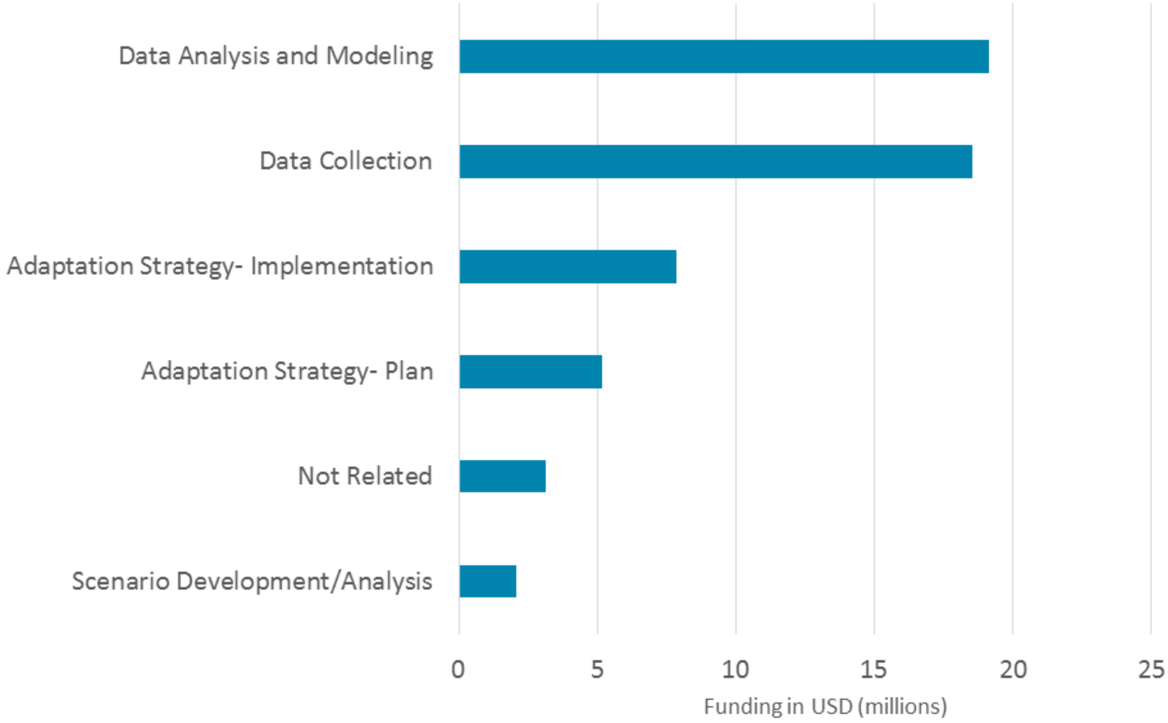
[22] To classify grants by the ecosystem function they addressed, CDFW used the following definition from Biology Online "The collective intraspecific and interspecific interactions of the biota, such as primary and secondary production and mutualistic relationships. The interactions between organisms and the physical environment, such as nutrient cycling, soil development, water budgeting, and flammability". Biology Online, "Ecosystem Function," Biology Online: Answers to All Your Biology Questions, 2005, 29 Jan. 2015 http://www.biology-online.org/dictionary/Ecosystem_function.

Climate Change

Climate change is an important category for the 2015 update and therefore the CDFW wanted to assess how past grant funding increased understanding of or addressed climate change. *Figure 11* shows the amount of funding by climate change categories developed by CDFW staff.

Figure 11: SWG Funding by Climate Change Category



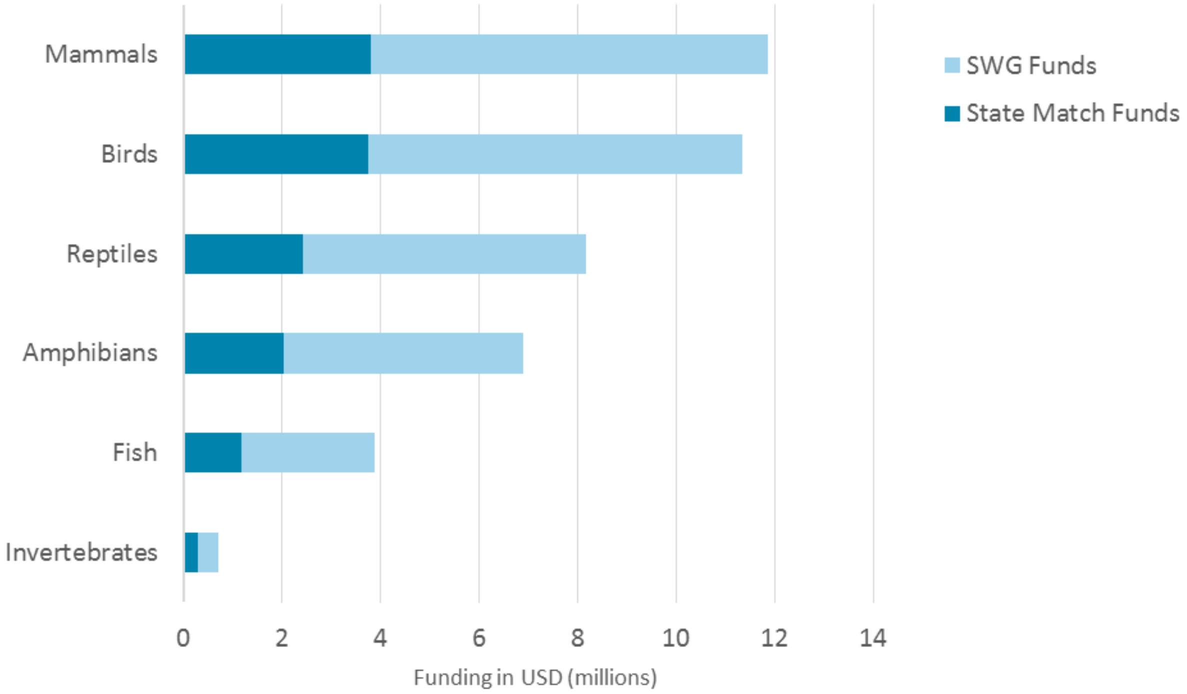
Invasive Species

In addition to climate change, another area of interest for the CDFW is invasive species. Of the grants examined, half of them addressed or involved invasive species. Of the total grants implemented in each period, proportionally more grants addressing invasive species were proposed after 2010 (approximately 50% of grants implemented in the period) than prior to 2010 (approximately 40% of grants implemented in the period).

Grant Analysis by Taxa

In addition to analyzing grants by region and ecosystem, grants were also reviewed as Multiple or Single Species and for specific target taxa groups. Fifty-seven percent of the grants implemented between 2005-2014 focused on Multiple Species, meaning that there was more than one target species that the grant sought to address, while 29% of grants focused on Single Species (for example, targeting Western burrowing owls or Pacific fishers). The remaining 14% of grants could not be classified as Single or Multiple Species because they were not species focused, meaning that they did not identify a specific species. Grant funding for Multiple Species grants was almost $39,370,786 over the last 10 years, which was $34,909,766 more than Single Species grants and $27,236,741 more than non-species specific grants. Twenty-four percent of the grants mentioned other benefiting species in their proposals, meaning that their project might target a single species but may, through implementation of project activities, benefit other species. For example by improving habitat for one species or taxa, other species or taxa may also benefit. *Figure 12* depicts the number of grants and funding by taxa.

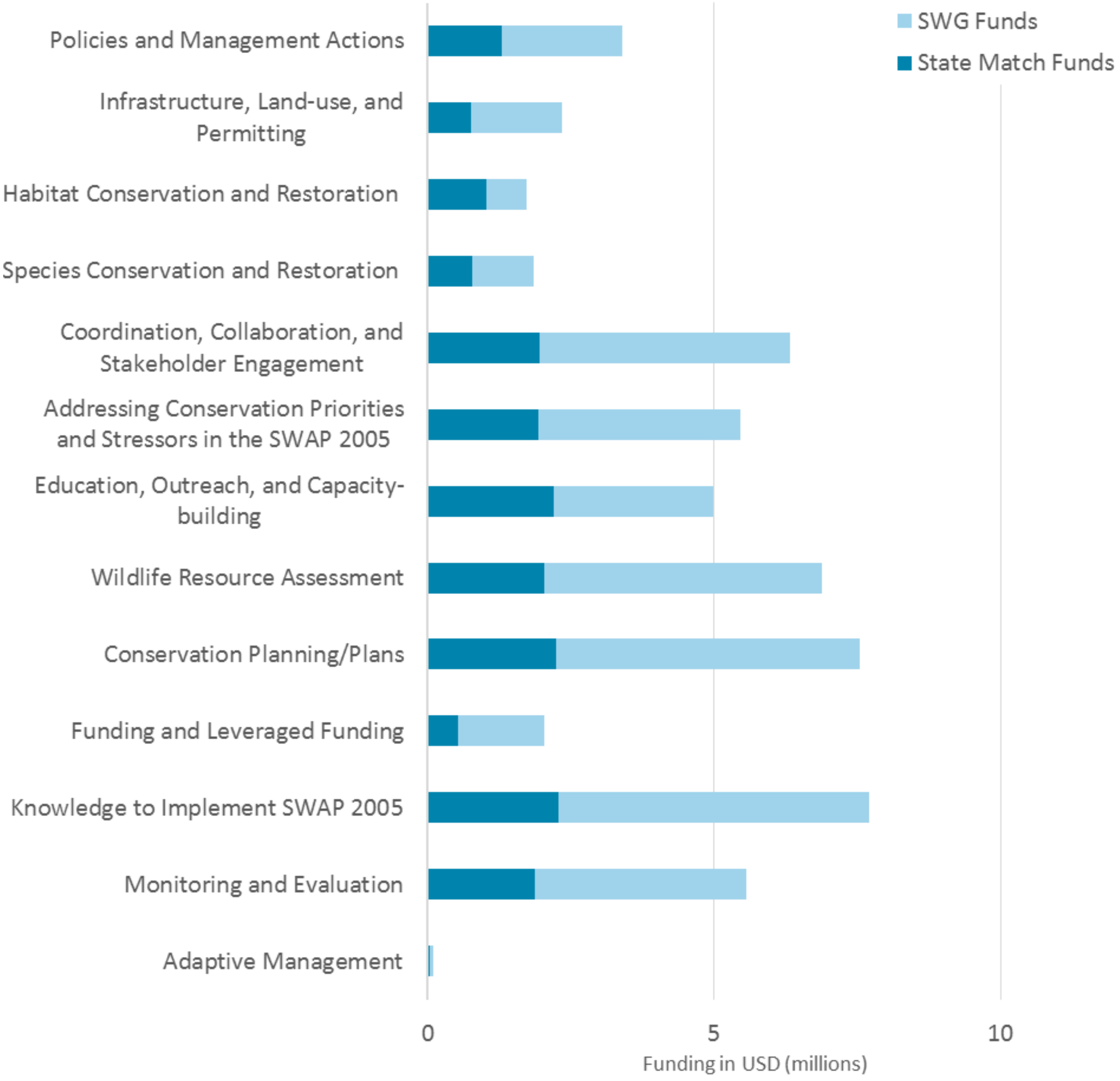
Figure 12: SWG and State Match Funding by Taxa



Grant Analysis by Conservation Action Category

As we shared in the *Purpose and Methodology* section and referenced in the *Evaluation Outcome 1* section, we categorized the SWAP 2005 recommended conservation actions into broader categories, because they were wide ranging, but fall under higher level themes. *Figure 13* presents SWG and State government funding by conservation action category.

Figure 13: SWG and State Match Funding Allocated by Grant Topic within Conservation Action Categories



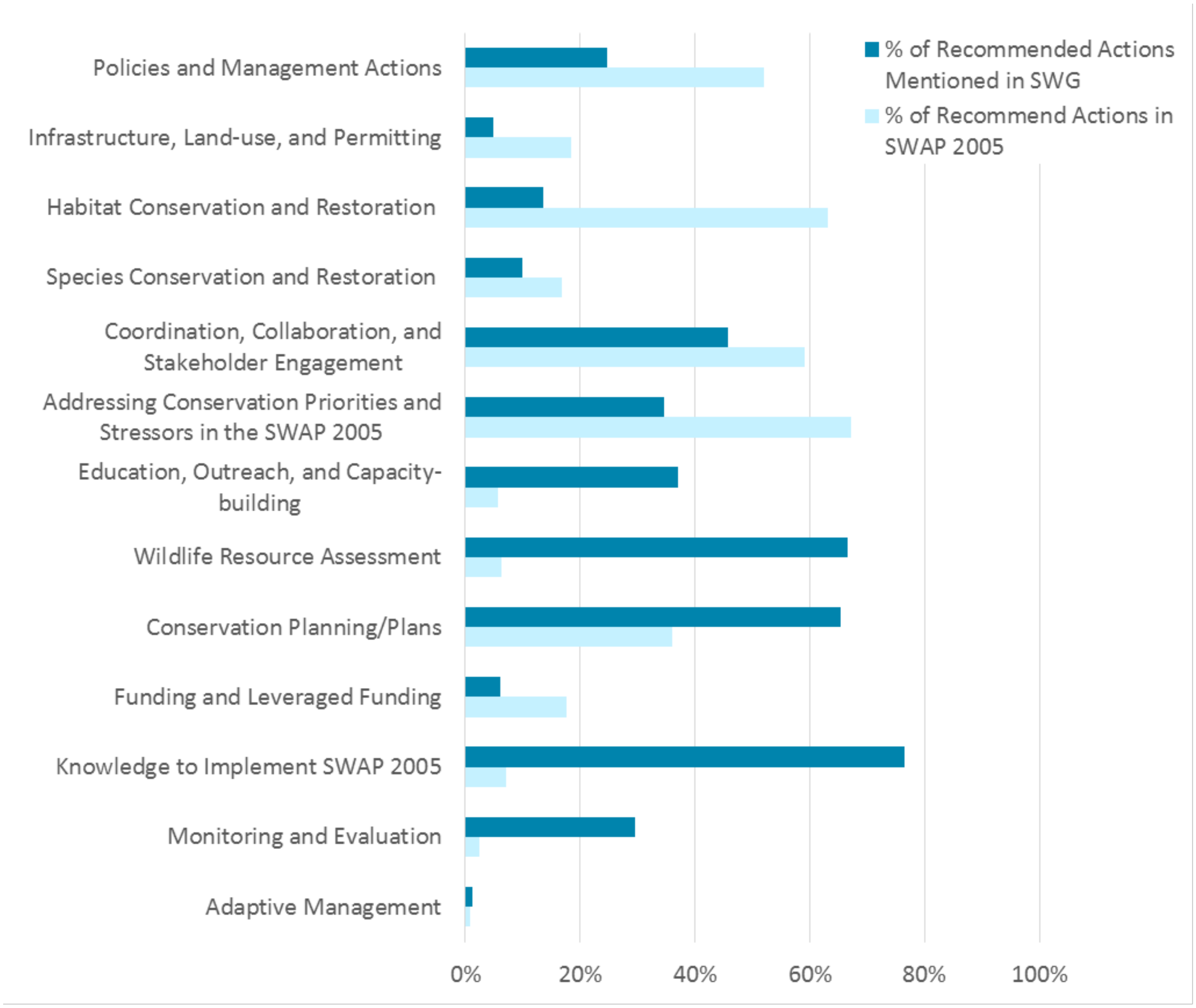
Comparison of SWAP 2005 Conservation Action Categories Addressed by SWG Funded Grants

To analyze conservation actions each SWG funded grant addressed, Blue Earth compared the focus of SWG funded grants against the focus of SWAP 2005 statewide and regional recommended conservation actions. *Figure 14*, shows the percent of recommended conservation actions mentioned in SWG funded grants against the percentage identified in the SWAP 2005. During the evaluation time period, recommended conservation action categories most aligned between SWG funded grants and the SWAP 2005 recommended conservation actions include Coordination, Collaboration, and Stakeholder Engagement, and Adaptive Management (although Adaptive Management was not highlighted as a significant focus for SWG funded grants nor the SWAP 2005).

Little alignment identified between SWG grants' focus and the most recommended conservation action categories—Policies and Management Actions; Habitat Conservation and Restoration; and Addressing Conservation Priorities and Stressors in the SWAP 2005.The biggest discrepancies between the SWAP 2005 and SWG funded grants, noted in *Figure 14*, were Habitat Conservation and Restoration; Education, Outreach, and Capacity-building; Wildlife Resource Assessment; Knowledge to Implement SWAP 2005; and Monitoring and Evaluation.

Although discrepancies exist, some activities such as Wildlife Resource Assessment, Knowledge to Implement SWAP 2005, and Coordination, Collaboration, and Stakeholder Engagement are key enabling actions that were needed to set the stage for State government to implement actions that address conservation priorities and stressors or inform policies and management actions. For example, a number of grants focused on obtaining baseline data that was needed for making informed decisions about specific species and wildlife resources and for developing conservation plans.

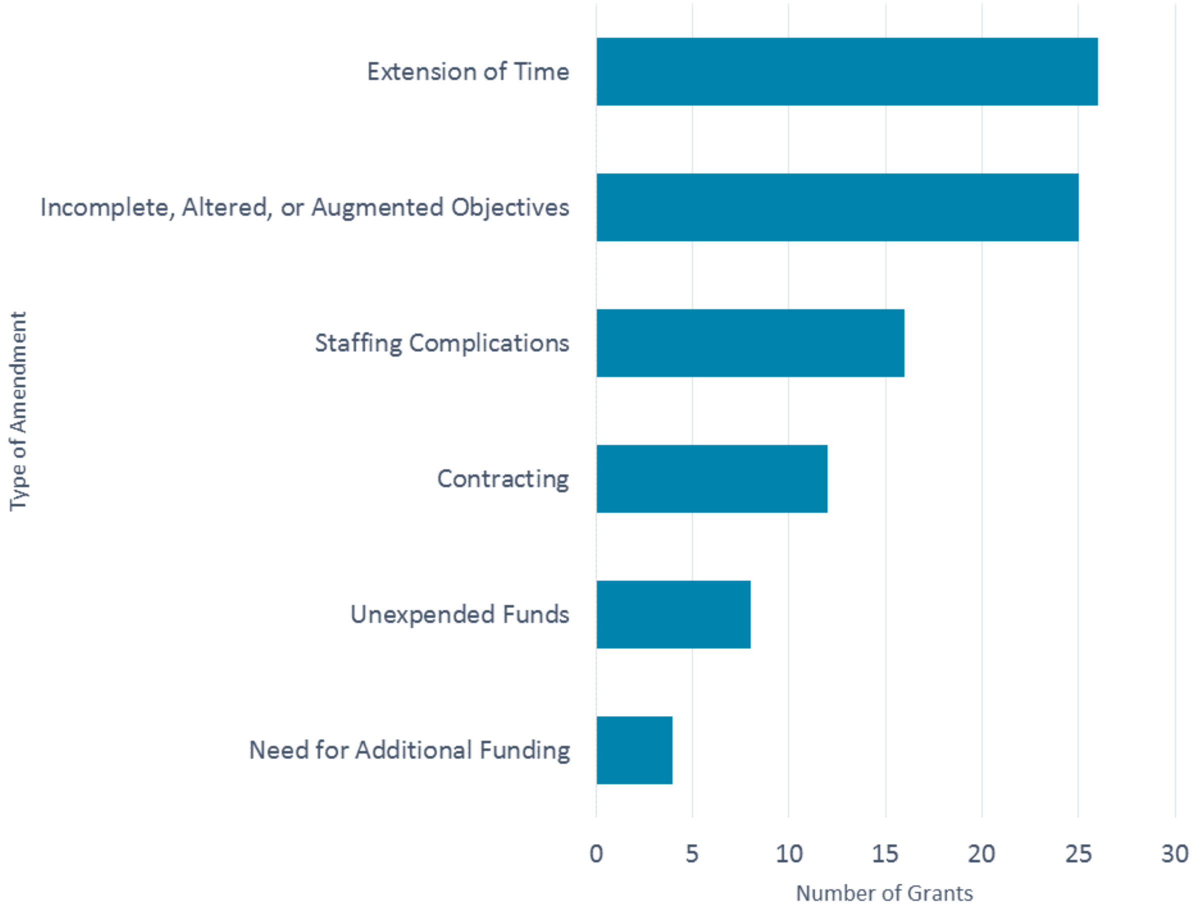
Figure 14: SWAP 2005 Conservation Actions and the Conservation Action Categories Addressed by SWG Projects



Amendments from Original Grant Making

During the SWAP 2005 implementation, a number of grants were amended from their planned objective and timeline. Because no progress reports exist for 2014 grants, we excluded them from our analysis. Out of 69 grants active between 2005 and 2014, 62% received amendments. *Figure 15* shares the number of grants and type of amendment received. Time extensions comprised 60% of all amendments and often resulted from delays in contracting or allocation of budget funds. Altered objectives included shifting the focus of the grant from species to habitat vulnerability, amending objectives to increase project efficiency by including species monitored under multiple projects under one grant, and switching from baited animal trapping to camera monitoring.

Figure 15: Number of Grants by Grant Amendment Type



Text Box 5: Evaluation Outcome 2 Summary: Statewide and Regional State Wildlife Grant Implementation

Evaluation Outcome 2 Summary: Statewide and Regional State Wildlife Grant Implementation

- State government match amount remained relatively consistent across years and grants, despite changes in total SWG funds.
- Thirty-one percent of the SWG funded grants had a statewide focus and received 41% of the total SWG funds.
- Majority of grants (57%) was multi-species focused.
- Grant Analysis by Region:
    - The Statewide or Headquarters CDFW region received consistent funding and grants throughout all regional analysis.
    - Aside from Statewide grants, the Northern CDFW region (Sierra Nevada and Cascade SWAP 2005 region) received the most grants from 2001-2013, while the South Coast and North Central CDFW regions received the most funding.
    - The Marine region (both CDFW and SWAP 2005) received the least amount of funding and number of grants.
- Grant Analysis by Ecosystem: Grassland and Wet Meadow habitats received the most funding, totaling $5.3 million, while a variety of habitat types received approximately $5 million in funding, including Wetland, Forest Wood, Montane-Subalpine/Mid-elevation, Riparian, and Fresh Water.
- Grant Analysis by Taxa: The majority of grants focused on mammals and birds, while invertebrates received the least focus. *Figure 2* shows the SWG and State government match funding allocation by taxa.
- Grant Analysis by Conservation Actions:
    - Strong correlation was identified between activities related to the conservation action categories Wildlife Resource Assessment, Increasing Knowledge to Implement SWAP 2005, and Conservation Planning/Plans. These topics also received the most grants and funding.
    - Activities related to the category Adaptive Management received the least funding and number of grants.
    - Weak correlation was found between conservation actions addressed in SWG objectives and conservation actions mentioned in the SWAP 2005.
- Amendments: The most common amendments included time extensions and incomplete or altered objectives.

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SWAP 2005 Implementation Progress and Outcome Case Studies

Below we present three case studies that share information on three separate species representing taxa groups that received the most SWG funding. Case studies provide information on the Pacific fisher, sage grouse, and Western pond turtle. With these case studies, we seek to show how SWG funded grants are linked to the SWAP 2005 identified wildlife stressors and overall progress outcomes and outputs for each. To select the case studies we identified which taxa received significant SWG funding between 2005-2014 (mammals, birds, and reptiles), identified grants that focused on a representative species within each taxa, and sought to identify key outputs, as well as outcomes from each grant. For each case study we not only reviewed the key outputs and outcomes that were identified in the grant reports, but also sought to find linkages with other statewide or regional planning efforts (HCP/NCCPs), mapping, and policy changes. Our follow-up research included web-based and literature searches and integration of verified interviewee insights. Although we sought to identify outcomes based on SWG funded grants, we could determine resulting activities and outputs, but could not find significant outcomes. For each case study we share, the number of single and multi-species grants implemented, value of implemented grants, objectives, SWAP 2005 stressors addressed, publications, outputs, and key outcomes. The three case studies below provide examples of the types of activities and outcomes performed under SWG funded grants to support each taxa type.

Dreamtime/JSteve Byland

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Case Study 3—SWAP 2005 Implementation Outcome Synthesis for Pacific Fisher

Number of Single and Multi-species Grants: Two single species grants (six multi-species grants)

Total Value of Single Species Grants for the Pacific Fisher: $262,220 in grants supporting specifically Pacific fisher projects (Total value of Pacific fisher grants and multi-species grants that included the Pacific fisher, $22,773,880. Multi-species grants addressed more than 80 additional species and all taxa types.)

Objective: Grant objectives varied among projects, with some common themes including:

- Increase knowledge to implement SWAP 2005 through surveys to inform conservation planning (nine grants)
- Wildlife resource assessments, such as collection of genetic samples to better understand the historical and contemporary connectivity of Pacific fisher populations in California (eight grants)
- Development of species conservation and management plans (eight grants)
- Coordination, collaboration, and stakeholder engagement (six grants)

SWAP 2005 Stressors Addressed:

- Climate change
- Forest management conflicts (North Coast – Klamath; denning trees)

Publications/Outputs: Four publications produced in connection with 10 grants addressing Pacific fisher:

- Facka, A.N., and R.A. Powell. 2010. Fishers released in the Northern Sierra Nevada of California: First year summary and observations. Martens Working Group Newsletter. Volume 17(1): 7-12.
- *Central Coast Lands Inventory Project Report and Biogeographic Information and Observation System (BIOS) Range Map*
- *North Central Region Lands Assessment. Final Report.*[*]
- *Facka, A.N. and R.A. Powell. Reintroduction of fishers into the northern Sierra Nevada of California, Poster presentation, American Society of Mammologists National Meeting, Laramie WY, 2010.*[*]

SWG Informed Outcomes:

- Range and distribution maps updated and made available in BIOS to inform planning and management
- Population status baselines completed
- Samples collected in Humboldt and Mendocino counties for future analysis of genetic diversity and population connectivity of California populations
- Assessment and ongoing (thru 2019) implementation of translocation project to test potential new sites, reproductive success, survival, and mortality of Pacific fisher
- Data collected to potentially inform HCP/NCCP plans in the North Coast-Klamath and Sierra Nevada and Cascades regions
- Reproductive success identified as a potential outcome on Hoopa reservation; however, a report was not produced resulting from the grant to indicate whether success has been achieved
- Development of agency and private landowner partnership within project areas to secure access to lands for the placement of camera stations

* Italics indicate additional documents referenced in grants that were not publically available.

Case Study 4—SWAP 2005 Implementation Outcome Synthesis for Sage Grouse

Number of Single and Multi-species Grants: Two single species grants (three multi-species grants)

Total Value of Single Species Grants for the Sage Grouse: $601,499 in grants supporting specifically sage grouse (Total value of sage grouse grants and multi-species grants that included the sage grouse, $7,298,637. Multi-species grants addressed more than 50 additional species and all but two taxa types.)

Objective: Grant objectives varied among grant projects, with some common themes including:

- Increase knowledge to implement SWAP 2005 through inventory assessments and monitoring efforts (five grants)
- Develop sage grouse habitat management and conservation recommendations for use in conservation planning (four grants)
- Perform wildlife resource assessments including collection of important data, such as nest success, survival seasonal movements, and habitat use, on resident and translocated sage grouse (four grants)

SWAP 2005 Stressors Addressed:

- Growth and land development, altered fire regimes, excessive livestock grazing (Sierra Nevada and Cascades)
- Forest management conflicts (Modoc Plateau)
- Multiple uses conflicting with wildlife on public lands (Mojave Desert)
- Western juniper expansion (Modoc Plateau)

Publications: Two publications produced in connection with five grants, including:

- Davis, D. M., and K. P. Reese. 2012. *Population Structure of Greater Sage Grouse: A Study of Dispersal and Genetic Variation in California*. June, 2012 Final Progress Report. 154pp.
- Tebbenkamp, J., K. P. Reese, and L. P. Waits. 2011. *Landscape effects on genetic structure and vital rates of greater Sage Grouse in Mono County, California*. December, 2011 Annual Progress Report. 25pp.

SWG Informed Outcomes:

- Collected information needed to objectively develop and assess conservation efforts, guide management and restoration activities, and understand the relative importance of conservation actions in the face of an emerging disease impacting isolated populations of genetically-unique sage grouse.
- Provided guidelines for habitat characteristics that increase the likelihood of survival and reproductive success for the species.
- Enabled better integration, coordination, and communication of conservation actions and monitoring priorities within the South Coast Region between CDFW programs, wildlife agencies, stakeholders, and the public and at multiple spatial scales (e.g., reserves, regional preserves, and entire ecoregions).
- Used information generated to evaluate and implement HCP/NCCPs throughout the State.

Case Study 5—SWAP 2005 Implementation Outcome Synthesis for Western Pond Turtle

Number of Single and Multi-species Grants: One single species grants (seven multi-species grants)

Total Value of Single Species Grants for the Western Pond Turtle: $271,507 in grants supporting specifically Western pond turtle (Total value of Western pond turtle grants and multi-species grants that included the Western pond turtle, $11,638,247. Multi-species grants addressed more than 40 additional species and all taxa types.)

Objective: Grant objectives varied among grant projects, with some common themes including:

- Supported education, outreach, and capacity-building by educating the public about the importance of Western pond turtle conservation and by providing resource managers and researchers with current information on the distribution status, ecology, and conservation/management needs for populations of Western pond turtles (five grants)
- Developed conservation plans, such as a comprehensive Western Pond Turtle Conservation Strategy for California (five grants)
- Increased knowledge to implement SWAP 2005 through the collection of wildlife survey data that can inform conservation decisions (four grants)
- Implemented an evaluation process and put tools in place to assess progress by integrating monitoring results and other learnings into decision-making through the development of a systematic data collection and assessment reporting protocol and data management procedures (four grants)

SWAP 2005 Stressors Addressed:

- Multiple uses conflicting with wildlife on public lands (Mojave Desert)
- Growth and land development, altered fire regimes, excessive livestock grazing (Sierra Nevada and Cascades)
- Climate change (Sierra Nevada and Cascades)

Publications/Outputs: No Publications

Challenges: Grants related to the Western pond turtle provide a good example of grants that did not meet their stated objectives. For example, the grant “Development of a Conservation Strategy for the Western Pond Turtle” intended to create a comprehensive conservation strategy; however, due to performance issues with the CDFW contractor a draft final version was delivered almost a year late, which limited the CDFW’s ability to provide input into the development of the document. Because of the delay, the CDFW altered the focus of the final document from a formal conservation strategy to an informal informational document titled “California’s Western Pond Turtle: Conservation Issues and Options.” Blue Earth’s attempts to locate the document on the CDFW website have been unsuccessful.

SWG Informed Outcomes:

- CDFW biologists and regional turtle experts provided input into the development of the document.
- Information generated from these grants supported HCP/NCCPs evaluation and implementation throughout the State.
- Increased awareness and understanding of the Western pond turtle’s biology and resource requirements; provided standardized methods for investigating, monitoring, and reporting the Western pond turtle’s success; and described research needs related to turtle conservation.

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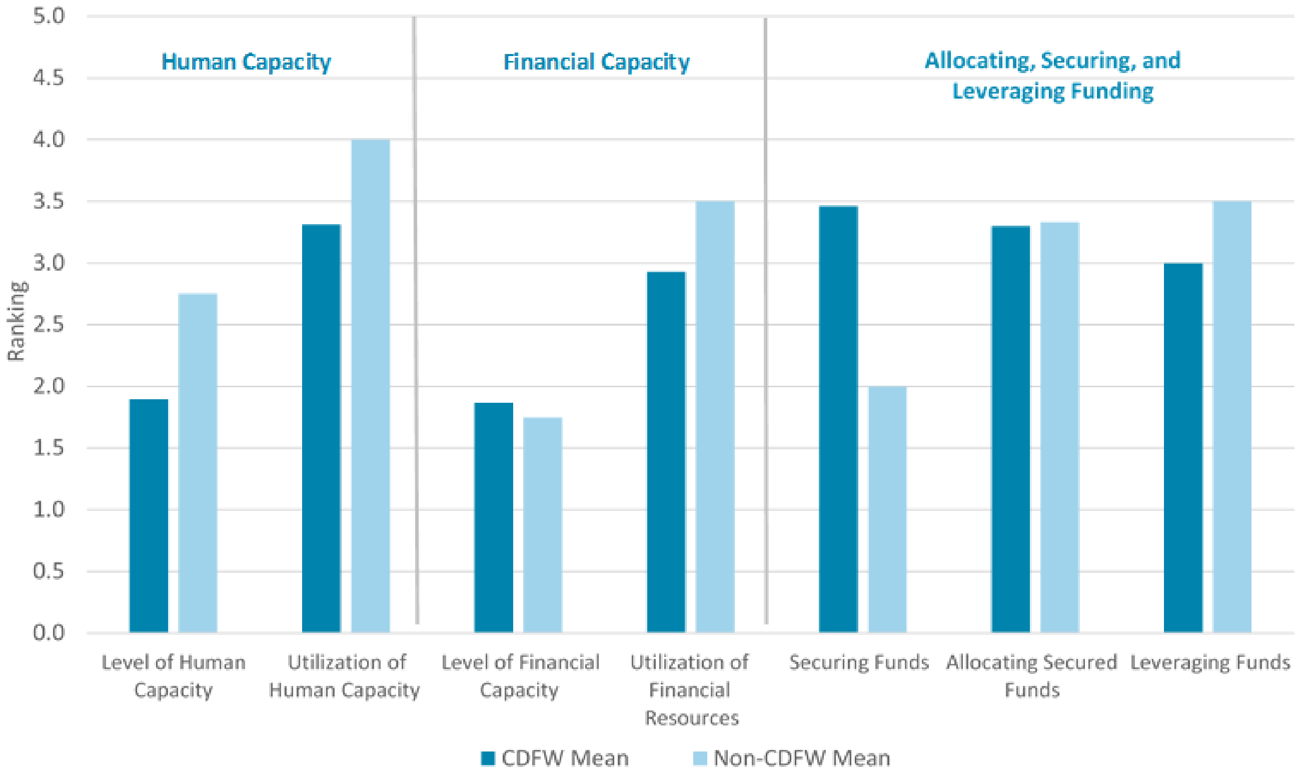
Evaluation Outcome 3 and 4: SWAP Implementation Effectiveness, Strengths, and Areas for Improvement

In this section we present findings regarding how effective and successful interviewees perceived State government was in implementing SWAP 2005 recommended conservation actions, including its human and financial capacity, ability to leverage additional human and financial resources, efficiency, strengths, areas for improvement, opportunities, gaps for effective implementation, and obstacles for implementation. See Text Box 6 at the end of this section for a summary of key findings presented in this section.

Effectiveness Implementing the SWAP 2005

This section shares our findings on effectiveness including the CDFW's human and financial capacity, strengths, areas of improvement, opportunities, and challenges, based on document review, interviews, and web-based research. Blue Earth asked interviewees seven questions focused on evaluating State government's effectiveness in implementing the SWAP 2005 on a scale of 1-5, **1 being ineffective and 5 being most effective**. In *Figure 16*, we show the average ranking CDFW and non-CDFW interviewee provided for each of these questions. Overall, CDFW and non-CDFW interviewee responses were similar, with an average effectiveness ranking across all effectiveness categories of just below 3 out of 5 (CDFW averaging a 2.8 and non-CDFW averaging a 3.0).

Figure 16: Mean CDFW and Non-CDFW Staff Perception of State Government's Effectiveness Implementing the SWAP 2005



Key: Scale of 1-5, 1 being ineffective or low and 5 being most effective or high

Human Capacity

A strong majority of CDFW and non-CDFW interviewees indicated State government’s level of human capacity was ineffective. CDFW interviewees’ mean ranking for the level of human capacity was 1.9, while non-CDFW interviewees’ mean was 2.8. Both CDFW and non-CDFW interviewees stated that while the CDFW has some big picture ideas, they have an inadequate number of staff to implement actions, often citing the recent recession and limited State government funding for increasing staff numbers. Interviewees also stressed that the CDFW consists of very dedicated staff who do the best with their resources, but given the size and complexity of a state like California, staffing is insufficient to implement conservation actions.

When asked how efficiently State government utilized its available human resources and capacity, interviewees were positive, particularly non-CDFW interviewees who had a mean response of 4, the highest of any category. CDFW interviewees indicated State government has been moderately effective, with a mean ranking of 3.3. In general, interviewees explained that State government has performed relatively well in terms of utilizing its available human capacity to implement the SWAP 2005, especially given the implementation coincided with an economic recession, which limited the ability to increase human capacity. Again, interviewees stressed that the high level of commitment of CDFW staff and a strong drive to implement important natural resource management actions coincided with more effective utilization of limited staff resources and capacity.

Financial Capacity

Both CDFW and non-CDFW interviewees ranked State government’s level of financial capacity just below a mean of 2, which was the lowest of any category, and indicates the level of financial capacity was insufficient. Interviewees explained that the CDFW struggles to obtain funding each year and described the financial capacity as low and just “squeaking” along, making it challenging to manage the State’s natural resources properly. Conversely, when interviewees’ were asked how efficiently State government utilized its available financial resources, CDFW interviewees ranked State government’s effectiveness just below 3 out of 5, or moderately effective, while non-CDFW interviewees ranked effectiveness at 3.5 out of 5, indicating State government has been somewhat effective. Interviewees stated that utilization of financial resources was decent, but could be improved by developing strategic planning for the use of funds for specific gaps and needs, rather than based on opportunity.

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Allocating, Securing, and Leveraging Funding

A divergence existed between CDFW and non-CDFW interviewees’ views on the effectiveness of State government securing funds. The majority of CDFW interviewees thought State government has been effective in securing funds, ranking effectiveness at a mean of 3.5 out of 5, while non-CDFW interviewees ranked effectiveness at a mean of 2, which indicates a lack of effectiveness. One non-CDFW interviewee expressed that securing funds had been inconsistent and had been specifically difficult to obtain for certain habitats and species and also noted that there was likely more consistent funding for terrestrial habitats and species than marine species. A CDFW interviewee stressed that the CDFW has done a good job securing funds for needed projects, despite severe limitations in staff capacity and available time.

CDFW and non-CDFW interviewees' had very similar responses to State government's effectiveness in allocating secured funds to support the implementation of the SWAP 2005, both groups of interviewees ranked State government at a 3.3 out of 5, indicating State government was moderately effective allocating secured funds. Interviewees mentioned that there was a need for a more holistic vision of how the SWAP is utilized across the State and aligned with other plans and activities in the State so that the CDFW and other partners could allocate funds effectively for priority issues across the State. Furthermore, several interviewees provided general feedback on how to improve allocation of secured funds identifying significant bottlenecks in terms of allocating secured SWG funds for implementation of SWG projects, hiring temporary or permanent staff, securing matching funds, obtaining necessary equipment for research, contracting, and general deployment of resources.

In addition to State government's effectiveness leveraging and allocating funding, interviewees ranked how effective State government was at leveraging funding. Non-CDFW interviewees had a slightly more positive response to the State's effectiveness leveraging funds with a mean of 3.5, than CDFW staff whose mean was 3 out of 5. One interviewee identified the great grey owl project as very successful leveraging and distributing ESA Section 6 grant funds every year evenly across the Klamath region. Alternatively, another interviewee highlighted that State government was not effective at leveraging funds, but rather specific programs and colleagues had done a very good job at leveraging and securing outside funds to support the implementation of the SWAP.

Implementation Strengths, Areas of Improvement, Opportunities, and Challenges

In this section, we share interviewees' perception of State government's key strengths, areas of improvement, opportunities, and challenges for implementing SWAP 2005. For each topic, informants spoke more generally about the CDFW's effectiveness and the implementation of the SWAP 2005. *Figure 17* provides a summary of this analysis and is followed by more in-depth descriptions of each category.

Figure 17: State's Strengths, Areas of Improvement, Opportunities, and Challenges for Implementing the SWAP

Strengths (Current)

- Development of Applied Science and Research
- Dedicated Staff with Topical Knowledge and Expertise
- SWAP 2005 Implemented Through Internal and External Collaboration
- Federal Funding Accessed Successfully

Areas of Improvement (Current)

- Limited Financial Capacity
- Lack Sufficient Human Capacity
- Lack Clear Conservation Priorities, Objectives, and Metrics to Measure Progress
- Complex and Inefficient Bureaucratic Process Including SWG Application and Administration

Opportunities (Future)

- Develop Clear Achievable Priorities, Objectives, and Metrics to Measure Progress
- Streamline Grant-Making Process
- Improve Education about SWAP
- Increase Collaboration and Communication with Other Partners
- Use SWAP to Guide and Leverage New Sources of Funding

Challenges (Future)

- Limited/Insufficient Human and Financial Resources to Implement SWAP
- Political Opposition
- Policy Reform
- Adverse Environmental Changes Outside Of CDFW Control
- Potential Interagency Conflicts or Lack of Engagement

SWAP 2005 Implementation Strengths (Current)

Blue Earth collected input on the overall strengths of the SWAP 2005 implementation from interviewees. In general, interviewees indicated strengths related to science and research, dedicated CDFW staff, strong internal and external collaboration, and the CDFW's ability to access Federal funding. Below we share several overarching strengths interviewees expressed related to the implementation of the SWAP 2005.

Development of Applied Science and Research

One of the dominant strengths identified for the SWAP 2005 implementation was the development of applied science and research. Interviewees indicated that the CDFW focused support for applied science and research related to conservation in California, and in many cases is leading other states in terms of data analysis related to biodiversity and connectivity despite the size and relatively high biodiversity in California. For example, interviewees identified research and surveys focused on bank swallow and yellow-billed cuckoo populations. Even with funding, staffing, and contractual limitations mentioned in the areas of improvement below, interviewees identified important conservation science and research developed through the SWAP that informs the CDFW and other conservation planning and decision-making.

Dedicated Staff with Topical Knowledge and Expertise

Related to the development of applied science and research, interviewees stressed the level of dedicated staff with topical knowledge and expertise as a significant strength of the CDFW and the SWAP 2005 implementation. CDFW staffs' expansive regional and statewide expertise and knowledge of species and habitats has enabled effective implementation of a variety of grants. Interviewees also emphasized that CDFW staff and its partners were dedicated individuals performing effective and relevant conservation science.

SWAP 2005 Implemented Through Internal and External Collaboration

Interviewees mentioned that one of the most effective ways the CDFW implemented the SWAP 2005 was through collaborative efforts, both internally and externally. They enabled successful implementation of grants even with limited available resources. Internally, interviewees highlighted successful collaboration across branches. Externally, interviewees indicated strong interagency and inter-state collaboration between California and Federal agencies, which resulted in effective knowledge sharing. Interviewees also stressed that the SWAP 2005 took into account current restoration or conservation projects, plans, and activities already in place. One interviewee specifically mentioned the SWAP 2005 successfully built off previous restoration plans, such as the Southern California Wetlands Recovery Project, that was already in place before the development of SWAP 2005. Furthermore, since the implementation of the SWAP 2005, SWAP related projects have supported development of NCCPs/HCPs throughout the State. In addition, other planning efforts and plans identified the SWAP 2005 as a key planning document, such as the California Water Plan and the Forest and Rangeland Assessment.

Federal Funding Accessed Successfully

Most interviewees indicated progress made for funding availability, specifically through Federal funding opportunities under the SWG program to support conservation projects. Furthermore, interviewees indicated that there are many other sources supporting identified recommended conservation actions including, but not limited to, ESA Section 6 grants, Pittman-Robertson Federal Aid in Wildlife Restoration Act, and USFWS Wildlife and Sport Fish Restoration program grants.

SWAP 2005 Implementation Areas of Improvement (Current)

While the implementation of the SWAP 2005 did have some overarching strengths, Blue Earth also collected input on specific areas of improvement that may have limited the successful implementation of the SWAP. In general, interviewees mentioned challenges related to funding, staff capacity, lack of defined SWAP 2005 priorities and objectives, and lack of metrics to measure progress.

Limited Financial Capacity

One of the primary factors limiting the success of the SWAP 2005 implementation was a lack of sufficient funds to meet the ambitious set of recommended conservation actions identified in the SWAP 2005. Interviewees indicated that adequate budgets were continuously a limiting factor, specifically match requirements for State government to access Federal funding through the SWG. While it was recognized that some of the grants were administered during a recession, some changes in funding use, such as limitations on vehicle purchases and hiring staff, inhibited implementation success. In addition, lack of awareness regarding SWAP 2005 recommended conservation actions and opportunities to partner with State government may have limited engagement with external agencies, potential funders, and NGOs.

Lack Sufficient Human Capacity

Similar to funding limitations, interviewees indicated a lack of sufficient staff and human capacity for implementing the SWAP 2005, as well as other CDFW programs. Moreover, interviewees indicated California’s size and significant conservation needs, stressed already limited human resources. In addition, limitations on how funding could be utilized did not allow SWG funding to hire staff to fulfill certain positions, and contracting limitations for personnel services further reduced implementation success.

Lack Clear Conservation Priorities, Objectives, and Metrics to Measure Progress

Interviewees thought the intent of SWAP 2005 was good, but frequently struggled to articulate the success or failure of the SWAP 2005 implementation because it lacked clear conservation priorities, objectives, and metrics to measure progress. Interviewees also stated the conservation actions were often general and poorly defined. Staff at the regional scale articulated that the SWAP 2005 had limited utility for day-to-day work and for guiding long-range regional actions. Similarly, interviewees found it difficult to evaluate the implementation of the SWAP 2005 because it lacked objectives or metrics to measure progress for assessing success over the last decade. Interviewees indicated that challenges related to a lack of clear conservation priorities and objectives may have been the result of not having a SWAP program home or champion within CDFW leadership, to foster greater uptake and support accountability for implementing recommended conservation actions.

Complex and Inefficient Bureaucratic Process Including SWG Application and Administration

Interviewees repeatedly cited general bureaucratic processes as an implementation weakness of the SWAP 2005 implementation. Specific government inefficiencies and institutional barriers mentioned by interviewees included contracts between government agencies and NGOs, legal documentation, permitting, working across jurisdictions, granting, and funding processes. One interviewee indicated that it was relatively easy to obtain grant funding, but the process of allocating and spending those funds was difficult. In some situations, delayed contracting resulted in amendments to SWG funded grants, and in some rare cases, resulted in the CDFW returning funding to the USFWS that could not be spent. In one instance, due to government inefficiencies, volunteers administered one grant almost entirely.

SWAP 2015 Update Opportunities (Future)

Moving forward there are several opportunities for the SWAP 2015 update to improve upon previous implementation efforts. Key overarching opportunities include developing more refined and clear priorities and metrics to measure progress, streamlining the grant-making process, improving education opportunities and knowledge about the SWAP, and further improving collaboration and communication with partners.

Develop Clear Achievable Priorities, Objectives, and Metrics to Measure Progress

While monitoring and evaluation has occurred within some regions of the State, many interviewees were unfamiliar with such efforts. Therefore, to better assess the implementation of the SWAP in the future, nearly all interviewees stressed the need to develop specific SWAP 2015 goals, priorities, objectives, and metrics to measure progress that are tracked to determine the effectiveness of the SWAP 2015 implementation. Once clear metrics to measure progress and regular evaluation of grants are established, the CDFW could regularly evaluate the effectiveness of grants and adaptively manage implementation accordingly. To implement SWAP 2015 and strengthen accountability, interviewees stressed the need for a leadership champion, which could direct resources towards priority projects and ensure SWAP 2015 statewide and regional implementation.

Streamline Grant-Making Process

Interviewees stressed the need and opportunity to improve the grant-making process. Interviewees specifically mentioned a need to increase awareness about available grants, provide sufficient training to develop robust proposals, and provide feedback on rejected grants. Moreover, the grant proposals could make applicants identify metrics to measure progress for grant activities and identify project partners or leveraged funding to support implementation.

Improve Education about SWAP

Because SWAP updates occur every 10 years, a potential gap in knowledge and awareness of the SWAP could develop between updates. One way CDFW staff knowledge could improve is through routine education and outreach or annual progress updates that show progress, success, and benefits of implementing SWAP recommended conservation actions. Updates could demonstrate how the SWAP is used, examples of how it links with other conservation efforts, and any successful SWG projects.

Increase Collaboration and Communication with Other Partners

Because resource limitations inhibit implementation, interviewees identified increasing collaboration and communication within the CDFW and externally with other agencies, partners, and stakeholders as a significant opportunity for improving future SWAP 2015 implementation. While the CDFW developed the SWAP 2005 and its update, because of its scope, many agencies and groups could play a role in its implementation. Interviewees indicates strong support for developing and implementing the SWAP 2015 companion plans, which will help align and leverage similar local, State, regional, and Federal conservation efforts in California, such as the WCB efforts, HCPs, and NCCPs.

Use SWAP to Guide and Leverage New Sources of Funding

In addition to increasing collaboration, the updated SWAP could also be used to help set the context and strategic direction of habitat and wildlife conservation and restoration efforts more broadly and help inform use of funding to support these efforts for the State, as well as among partners (both government and non-government). For example, strategies and priorities set in the SWAP 2015 could guide allocations of the 2014 Water Bond wildlife and habitat conservation and restoration funding. In addition, by articulating the goals and objectives of the SWAP 2015 and aligning it with other ongoing efforts, the SWAP 2015 could help others identify how their support could foster implementation moving forward.

SWAP 2015 Update Challenges (Future)

Interviewees identified a number of potential challenges, which could affect the implementation of the SWAP 2015. Specific challenges mentioned include insufficient human and financial resources, political opposition, policy reform, adverse environmental changes, and interagency conflicts. While some of the challenges highlighted may be out of the control of the CDFW, it is important to acknowledge these challenges and develop ways to adapt and address them as they arise.

Limited/Insufficient Human and Financial Resources to Implement SWAP

As mentioned previously, one area of improvement from the SWAP 2005 implementation was a lack of sufficient human and financial capacity and resources to meet the broad scale objectives of the SWAP 2005. Similarly, moving forward, lack of sufficient human and financial resources could impede the successful implementation of the SWAP 2015 by further limiting the CDFW's ability to implement conservation actions as well as limiting its ability to engage and leverage partner support for implementation successfully.

Political Opposition

Interviewees identified political opposition as potential risks for implementing the SWAP 2015 because public opposition to certain conservation actions and activities may hinder implementation or reduce the effectiveness of implementing recommended conservation actions. Interviewees indicated that California is particularly sensitive to political opposition.

Policy Reform

Interviewees identified policy reform as potential risks for implementing the SWAP 2015 because reforms that relax existing regulations may hinder implementation or reduce the effectiveness of implementing recommended conservation actions. Furthermore, approval of regulations or policies that are not in the best interest of conservation, could negatively affect the implementation of the SWAP 2015. Interviewees indicated that California is particularly sensitive to reforms that weaken environmental regulations, such as potential reforms to the California Environmental Quality Act, because of the demand for growth and development as well as its link to economic development.

Adverse Environmental Changes Outside Of CDFW Control

Numerous environmental changes outside of the CDFW and other agencies' control, such as wildfires, drought, and climate change, pose a risk to wildlife and habitats. The increased risk of adverse environmental changes could impede the efficacy of conservation actions, including Species and Habitat Conservation and Restoration.

Potential Interagency Conflicts or Lack of Engagement

Given that conservation actions often intersect other State and Federal agency jurisdictions (for example, Caltrans, United States Bureau of Land Management, United States Army Corps of Engineers, and U.S. Department of Energy), engagement and collaboration is important for implementing the SWAP 2015 as well as ensuring that key enabling conditions are in place to support success. Moving forward it will be important to foster communication and engagement with these agencies to implement the broad range of conservation strategies outlined in the SWAP 2015.

Ways to Address Key Areas of Improvement and Challenges

Interviewees mentioned a variety of challenges and bottlenecks associated with the implementation of the SWAP 2005. Below we share these overarching challenges and potential solutions for overcoming these challenges moving forward.

Limited Staff Capacity and Human Resources Limitations: To overcome staff capacity and human resource limitations, interviewees stated that CDFW leadership could encourage and potentially mandate implementation and integration of the SWAP 2015 actions in day-to-day operations. In addition, leadership could increase staff accountability by assigning specific staff to drive implementation, act as a point person for grant proposal development and administration, as well as oversee monitoring and evaluation activities related to grants, conservation actions, and overall implementation of the SWAP 2015 in accordance with the eight required SWAP elements (see page 3 for more detail). Furthermore, where priorities align with the CDFW's overall mandate, there is an opportunity to reallocate resources (financial and human) towards priorities to focus and more efficiently utilize the CDFW's resources. Given that human resources will likely remain limited in the future, engagement with partners and leveraging their additional staff and financial capacity could alleviate this challenge.

Lack Clear Priorities and Measureable Actions: As stated in previous sections, one of the primary shortfalls of the SWAP 2005 implementation was a lack of strategic priorities; measurable, achievable

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goals to guide the direction of the SWAP 2005; and clear metrics to measure progress. To overcome this challenge, interviewees suggested distilling the SWAP 2015 recommended conservation actions into a set of very specific recommended conservation actions for the next 10 years, which could be easily referenced and reviewed. Once clear priorities are identified, metrics to measure progress can be developed to assess progress and increase accountability for implementing the SWAP 2015 and SWG projects. In addition, the interviewees suggested leveraging the SWG with other grant opportunities, such as ESA Section 6 grants, to identify projects that benefit both SGCN as well as endangered species.

Complex Grant Administration and Bureaucracy: Interviewees had several recommendations to alleviate the challenges associated with grant administrative processes, bureaucracy, and improve future implementation of the SWAP 2015. Specifically, interviewees suggested establishing consistent statewide processes, forms, and templates for grants; sharing all up-to-date documents on a website or grant page that is updated regularly and easily accessible by grant applicants and recipients; providing grant administrative support and training to SWG recipients; articulating clear objectives and metrics to measure progress in grant applications; developing more efficient and flexible processes for spending and allocating grant funds; identifying opportunities and processes for obtaining matching funds; streamlining the contracting process with outside organizations; establishing a clear lead for each grant that is accountable for grant performance; and providing grant applicants with feedback and rational for rejected grants.

Limited Communication and Collaboration: Interviewees indicated that communication and collaboration was both a challenge and a weakness during the implementation of the SWAP 2005; however, to ensure that the implementation of the SWAP 2015 meets its intent, interviewees stressed the need for continued focus on communication and collaboration. Interviewees specifically mentioned communication and collaboration could be improved by increasing interactions and partnerships with external groups (agencies, NGOs, private sector, and the public); developing opportunities for inter-agency interactions such as webinars and regular meetings; integrating SWAP implementation into other statewide strategies to increase engagement and implementation of synergistic actions; and building off of existing programs and initiatives to avoid duplication of efforts, such as working with local agencies through HCP/ NCCPs. Encouraging and incentivizing staff to collaborate across divisions or with outside groups could also simplify processes and reduce duplication of efforts within the CDFW and externally.

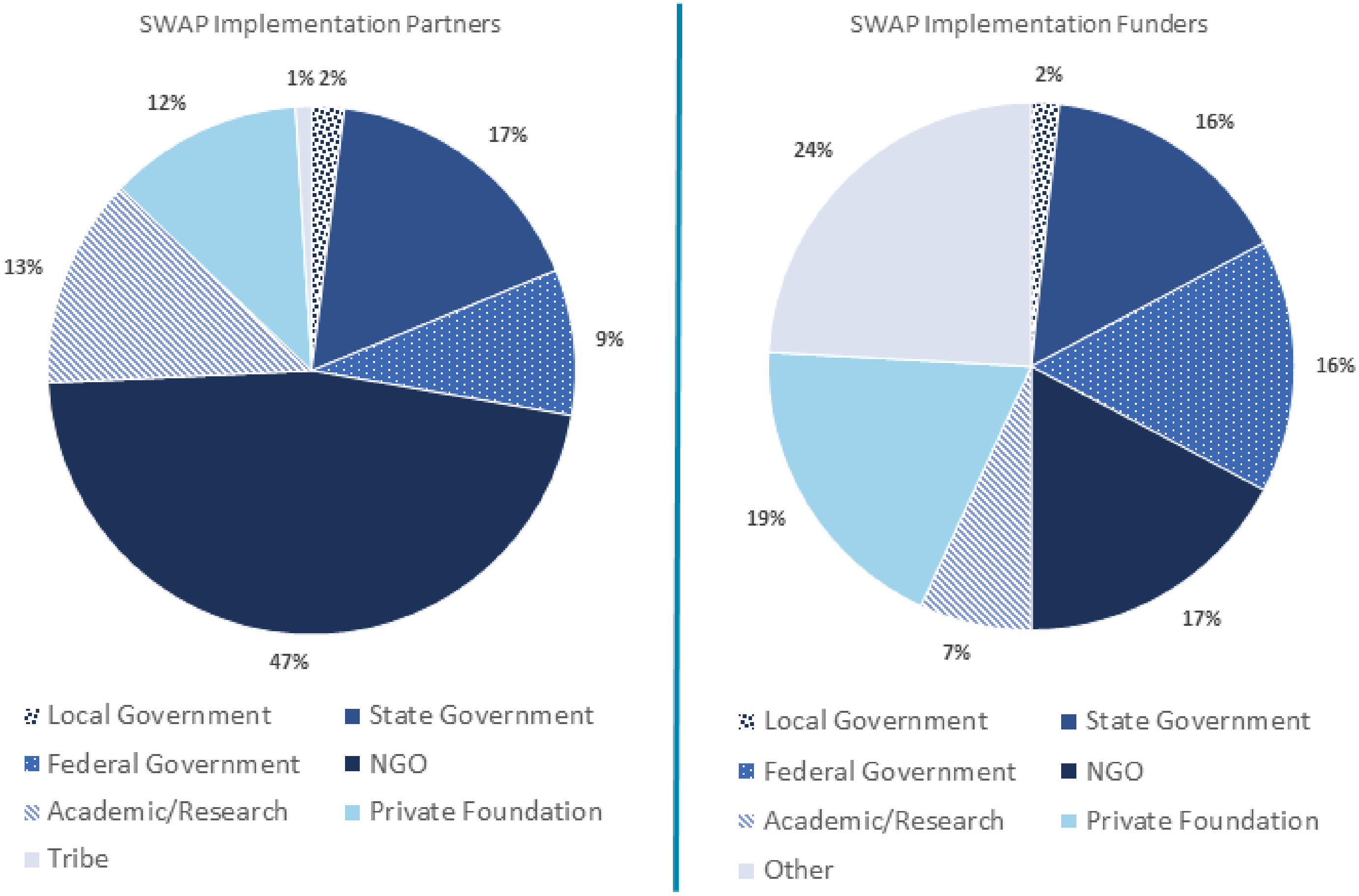
Limited SWAP Awareness and Education: Lack of awareness and education about the SWAP 2005 within the CDFW and within external organizations and agencies hindered SWAP 2005 implementation. To overcome this challenge during the implementation of the SWAP 2015, interviewees suggested educating staff and stakeholders about the SWAP 2015 through informative workshops; providing regular SWAP progress updates through the CDFW website or through annual reports; educating stakeholders about the SWAP 2015 to increase engagement and support of the SWAP 2015 conservation strategies and recommend actions; and by developing linkages to regional activities and implementation efforts. Interviewees also stressed the importance of developing sector-specific companion plans and felt this approach would not only help increase awareness, but would also increase collaboration.

Adaptability to Emerging Stresses and Pressures: Interviewees suggested making the SWAP 2015 more flexible so that it can adapt to emerging statewide stresses or pressures, rather than remain static between 10-year updates. Some interviewees also indicated that while having set priorities listed in the SWAP 2015 is important, they also highlighted the need to support adaptation and responsiveness to new emerging priorities. Interviewees also suggested using mid-term updates or reviews to revise the SWAP 2015 or allow for adaptations to key strategies, goals, and priorities based on new information or emerging needs.

Current and Future Partners and Funders Supporting SWAP Implementation

Partners and funders play an important role in the current and future implementation of SWAP conservation actions. Partners often help support complementary efforts, provide additional human and financial capacity, or engage in efforts to support specific SWAP conservation actions. In addition, funders provide needed financial resources necessary for implementation. To support the future implementation of the SWAP 2015, interviewees mentioned a variety of organizations that will likely support the SWAP 2015 implementation through funding and collaborative partnerships. *Figure 18* provides a breakdown of the types of partners and funders interviewees identified as likely to support SWAP 2015 implementation. Blue Earth recognizes that many efforts and funds support complementary efforts to the SWAP implementation statewide and regionally that may not be captured here or elsewhere in this evaluation.

Figure 18: Types of Partners and Funders Identified by Interviewees



SWAP Implementation Partners

SWAP Implementation Funders

Text Box 6: Evaluation Outcomes 3 and 4 Summary: SWAP Implementation Effectiveness, Strengths, and Areas for Improvement

Evaluation Outcomes 3 and 4 Summary: SWAP Implementation Effectiveness, Strengths, and Areas for Improvement

- Interviewees identified collaboration with external partners as both a strength of the SWAP 2005 implementation, as well as an opportunity and area of improvement for the SWAP 2015.
- State government's lack of sufficient staff to support SWAP implementation strongly correlated to a lack of overall funding to support the CDFW and SWAP activities.
- SWAP 2005 had limited utility for day-to-day work and for guiding long-term regional actions.
- Regional interviewees emphasized more difficulties with the grant process than statewide interviewees did; specifically they mentioned a need for a clearer grant application process and feedback on rejected grants.
- Identified challenges to successful implementation of the SWAP 2015 included insufficient human and financial resources, political opposition, policy reform, adverse environmental changes outside the control of CDFW (e.g., climate change), and potential interagency conflicts.
- Additional education and outreach to applicants and partners about the grant process, along with standardized applications, and increased administrative support could improve the grant-making process overall.
- Government agencies were identified as the sector most likely to fund related projects or provide match funding in support of SWAP projects, while NGOs comprised almost half of the potential implementation partners mentioned.

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Interviewee Lessons Learned

In this section, we share SWAP 2005 implementation lessons learned gleaned from interviewee perception and SWG funded grant reports to inform the SWAP 2015. Please note that SWG reporting documents did not include a lessons learned component. However, we gathered lessons learned from grant amendment documents as well as asked interviewees about implementation lessons learned. When interviewees responded to these questions, they often focused on programmatic planning and administration lessons rather than implementation lessons.

Lesson 1: Clear and Prioritized Implementation Strategies and Actions are Key to Successful Implementation

To enhance the SWAP 2015 implementation success and effectiveness, interviewees indicated the importance of having clear and prioritized implementation strategies that focus on achievable actions (e.g., actions are time bound and realistic). For example, the SWAP update process is utilizing the Miradi system based on the Open Standards. Through this system, conservation strategies and actions undergo numerous viability assessments to identify the strategies that will yield the most effective outcomes. By articulating and prioritizing actions in this way, informants shared that the SWAP 2015 could support greater uptake by identifying what is feasible and most important for addressing the threats and stressors facing species and habitats in the State. In addition, the CDFW, other agencies, and partners could more effectively align funding allocations with prioritized strategies, objectives, and activities to ensure more adequate levels of funding are available to address these priorities. One caveat noted by interviewees was the importance of ensuring that although specific strategies and actions are prioritized based on the best available information at this time, there is a need to allow flexibility to address emerging or new issues in the future.

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Lesson 2: Clearly Articulating Goals, Objectives, and Metrics to Measure Progress Could Help Improve and Support State Government's Ability to Regularly Evaluate and Assess Progress

Informants suggested clearly articulating goals, objectives, and metrics to measure progress could lead to improved assessment capabilities and more routine evaluation and assessment of progress. In addition, having these components in place could strengthen accountability based on progress assessment and evaluation results.

Lesson 3: Accountable, Transparent, Consistent, and Effective Grant Administration Processes Improve Overall Grant Success and Implementation

Interviewees indicated increased consistency and transparency in the current grant administration procedures could lead to more effective implementation and reductions in delays and complications. Improved consistency in forms, applications, and contracting procedures between regions for example could improve implementation and more efficient use of staff time overall. One grant administration and tracking model interviewees suggested that CDFW could emulate internally is the DWR's online grant tool and tracking system. In addition, for grants administered under the USFWS Wildlife and Sport Fish Restoration program CDFW already uses the USFWS' 2013 Wildlife TRACS tool, which allows for real-time tracking and reporting online. Interviewees also indicated that greater guidance and training for grant administration and budgeting, could improve ability to meet timelines and reduce delays caused by denied spend-down requests for equipment purchases or staff hires. Interviewees explained that understanding the grant process, fund allocation, and spending limitations, could improve their proposal and implementation effectiveness.

Lesson 4: Increased Integration of SWAP with other Statewide and Regional Plans Fosters Uptake and Successful Implementation

Interviewees shared that increasing buy-in and linkages with other efforts at statewide and regional scales could not only increase uptake and integration of SWAP 2015 strategies into work supported by groups beyond the CDFW, but could also address gaps in capacity. In addition, interviewees suggested that coordination between agencies and organizations could lead to greater human and financial capacity, reductions in effort duplication, and stronger implementation.

Lesson 5: Increased Awareness, Buy-in, and Engagement of Partners and Stakeholders Increases Successful Implementation

Interviewees indicated that increasing awareness, buy-in, and engagement of agencies, partners, and stakeholders beyond CDFW could improve implementation success. Greater outreach and education, could also lead to implementation of mutually beneficial activities, additional resources, and leveraged support in the future.

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Recommendations and Paths Forward

Based on Blue Earth's evaluation of SWG documents, semi-structured interviews with key interviewees, web-based research, review of other documents, and synthesis of collected information, we have several recommendations for improving the SWAP implementation moving forward. Recommendations for improving SWAP implementation are organized into three categories below: SWAP 2015 Update, State Operations and SWAP Implementation, and Awareness Building, Coordination, and Collaboration. Following the recommendations, we highlight next steps.

SWAP 2015 Update

Interviewees provided specific feedback with regard to information that should be included in the SWAP update, primarily a need for articulating the SWAP 2015's purpose, vision, goals, objectives, and metrics to measure progress. There is also an opportunity to explicitly link the SWAP 2015 with SWG applications and implemented projects, the CDFW's ongoing work, other State government efforts (such as the Governor's Water Action Plan or the 2014 Water Bond), and other partners' activities. Blue Earth also determined that the CDFW should consider crafting a realistic plan that matches available capacity as well as seek opportunities to strengthen capacity and the CDFW's ability to implement the plan through partner engagement.

Recommendation 1: Articulate the SWAP 2015 Vision, Conservation Goals, Objectives, and Metrics to Measure Progress that will Guide Future Implementation

In order to encourage broader partner engagement, track progress, and demonstrate successes, the SWAP 2015 should articulate a clear vision for what the plan aims to support, outline specific goals it seeks to achieve, share objectives and outlined actions that State government will aim to meet, and provide a set of metrics to measure progress toward stated objectives and goals. By outlining these components clearly, the SWAP 2015 could serve to help set the context and strategic direction of habitat and wildlife conservation and restoration efforts more broadly and help inform use of funding to support these efforts for the State, as well as among partners (see *Recommendation 7* for more detail). For example, the SWAP 2015 could be used as State government's investment guide in using 2014 Water Bond and other sources of funding.

Additionally, the SWAP 2015 could include a high-level theory of change that outlines and further describes how implementation of recommended conservation actions will help the CDFW achieve near-term SWAP 2015 goals and its long-term vision. A theory of change is a comprehensive description or model of the theory that underlies all or part of an organization's or program's work.[23] A theory of change describes the order, timing of strategies to achieve key outcomes, goals, and metrics to measure progress, as well as describes the alignment and role within the CDFW and among other agencies and partners to address implementation needs. Despite the shortcomings of the SWAP 2005, through the update process, the CDFW is already taking steps to develop goals and metrics to measure progress through use of the Open Standards process, which has drawn upon expert knowledge.

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[23] Paul Brest, "Update on the Hewlett Foundation's Approach to Philanthropy: The Importance of Strategy," The William and Flora Hewlett Packard Foundation, 2004, 29 Jan. 2015 http://www.hewlett.org/about-us/annual-reports

State Government Operations and SWAP Implementation

The following recommendations focus on State government operations and SWAP implementation that could improve the implementation and impact of the SWAP 2015.

Recommendation 2: Increase, Balance, and/or Leverage State Government Human and Financial Resources to Achieve SWAP Goals and Objectives

To be successful, State government should seek to increase staff capacity and financial resources, where possible, or balance available human and financial resources and capacity with prioritized SWAP 2015 actions over the next 10 years. Identifying where and how resources could be leveraged to address both SWAP 2015 priorities and other priorities of the CDFW could help balance available resources and foster successes beyond the SWAP 2015's intended objectives (see Recommendation 7 for more detail on partnership engagement among agencies and with partners). This could be done through redirection of positions to high priority activities, Budget Change Proposals, or through legislation to support new positions focused on specific priorities.

Furthermore, interviews with CDFW staff highlighted an opportunity to educate internal staff about existing and potential ways to fund activities that support SWAP 2015 implementation beyond SWG funding and other government funding streams. Moreover, because limitations exist for the type of funding and funding mechanisms available for the CDFW to utilize, we recommend 1) identifying existing and new SWAP-relevant funding options; 2) considering how required match funding could be leveraged more broadly and effectively from internal and external groups; and 3) exploring the feasibility of efficiently granting SWG funds to external partners or other agencies outside of the CDFW to support implementation, for example utilizing the payable grants program. If possible, the grants division could identify and update a list of available SWAP-relevant funding sources. The list would need to be updated as new funding sources are developed, such as drawing upon funds made available through the recent passage of the 2014 Water Bond.

CalPhotos/G. Monroe

Recommendation 3: Develop a SWAP Strategic Work Plan, Identify a Program Home, and Assign Staff to Champion Implementation of SWAP Strategies

Although the SWAP is one of many efforts that the CDFW undertakes, in order to support the CDFW's implementation of the SWAP 2015 we recommend that the CDFW develop a strategic work plan that outlines how implementation of SWAP 2015 will be integrated into staff and division efforts and incentivizes this integration. We also recommend that the CDFW not only allocate staff time to SWAP 2015 implementation, but also identify a program home and/or a champion responsible for managing SWAP 2015 implementation across State government agencies, topics, and regions in order to build awareness and promote success among staff and external partners. For example to help coordinate implementation of shared goals and activities outlined in the Governor's Water Action Plan. Specific duties could include supporting grant-making, encouraging uptake of the SWAP 2015 recommendations across the department and with external partners, communicating successes, and supporting adaptation of the SWAP 2015 as management, needs, and priorities change over time.

Recommendation 4: Monitor and Evaluate Changes in Ecosystem Health and Stressors, as well as Progress and Effectiveness of SWAP Implementation, Integration with Wildlife Conservation Efforts Throughout the State, and Adaptive Management

We recommend that State government use goals, objectives, and metrics developed through the Open Standards process to monitor and track SWAP 2015 implementation progress in real time and adapt implementation based on evaluation findings. Metrics should also be SMART (Specific, Measurable, Action-oriented, Realistic, and Time-bound). In addition, the CDFW and USFWS should encourage SWG grantees to articulate proposal objectives and then monitor and evaluate SWG progress based on these stated proposal objectives. Furthermore, consider developing additional materials that are completed alongside proposal and reporting templates and forms developed by the USFWS. Additional materials could include identification of not only objectives for each grant, but also specific metrics to measure SWG funded project success and implementation progress (for more discussion on this topic, please see *Recommendation 5*).

At this time, grants proposals and reports include objectives and expected results; however, the expected results are typically outputs such as reports or surveys completed rather than articulating outcomes, such as changes in policy, management action, behavior, or ecosystem or species health. The SWAP eight required elements also require that State government monitor and evaluate not only changes in species and habitat health, but also how effective the implementation is and adaptive management. The SWAP 2015 should include overarching measures to help assess each of these monitoring and evaluation categories and the CDFW should seek to provide implementation status and progress updates more regularly (e.g., annually), for more discussion on sharing SWAP 2015 implementation success and progress see *Recommendation 6*.

Recommendation 5: Strengthen Grant Administration, Application, and Reporting Processes to Improve Grant Implementation Effectiveness

We recommend that the CDFW develop and promote internal staff training for grant proposal writing and administration to help ensure staff build grant administration skills, understand limitations on fund use, improve efficiency and effectiveness of proposals preparation, and reporting is improved. In addition to training, there are several ways to improve the proposal development and reporting.

- First, incentivize proposal approval based on not only advancement of SWAP goals and outcomes defined in the SWAP 2015, but also identifying and using partners or other leveraged funding (beyond multi-program funding, which typically highlights internal funding sources or match), where possible.

- Second, model grant reporting off other government grant programs such as Pittman-Robertson Federal Aid in Wildlife Restoration Act or the Sport Fish Restoration Act, which have grantees identify and propose metrics to measure progress based on stated objectives in their proposals. In addition, incorporate standardized metrics that all SWG grantees report upon, and then require grantees to monitor, evaluate, and report on their progress in each grant report.
- Third, develop transparent, consistent, and efficient grant administration processes and system, including: creating a website that provides SWG application information and standardized templates (e.g., deadlines, proposal template, contract templates, budget templates, etc.), developing more efficient processes for distributing funding secured through SWG for identified budget items (both equipment and staff), increasing consistency between regional requirements, and developing a grants management system that supports grant tracking and progress reporting. One option is to adapt DWR's Grants Review and Tracking System (GRanTS) grant administration application software.

Awareness Building, Coordination, and Collaboration

One of the common themes identified during this evaluation was the need for awareness building activities to foster more coordination and collaboration for SWAP implementation both internally and externally to the CDFW. The recommendations below share how State government may address this need. Please note, successful implementation of *Recommendations 6* and *7* would be strengthened by implementation of *Recommendation 3* above.

Recommendation 6: Improve SWAP Recognition to Increase Buy-in, Support, and Implementation Success

Strengthen communication to increase not only awareness and recognition of the SWAP 2015, but also to encourage greater buy-in, alignment, and support for implementing the SWAP. Two overarching themes emerged within this recommendation: 1) educate and inform a broad SWAP audience (e.g., staff, partners, funders, and stakeholders) and 2) communicate successes. Some differences exist between how State government can improve internal (within the CDFW and other agencies) and external (with partners and the public) recognition and support for SWAP through awareness building, coordination, and collaboration, below we provide examples where relevant.

Educate and Inform Broad SWAP Audience

Moving forward, encourage CDFW leadership, staff, agencies, partners, funders, and stakeholders to review and engage in the SWAP 2015's content. We recommend developing a shorter quick-reference version of the SWAP 2015 that provides a concise overview of the SWAP 2015, presents the SWAP 2015 goals and strategy, and provides references to relevant sections of the SWAP 2015. The reference version could then be utilized to brief CDFW leadership, external agencies, partners, and potential funders to strengthen buy-in and encourage broader support for SWAP 2015 implementation.

In addition to developing a shorter reference version, the updated SWAP 2015 should be disseminated broadly with CDFW leadership, staff, other State agencies, external partners, funders, stakeholders, and the public to increase awareness of the plan and its content, as well as build buy-in with each of these types of SWAP 2015 audiences. We recommend that CDFW hold a road show or other meetings when the SWAP is released to inform others about the actions, activities, projects, and next steps the CDFW will undertake in relation to the SWAP 2015 implementation. To encourage greater awareness internally and with other agencies, sharing information at regional coordinating body and conservancy meetings that a range of agency actors participate could support broad dissemination without a significant demand on resources. Examples of regional coordinating bodies and conservancies include the Coastal Conservancy, Resource Conservation Districts, and CA LCC. To encourage greater partner awareness consider sharing information in both public meetings and small informal road show style meetings with key partners (e.g., NGOs, foundations, and academic institutions).

Communicate Successes

We recommend that the SWAP 2015 highlight and present what positive changes have occurred to benefit key SGCN or key habitats addressed in the SWAP 2005, doing so will help communicate examples of success or frame the ongoing need for conservation and restoration.

Providing annual updates on progress could also ensure the SWAP 2015 and its recommended conservation actions remain in the forefront of agency, partner, funders, and stakeholder consciousness. Sharing these updates and success, will also foster a better understanding of the SWAP's purpose, potential ways to leverage efforts throughout the State, and could help identify new sources of funding to support the SWAP 2015's implementation. Another way to communicate information could be to hold an annual forum, in which SWG recipients explain progress, success, areas of improvement, outputs (publications, surveys, etc.), and outcomes (behavior change, change in ecosystem or species health, policy implications, etc.) with internal CDFW staff as well as external partners and groups. The forum could not only serve to communicate success, but could also offer workshops and training to address needs highlighted in Recommendation 5 above.

Recommendation 7: Increase and Leverage Human and Financial Capacity by Fostering Coordination and Collaboration Among Agencies and with Partners to Implement the SWAP

Coordination and collaboration is important to address the limited human and financial resources needed to implement SWAP 2015. It is also a priority identified by other California coordination groups and bodies (such as the Biodiversity Council's Interagency Alignment Team).

To encourage greater collaboration, the SWAP 2015 should describe how it connects or overlaps with other State priorities and plans. By making these connections, State government will increase the likelihood that partners will support or help leverage both financial and human resources for SWAP 2015 implementation. At this time, State government already has a number of interagency collaborations including the California Biodiversity Council, Strategic Growth Council, OPC, California Water Plan State Agency Steering Committee, Resource Conservation Districts, CA LCC, Regional Advanced Mitigation Program (RAMP), and WCB, which it could draw upon to strengthen collaboration among agencies and partners at local, State, Federal, and regional scales. State government may also want to consider developing public/private partnerships that help grow funding and can support a broad range of activities highlighted by the SWAP 2015.

Internally, we recommend State government identify additional government and non-government funding sources (local, State, Federal, and regional), as well as explore possible mechanisms for allocating portions of SWG grant funds to external partners efficiently and effectively, which will help enhance SWAP 2015 implementation, reduce need for in-kind State government match of staff time, increase external match funding, and reduce implementation delays.

Next Steps and Path Forward

The most pressing next steps include completing the SWAP 2015 update process, developing SWAP 2015 sector-specific companion plans, and integrating recommendations and findings shared in the this SWAP 2005-2014 evaluation into planning processes, CDFW vision, CDFW's structure, and implementation activities. Uptake of recommendations from the evaluation is occurring at this time, which demonstrates that the CDFW is committed to developing and implementing a successful SWAP 2015. Internally, the CDFW may integrate recommendations outlined here and elsewhere into its guiding vision document, which will be developed in 2015. Externally, the CDFW has begun engaging other agencies and partners to ensure the SWAP 2015 is complimentary to other planning documents and strategic activities, such as the environmental stewardship priority actions outlined in the Governor's Water Action Plan and activities of the California Biodiversity Council. In addition, the companion plans are a solution CDFW designed based on CDFW staff and partner feedback, which go beyond the requirements of the 2005 and 2015 SWAPs and will strengthen implementation of the SWAP 2015. Companion plan development will begin in 2015. Specifically, companion plans will help:

- Serve as a way to coordinate and collaborate among agencies and partners,
- Identify key common priorities among partners for each sector,
- Outline specific linkages between sector goals and conservation actions and the SWAP 2015,
- Leverage implementation opportunities among partners in each sector to effectively implement common priorities, and
- Identify additional actions that sector partners can take to support overall implementation of the SWAP 2015.

These plans serve as a way to coordinate and collaborate among agencies and partners, by setting the context and strategic direction for habitat and wildlife conservation and restoration efforts more broadly. The SWAP 2015 and associated companion plans will help inform investments such as the 2014 Water Bond, WCB, and other sources of funding, thus increasing capacity and improving implementation success.

In addition, the Tribal Lands companion plan ensures effective, streamlined communication and collaboration with California tribes, tribal governments, the State of California, and other partners across sector areas. In addition to the above ways the companion plans supplement the SWAP 2015, the Tribal Lands companion plan helps explore opportunities to leverage aligned initiatives to support implementation of the SWAP 2015.

Appendices

Appendix 1: Map of the SWAP 2005 Regions
Appendix 2: Map of the CDFW Regions
Appendix 3: SWAP 2005 Statewide and Regional Major Wildlife Stressors Identified by Region
Appendix 4: Steering Committee Membership
Appendix 5: SWAP Evaluation Semi-structured Survey Tool
Appendix 6: SWAP Evaluation Interviewees
Appendix 7: Conservation Action Categories and Examples
Appendix 8: Publications Developed through SWG Funded Projects
Appendix 9: SWG Funded Grants, Grant Period, Funding Amount, and Final Outputs

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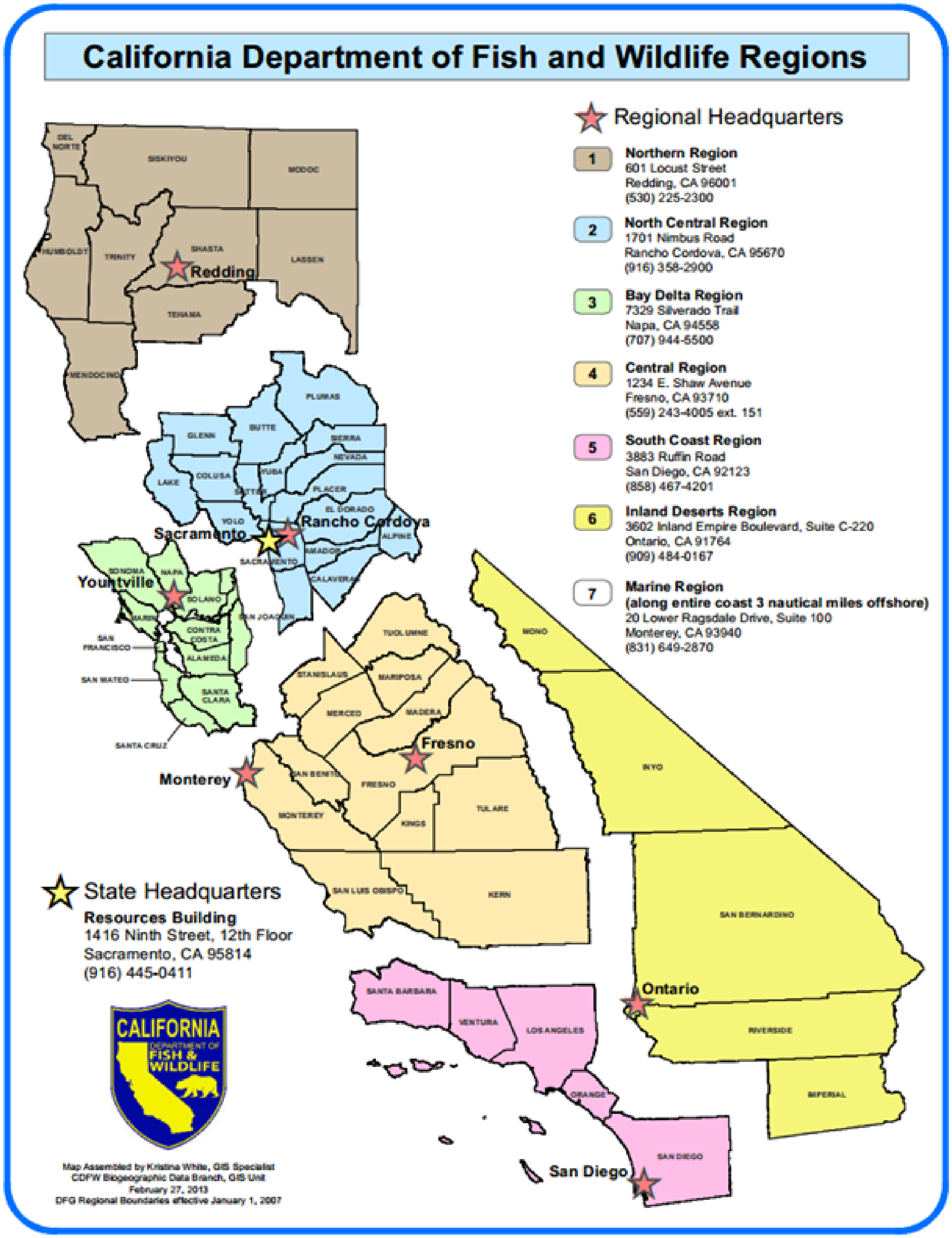
Appendix 1: Map of CDFW Regions


California Department of Fish and Wildlife Regions
DEL NORTE
SISKIYOU
MODOC
HUMBOLDT
TRINITY
SHASTA
LASSEN
Redding
TEHAMA
MENDOCINO
PLUMAS
GLENN
BUTTE
SIERRA
NEVADA
LAKE
COLUSA
YUBA
SUTTER
PLACER
EL DORADO
YOLO
Rancho Cordova
ALPINE
Sacramento
SACRAMENTO
AMADOR
SONOMA
NAPA
Yountville
SOLANO
CALAVERAS
MARIN
SAN JOAQUIN
CONTRA COSTA
SAN FRANCISCO
ALAMEDA
TUOLUMNE
MONO
SAN MATEO
STANISLAUS
MARIPOSA
SANTA CLARA
MERCED
MADERA
SANTA CRUZ
Fresno
INYO
Monterey
SAN BENITO
FRESNO
MONTEREY
TULARE
KINGS
SAN LUIS OBISPO
KERN
SAN BERNARDINO
SANTA BARBARA
Ontario
VENTURA
LOS ANGELES
RIVERSIDE
ORANGE
IMPERIAL
SAN DIEGO
San Diego
CALIFORNIA
DEPARTMENT OF
FISH &
WILDLIFE

★ Regional Headquarters

1 **Northern Region**
601 Locust Street
Redding, CA 96001
(530) 225-2300

2 **North Central Region**
1701 Nimbus Road
Rancho Cordova, CA 95670
(916) 358-2900

3 **Bay Delta Region**
7329 Silverado Trail
Napa, CA 94558
(707) 944-5500

4 **Central Region**
1234 E. Shaw Avenue
Fresno, CA 93710
(559) 243-4005 ext. 151

5 **South Coast Region**
3883 Ruffin Road
San Diego, CA 92123
(858) 467-4201

6 **Inland Deserts Region**
3602 Inland Empire Boulevard, Suite C-220
Ontario, CA 91764
(909) 484-0167

7 **Marine Region**
(along entire coast 3 nautical miles offshore)
20 Lower Ragsdale Drive, Suite 100
Monterey, CA 93940
(831) 649-2870

★ State Headquarters
Resources Building
1416 Ninth Street, 12th Floor
Sacramento, CA 95814
(916) 445-0411

Map Assembled by Kristina White, GIS Specialist
CDFW Biogeographic Data Branch, GIS Unit
February 27, 2013
DFG Regional Boundaries effective January 1, 2007

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[24] CDFW, "Regions," California Department of Fish and Wildlife, 2014, 29 Jan. 2015 https://www.wildlife.ca.gov/Regions.

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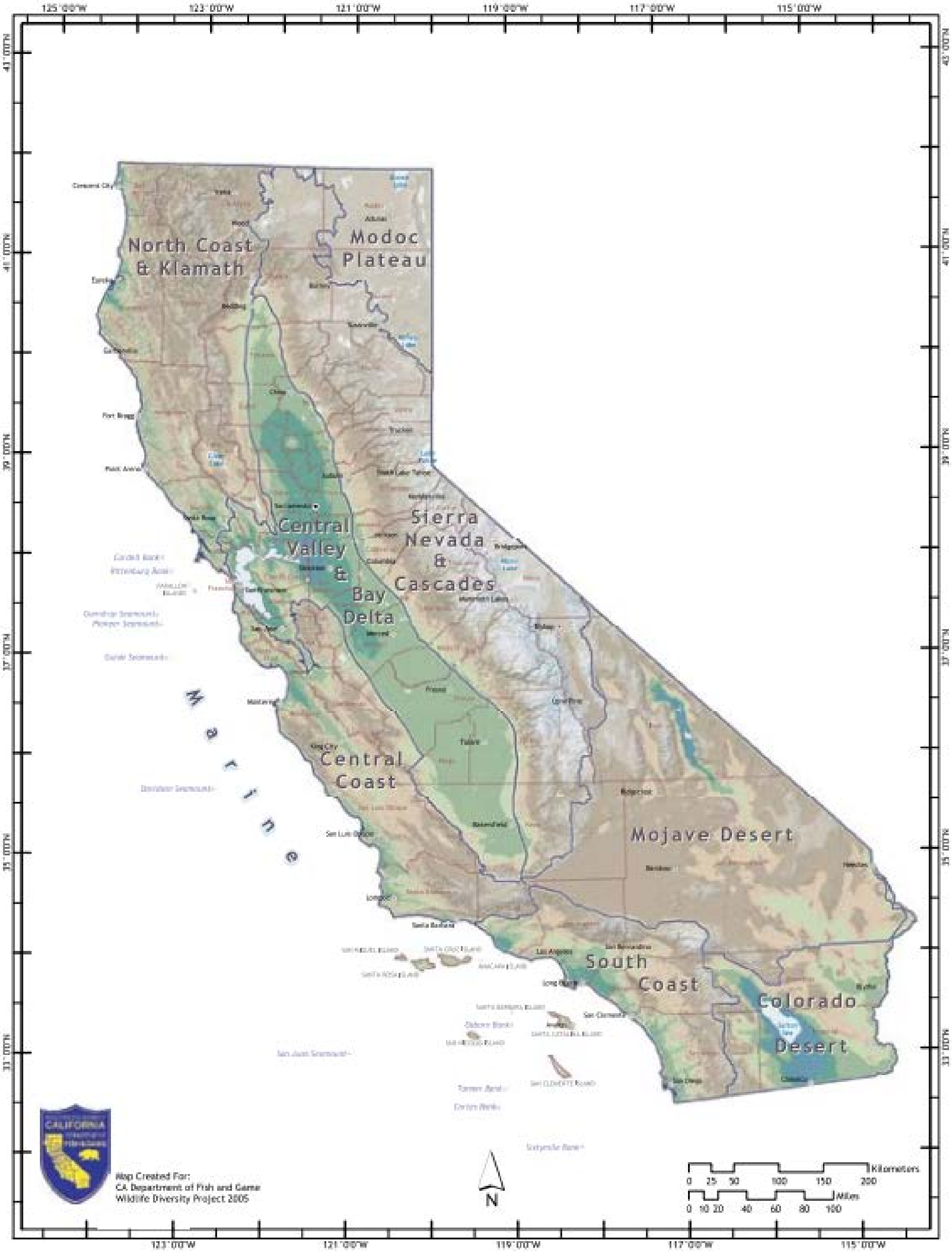
Appendix 2: Map of SWAP 2005 Regions


125°00'W
123°00'W
121°00'W
119°00'W
117°00'W
115°00'W
41°00'N
39°00'N
37°00'N
35°00'N
33°00'N
North Coast & Klamath
Modoc Plateau
Central Valley & Bay Delta
Sierra Nevada & Cascades
Marine
Central Coast
Mojave Desert
South Coast
Colorado Desert
Crescent City
Eureka
Fort Bragg
Point Arena
Sacramento
San Francisco
San Jose
Monterey
Fresno
Tulare
Merced
Bakersfield
San Luis Obispo
Lompoc
Santa Barbara
Los Angeles
Long Beach
San Bernardino
San Clemente
San Diego
Bishop
Needles
Blythe
Chico
Truckee
Ridgecrest
Barstow
Lone Pine
Mammoth Lakes
Bridgeport
San Nicolas Island
San Clemente Island
Santa Catalina Island
Santa Barbara Island
N
Kilometers
0 25 50 100 150 200
Miles
0 10 20 40 60 80 100
Map Created For:
CA Department of Fish and Game
Wildlife Diversity Project 2005

[25]

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[25] David Bunn, et al., "California Wildlife Conservation Challenges: California's Wildlife Action Plan," University of California Davis Wildlife Health Center, California Department of Fish and Wildlife, 2007, 29 Jan. 2015 http://www.dfg.ca.gov/SWAP/2005/docs/SWAP-2005.pdf.

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Appendix 3: SWAP 2005 Major Wildlife Stressors

The table below drawn from the wildlife stressors outlined in the SWAP 2005 "Chapter 3: Threats to Wildlife Diversity in California." Stressors are shared in the order presented in the SWAP 2005 for each region.

Region	Wildlife Stressor
Statewide	• Growth and development • Water management conflicts • Invasive species • Climate change
Mojave Desert	• Multiple uses conflicting with wildlife on public lands • Growth and development • Groundwater overdrafting and loss of riparian habitat • Inappropriate off-road vehicle use • Excessive livestock grazing • Excessive burro and horse grazing • Invasive plants • Military land management conflicts • Mining operations
Colorado Desert	• Water management conflicts and water transfer impacts • Inappropriate off-road vehicle use • Loss and degradation of dune habitats - Disruption of sand transport processes - Invasive plant species - Inappropriate off-road vehicle use • Growth and development • Invasive species
South Coast	• Growth and development • Water management conflicts and degradation of aquatic ecosystems • Invasive species • Altered fire regimes • Recreational pressures
Central Coast	• Growth and development • Intensive agriculture • Excessive livestock grazing • Water management conflicts and degradation of aquatic ecosystems • Recreational pressures • Invasive species
North Coast–Klamath	• Water management conflicts • Instream gravel mining • Forest management conflicts • Altered fire regimes • Agriculture and urban development • Excessive livestock grazing

Region	Wildlife Stressor
	• Invasive species
Modoc Plateau	• Excessive livestock grazing • Excessive feral horse grazing • Altered fire regimes • Western juniper expansion • Invasive plants • Forest management conflicts • Water management conflicts and degradation of aquatic ecosystems
Sierra Nevada and Cascades	*Stressors affecting upland habitats* • Growth and land development • Forest management conflicts • Altered fire regimes • Excessive livestock grazing • Invasive plants • Recreational pressures • Climate change *Stressors affecting aquatic and riparian habitats* • Water diversions and dams • Watershed fragmentation and fish barriers • Hydropower project operations • Excessive livestock grazing • Water diversion from the Owens Valley • Introduced non-native fish
Central Valley and Bay-Delta	• Growth and development (including urban, residential, and agricultural) • Water management conflicts and reduced water for wildlife • Water pollution • Invasive species • Climate change
Marine	• Overfishing • Degradation of marine habitat • Invasive species • Pollution • Human disturbance

Appendix 4: Steering Committee Membership

SWAP Evaluation Steering Committee Membership:

Rebecca Fris, Science Coordinator, California Landscape Conservation Cooperative, Pacific Southwest Region U.S. Fish and Wildlife Service
Kamyar Guivetchi, Manager, Statewide Water Planning, Department of Water Resources; Co-Chair California Biodiversity Council
Christina Kakoyannis, Ph.D., Director, Strategic Planning and Evaluation, National Fish and Wildlife Foundation
Catherine Kuhlman, Executive Director of the Ocean Protection Council and Deputy Secretary for Ocean and Coastal Policy, California Natural Resources Agency
Eric Loft, Ph.D., Wildlife Branch Chief, California Department of Fish and Wildlife (Internal to CDFW)
Craig Shuman, D. Env., Regional Manager, Marine Region California Department of Fish and Wildlife (Internal to CDFW)
Mike Sutton, President, California Fish and Game Commission

Advisory and Information Role: Provide information to the steering committee and respond to any questions as they arise.

Armand Gonzales, SWAP 2015 Project Lead, Special Advisor, California Department of Fish and Wildlife, Climate Science and Renewable Energy Branch	Junko Hoshi, Ph.D., SWAP 2015 Assistant Project Lead, Senior Environmental Scientist, California Department of Fish and Wildlife, Climate Science and Renewable Energy Branch

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Appendix 5: SWAP Evaluation Semi-structured Survey Tool

Introduction:

First, I want to thank you for taking the time to speak with me today. This interview will inform an evaluation of the California State Wildlife Action Plan or SWAP that we are conducting. The first SWAP was developed in 2005 and is under review at this time for an update in 2015. At this time, we have been tasked with both evaluating the past efforts and progress towards implementing the recommended SWAP actions between 2005 and June 2014, as well as providing recommendations and considerations for the implementation of the SWAP moving forward. The findings from our evaluation will be incorporated into the SWAP update, which will conclude in 2015. The evaluation report will be shared publically. We will send this once approved, likely Spring 2015.

Because of your experience and current position as XX CDFW STAFF, FORMER SWG RECIPEINT, POTENTIAL/EXISTING PARTNER, STAKEHOLDER, FUNDER XX we believe you could provide valuable insight to address the following topics:

- ***Evaluation Outcome 1****: Progress and results of the SWAP 2005 implementation from 2005-2014.*
- ***Evaluation Outcome 2****: Analysis of SWG portfolio spending between 2005- 2014 by region, taxa, and conservation action category.*
- ***Evaluation Outcome 3****: Assess State government's effectiveness in implementing SWAP 2005 actions, including the human and financial capacity, ability to leverage additional human and financial resources, efficiency, strengths, opportunities for improvement, and gaps and obstacles for effective implementation.*
- ***Evaluation Outcome 4****: Describe overarching SWAP 2005 implementation challenges and identify areas where improvement could be made.*
- ***Evaluation Outcome 5****: Provide recommendations for the SWAP 2015 update and steps forward.*

Given these information needs, are there specific areas where you believe you have strong expertise and where we could focus our discussion?

I want to mention before we begin that this is a confidential interview, in that we will share trends and a synthesis of findings but will not share or attribute any specific information to you or your organization, agency, tribe, or group.

Do you have any questions before we begin?

In addition, if there are any questions that you are unfamiliar or feel you cannot answer, please just let me know.

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1. Could you describe how familiar you are with the SWAP 2005?
2. Can you please briefly describe your experience and role in addressing the implementation of the past SWAP or other aspects of wildlife conservation and including SGCN, wildlife, science, conservation, and the environment?

Evaluation Outcome 1: Progress and results of the SWAP 2005 implementation from 2005- 2014.

In this section, I will ask you questions regarding the progress and results of the SWAP 2005 implementation from 2005 through June 2014. I will first ask you questions at the statewide scale and then ask you questions at the regional scale.

Statewide Key Questions: Progress and Results

3. We shared a list of SWAP 2005 recommended actions, prior to receiving this list; did you know what the SWAP 2005 recommended statewide actions were?
4. In your opinion, were these the most appropriate conservation actions and conservation capability needs to address between 2005 and 2014? [*prompt if need be considering funding, capacity available, conservation needs*]
5. What activities have you or your organization been involved in implementing related to the SWAP 2005 recommended statewide actions?
6. How much progress has been made toward addressing and/or achieving SWAP 2005 statewide recommended conservation actions?
    a. Policies and Management Actions
    b. Enforcement
    c. Infrastructure, Land-use, Permitting
    d. Habitat Conservation and Restoration
    e. Species Conservation and Restoration
    f. Coordination, Collaboration, and Stakeholder Engagement
    g. Addressing Conservation Priorities and Emerging Stressors Identified in the SWAP 2005
    h. Education, Outreach, and Capacity-building
    i. Wildlife Resource Assessment
    j. Conservation Planning/ Plans
    k. Funding and Leveraged Funding
    l. Knowledge to Implement SWAP 2005
    m. Monitoring and Evaluation
    n. Adaptive Management
7. How much progress has been made toward addressing conservation capabilities needs (Wildlife Resource Assessment, Conservation Planning/ Plans, Funding and Leveraged Funding) since implementation of the SWAP 2005?
    a. Wildlife Resource Assessment
    b. Conservation Planning/ Plans
    c. Funding and Leveraged Funding
8. What key achievements/successes have been achieved in addressing challenges and meeting California's conservation and restoration needs since implementation of the SWAP 2005?
9. In your opinion, what has been the overall impact in addressing statewide stressors outlined in the 2005 SWAP and meeting California's conservation and restoration needs since implementation of the SWAP 2005? [*In addition, if you have any reports that speak to progress or impact, we would be interested in reviewing*]
    a. Growth and Development
    b. Water Management Conflicts

    c. Invasive Species
    d. Climate Change
10. How much progress has been made toward addressing monitoring and adaptive management targets since implementation of the SWAP 2005?
    a. Has a statewide monitoring program been implemented?

Regional Key Questions: Progress and Results

11. We shared a list of SWAP 2005 recommended actions, prior to receiving this list; did you know what the SWAP 2005 recommended regional actions were?
12. In your opinion, were these the appropriate conservation actions and conservation capability needs to address between 2005 and 2014? [prompt if need be considering funding, capacity available, conservation needs]
13. What activities have you or your organization been involved in implementing related to the SWAP 2005 recommended regional actions?
14. How much progress has been made toward addressing and/or achieving SWAP 2005 regional recommended conservation actions since implementation of the SWAP 2005?
    b. Policies and Management Actions
    c. Enforcement
    d. Infrastructure, Land-use, Permitting
    e. Habitat Conservation and Restoration
    f. Species Conservation and Restoration
    g. Coordination, Collaboration, and Stakeholder Engagement
    h. Addressing Conservation Priorities and Emerging Stressors Identified in the SWAP 2005
    i. Education, Outreach, and Capacity-building
    j. Wildlife Resource Assessment
    k. Conservation Planning/ Plans
    l. Funding and Leveraged Funding
    m. Knowledge to Implement SWAP 2005
    n. Monitoring and Evaluation
    o. Adaptive Management
15. How much progress has been made toward addressing conservation capabilities needs (Wildlife Resource Assessment, Conservation Planning/ Plans, Funding and Leveraged Funding) since implementation of the SWAP 2005?
    a. Wildlife Resource Assessment
    b. Conservation Planning/ Plans
    c. Funding and Leveraged
16. In your opinion, what has been the overall impact in addressing regional stressors outlined in the 2005 SWAP and meeting California's conservation and restoration needs since implementation of the SWAP 2005? [*In addition, if you have any reports that speak to progress or impact, we would be interested in reviewing*]

17. How much progress has been made toward addressing monitoring and adaptive management targets since implementation of the SWAP 2005?
    a. Has a regional or statewide monitoring program been implemented?
18. What key achievements/successes have been achieved in addressing challenges and meeting California's conservation and restoration needs since implementation of the SWAP 2005?
19. Have metrics to measure progress been developed to measure progress toward key indicators of wildlife and habitat conservation success in each region or across regions?
    a. If so, what metrics to measure progress have been developed? What progress has been identified for each key indicator developed?

Evaluation Outcome 3: An assessment of State government's effectiveness in implementing SWAP 2005 actions, including human and financial capacity, ability to leverage additional human and financial resources, efficiency, strengths, opportunities for improvement, gaps for effective implementation, and obstacles for implementation.

Evaluation Outcome 4: Describe overarching SWAP 2005 implementation challenges and identify areas where improvement can be made.

In this section I will ask you questions regarding State government's effectiveness in implementing the SWAP 2005 including its human and financial capacity, ability to leverage additional human and financial resources, efficiency, strengths, opportunities for improvement, gaps for effective implementation, and obstacles for implementation. IN addition, I will ask you questions regarding any challenges or bottlenecks for implementing the SWAP 2005 and what improvements could be made.

Statewide Key Questions: Program Organizational Effectiveness

20. On a 1-5 scale, 5 being most effective and 1 being ineffective, what was the level of human capacity (e.g., has the department had sufficient staff to implement the recommended actions of the SWAP 2005) at the statewide scale? Please explain.
21. On a 1-5 scale, 5 being most effective and 1 being ineffective, how efficiently has the State utilized its human capacity (e.g., has the department used human resources effectively and in ways that maximized benefit)? Please explain.
22. What have been State government's strengths for grant-making at the statewide levels?
23. On a 1-5 scale, 5 being most effective and 1 being ineffective, what was the level of financial capacity (e.g., has the department had sufficient funding) to implement the recommended actions of the SWAP 2005? Please explain.
24. On a 1-5 scale, 5 being most effective and 1 being ineffective, how efficiently has State government utilized its financial resources (e.g., has the department used financial resources effectively and in ways that maximized benefit)? Please explain.
25. On a 1-5 scale, 5 being most effective and 1 being ineffective, how effective has State government been at securing funds to support implementation of SWAP 2005 recommended conservation actions? Please explain.

26. On a 1-5 scale, 5 being most effective and 1 being ineffective, how effective has State government been at allocating secured funds to support implementation of SWAP 2005 recommended conservation actions? Please explain.
27. On a 1-5 scale, 5 being most effective and 1 being ineffective, how effective has State government been at leveraging funds to support implementation of SWAP 2005 recommended conservation actions? Please explain.
28. In your opinion, in what ways has State government allocated funding to support SWAP 2005 recommended conservation actions (e.g., for ecosystem/habitat versus species conservation efforts)?
    - b. Policies and Management Actions
    - c. Enforcement
    - d. Infrastructure, Land-use, Permitting
    - e. Habitat Conservation and Restoration
    - f. Species Conservation and Restoration
    - g. Coordination, Collaboration, and Stakeholder Engagement
    - h. Addressing Conservation Priorities and Emerging Stressors Identified in the SWAP 2005
    - i. Education, Outreach, and Capacity-building
    - j. Wildlife Resource Assessment
    - k. Conservation Planning/ Plans
    - l. Funding and Leveraged Funding
    - m. Knowledge to Implement SWAP 2005
    - n. Monitoring and Evaluation
    - o. Adaptive Management
29. What activities outlined in the statewide recommended SWAP 2005 actions were (if unaware of SWAP actions, ask more generally what is well funded/poorly funded?)
    - a. Well funded?
    - b. Poorly funded?
30. What were the CDFW and other State government agencies' strengths/strong capabilities for implementing the SWAP 2005?
31. What were the CDFW and other State government agencies' needs for implementing the SWAP 2005?
    - a. Will any persist in the future? If so, which ones?
32. What challenges existed for the CDFW and other State government agencies' implementing the SWAP 2005?
33. What bottlenecks existed for the CDFW and other State government agencies' implementing the SWAP 2005?
34. Besides State Wildlife Grant and matching in –kind labor, what other sources of funding were used to help support implementation of SWAP 2005 actions at the statewide scale, if any? How much funding was made available through these sources?
35. What partners (government, tribes, NGO, academic, foundation, etc.) were engaged to support implementation of SWAP actions?

Regional Key Questions: Program Organizational Effectiveness

36. On a 1-5 scale, 5 being most effective and 1 being ineffective, what was the level of human capacity (e.g., has the department had sufficient staff) to implement the recommended actions of the SWAP 2005 at the regional scale? Please explain.
37. On a 1-5 scale, 5 being most effective and 1 being ineffective, how efficiently has State government utilized its human capacity (e.g., has the department used human resources effectively and in ways that maximized benefit)? Please explain.
38. On a 1-5 scale, 5 being most effective and 1 being ineffective, what was the level of financial capacity (e.g., has the department had sufficient funding) to implement the recommended actions of the SWAP 2005? Please explain.
39. On a 1-5 scale, 5 being most effective and 1 being ineffective, how efficiently has State government utilized its financial resources (e.g., has the department used financial resources effectively and in ways that maximized benefit)? Please explain.
40. What have been State government's strengths for grant-making at the regional level?
41. One a 1-5 scale, 5 being most effective and 1 being ineffective, how effective has State government been linking regional projects and activities to statewide goals? Please explain.
42. One a 1-5 scale, 5 being most effective and 1 being ineffective, how effective has State government been securing funds to support implementation of SWAP 2005 recommended conservation actions at a regional scale? Please explain.
43. One a 1-5 scale, 5 being most effective and 1 being ineffective, how effective has State government been allocating funds to support implementation of SWAP 2005 recommended conservation actions at a regional scale? Please explain.
44. One a 1-5 scale, 5 being most effective and 1 being ineffective, how effective has State government been leveraging funds to support implementation of SWAP 2005 recommended conservation actions at a regional scale? Please explain.
45. In your opinion, what ways has State government allocated funding to support SWAP 2005 regional recommended conservation actions?
    a. Policies and Management Actions
    b. Enforcement
    c. Infrastructure, Land-use, Permitting
    d. Habitat Conservation and Restoration
    e. Species Conservation and Restoration
    f. Coordination, Collaboration, and Stakeholder Engagement
    g. Addressing Conservation Priorities and Stressors in the SWAP 2005
    h. Education, Outreach, and Capacity-building
    i. Wildlife Resource Assessment
    j. Conservation Planning/ Plans
    k. Funding and Leveraged Funding
    l. Knowledge to Implement SWAP 2005
    m. Monitoring and Evaluation
    n. Adaptive Management

46. What activities outlined in the regional recommended SWAP 2005 actions were (if unaware of SWAP actions, ask more generally what is well funded/poorly funded?)
    a. Well funded?
    b. Poorly funded?
47. What were the CDFW and other State government agencies' strength/strong capabilities for implementing the SWAP 2005?
48. What were the CDFW and other State government agencies' needs for implementing the SWAP 2005?
    a. Will any persist in the future? If so, which ones?
49. What challenges existed for the CDFW and other State government agencies' implementing the SWAP 2005?
50. What bottlenecks existed for the CDFW and other State government agencies' implementing the SWAP 2005?
51. Besides State Wildlife Grant and matching in –kind labor, what other sources of funding were used to help support implementation of SWAP 2005 actions at the regional scale, if any? How much funding was made available through these sources?
52. What partners (government, tribes, NGO, academic, foundation, etc.) were engaged to support implementation of SWAP actions?

Evaluation Outcome 5: Recommendations for SWAP 2015 update and steps forward.

In this section, I will ask you questions regarding your recommendations for improving the SWAO 2005 as well as lessons learned or best practices, improving implementation; and addressing bottlenecks, challenges, or risks moving forward.

Statewide Key Questions: Recommendations for Improvement

53. How might past implementation challenges be overcome at the statewide scale?
54. Were there some key bottlenecks that need to be addressed to be able to implement more effectively in the future? What bottlenecks might inhibit implementation moving forward at the statewide scale?
    a. How might these bottlenecks be addressed?
55. Are there opportunities to leverage the SWAP 2015 to support implementation moving forward (e.g., funding, programs, capacity, policies, mandates etc.)?

56. What risks exist to being able to successfully implement SWAP activities moving forward? [prompt if need be: Regulatory, Financial, Environmental, Scientific, Social, Economic, or Institutional]
57. What information is currently used to inform decision-making at the statewide scale relevant to SWAP recommended actions?
    a. What information from monitoring and evaluation would be most helpful in decision-making moving forward?

58. How could SWAP 2005 monitoring and evaluation be strengthened and improved for the 2015 update process
    a. What are some SMART metrics to measure progress to consider for the SWAP 2015 update? (TIER 2 QUESTION)
    b. What other efforts could be leveraged for monitoring and evaluation?
59. To what extent is learning incorporated back into future SWAP decision-making?
    a. "How can this be improved moving forward?
60. What key lessons learned can be drawn from the implementation of the SWAP 2005?
61. In what ways could State government improve its grant-making at the statewide level to more effectively create and implement a common vision across the state?
    a. How could the grant-making program be used to catalyze and leveraged efforts in the state?
62. What additional funding sources exist or could be leveraged to support SWAP actions moving forward? *[prompt if needed: Federal, foundation, other private]*
63. What partners (government, tribes, NGO, academic, foundation, etc.) could be engaged to support implementation of SWAP actions moving forward?

Regional Key Questions: Recommendations for Improvement

64. How might past implementation challenges at the regional scale be overcome?
65. What bottlenecks might inhibit implementation moving forward at the regional scale?
    a. How might these bottlenecks be addressed?
66. Are there opportunities to leverage the SWAP 2015 to support implementation moving forward (e.g., funding, programs, capacity, policies, mandates etc.)?
67. What risks exist for implementing SWAP activities moving forward at the regional scale? [prompt if need be: Regulatory, Financial, Environmental, Scientific, Social, Economic, or Institutional]
68. What information is currently used to inform decision-making at the regional scale relevant to SWAP recommended actions?
    a. What information from monitoring and evaluation would be most helpful in decision-making moving forward?
69. How could SWAP 2005 monitoring and evaluation be strengthened and improved for the 2015 update process
    a. What are some SMART metrics to measure progress to consider? (TIER 2 QUESTION)
    b. What other efforts could be leveraged for monitoring and evaluation?
70. To what extent is learning incorporated back into future SWAP decision-making?
    a. "How can this be improved moving forward?
71. What best practices exist from implementing the SWAP 2005 at the regional scale?
72. What key lessons learned can be drawn from the implementation of the SWAP 2005 at the regional scale?
73. In what ways could State government improve its grant-making at the regional level to more effectively create and implement a common vision across the state?

   a. How could the grant-making program be used to catalyze and leveraged efforts in the state?

74. What additional funding sources exist or could be leveraged to support SWAP actions moving forward? *[prompt if needed: Federal, foundation, other private]*
75. How could regional SWAP 2005 adaptive management be strengthened and improved for the 2015 update process?
76. What partners (government, tribes, NGO, academic, foundation, etc.) could be engaged to support implementation of SWAP actions moving forward?

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Appendix 6: SWAP Evaluation Interviewees

Interviewee	Affiliation
Amber Transou	California Department of Parks and Recreation
Amy Golden	California Department of Transportation
Andrea Jones	Audubon California
Bill Craven	Senate Natural Resources and Water Committee
Brett Furnas	California Department of Fish and Wildlife
Bruce Gwynne	California Department of Conservation
Carie Battistone	California Department of Fish and Wildlife
Catherine Kuhlman	California Natural Resources Agency
Chris Beale	Resources Legacy Fund
Chris Dorsett	Ocean Conservancy
Chris Potter	California Natural Resources Agency
Craig Shuman	California Department of Fish and Wildlife
Dave Shuford	Point Blue Conservation Science
David Elms	California Department of Fish and Wildlife
David Wright	California Department of Fish and Wildlife
Elliot Chasin	California Department of Fish and Wildlife
Gary Falxa	California Department of Fish and Wildlife
Gary Knoblock	S.D. Bechtel, JR. Foundation
Hawk Rosales	InterTribal Sinkyone Wilderness Council
Heather Ludemann	The David and Lucile Packard Foundation
James Thorne	University of California Davis
Joe Croteau	California Department of Fish and Wildlife
Julie Horenstein	California Department of Fish and Wildlife
Justin Oldfield	California Cattlemen’s Association
Kamyar Guivetchi	California Department of Water Resources
Karen L. Miner	California Department of Fish and Wildlife
Kim Delfino	Defenders of Wildlife
Krista Tomlinson	California Department of Fish and Wildlife
Krysta Rogers	California Department of Fish and Wildlife
Leslie MacNair	California Department of Fish and Wildlife
Mark Stopher	California Department of Fish and Wildlife
Mary Beth Woulfe	California Department of Fish and Wildlife
Mike Sutton	California Fish and Game Commission
Monica Parisi	California Department of Fish and Wildlife
Noelle G. Cremers	California Farm Bureau Federation
Patrick Huber	University of California Davis
Pelayo Alvarez	California Rangeland Conservation Coalition
Pete Figura	California Department of Fish and Wildlife
Rebecca Fris	California Landscape Conservation Cooperative

Interviewee	Affiliation
Richard Callas	California Department of Fish and Wildlife
Robert M. Sullivan	California Department of Fish and Wildlife
Sarah Reed	Colorado State University
Scott Gardner	California Department of Fish and Wildlife
Scott Koller	California Department of Fish and Wildlife
Scott Osborn	California Department of Fish and Wildlife
Scott Wilson	California Department of Fish and Wildlife
Stacy Anderson	California Department of Fish and Wildlife
Steve Goldman	California Department of Fish and Wildlife
Steve Torres	California Department of Fish and Wildlife
Tina Bartlett	California Department of Fish and Wildlife
William Hull	Consultative Group on Biological Diversity

Appendix 7: Conservation Action Categories and Examples

The table below provides examples of the type of activities and actions included within each conservation action categories. In the column "example conservation actions," information comes directly from the SWAP 2005. Information provided in the column "example grant planned or implemented activities," shares information drawn directly from SWG funded project reports and documentation. Finally, information shared in the column "interviewee examples of actions/activities supporting SWAP 2005 conservation action," provides direct quotes from interviewees shared during interviews.

Recommended Conservation Actions	Example Conservation Actions	Example Grant Planned or Implemented Activities	Interviewee Examples of Actions/Activities Supporting SWAP 2005 Conservation Action
Policies and Management Actions	h. Fully implement the recovery plans for the Mojave tui chub, Amargosa vole, and Inyo California towhee. (Mojave Desert region)	Improve the habitat for the SGCN (sensitive, listed and candidate) through active management of the natural resources on CDFW-Managed lands.	*Lots of management actions have taken place, specifically in the Bay Delta system where bond money has been used for restoration and protection.*
Enforcement	i. Federal and State resource agencies should foster and facilitate interstate collaborative enforcement efforts on marine species whose ranges cross jurisdictional boundaries. (Marine region)	A variety of projects were implemented with the goal of achieving site security and habitat improvements. *No other grants mentioned enforcement	*Department signed an MOU with the U.S. Coast Guard to collaborate on MPA enforcement.*
Infrastructure, Land-use, Permitting	b. Wildlife agencies should establish regional goals for species and habitat protection and work with city, county, and State agency land-use planning processes to accomplish those goals. (South Coast region) l. Public agencies and private organizations should protect, restore, and improve water dependent habitats (including wetland, riparian, and estuarine) throughout the region. Design of these actions should factor in the likely effects of accelerated climate change. (Central Valley and Bay-Delta region)	Department developed a monitoring strategy to identify species conservation goals for future and ongoing land management. Maintenance activities conducted from June 2011 to May 2012 included fence repair, trash removal, invasive plant monitoring and control, and various tasks associated with grazing lease management and burn preparation.	*Progress has been made, particularly linking up program efforts with the RAMP and streamlining restoration permitting.*

Recommended Conservation Actions	Example Conservation Actions	Example Grant Planned or Implemented Activities	Interviewee Examples of Actions/Activities Supporting SWAP 2005 Conservation Action
Habitat Conservation and Restoration	d. State and Federal agencies should work with cities and counties to secure sensitive habitats and key habitat linkages. (Statewide) j. Water management agencies need to reestablish and maintain more natural river flows, flooding patterns, water temperatures, and salinity conditions to support wildlife species and habitats. (Central Valley and Bay-Delta region)	Project activities focused on improvement of vegetation conditions in California tiger salamander upland habitat and 950 native plants were planted at the Woodbridge Ecological Reserve.	*With funding from the Coastal Conservancy and through collaborative efforts such as the Southern California Wetlands Recovery Project, CDFW and other agencies have worked together on coastal acquisition and restoration of coastal areas. Both the Federal and State government are purchasing land along the Sacramento River to protect riparian species. This is good for both flood control and lower property damage from floods.*
Species Conservation and Restoration	k. The State should strengthen its capacity to implement conservation actions and to assist local agencies and landowners with planning and implementation of wildlife and habitat restoration and conservation efforts. (Statewide) e. Federal, State, and local public agencies should sufficiently protect sensitive species and important wildlife habitats on their lands. (Central Coast region)	Since the project started, we have completed 625 plots, and have identified a baseline inventory consisting of 150 bird and 25 small mammal species. These data have been used to map distributions of upland game birds (e.g., mountain quail) and species of special concern (e.g., olive-sided flycatcher). Efforts to repair guzzlers, restore springs, salt cedar and fountain grass removal resulted in maintaining populations of peninsular bighorn sheep in Magnesia Spring and Carrizo Ecological Reserves.	*We are spending funding on riparian areas and target species like the red-legged frog, which has been identified as a species that has data gaps.* *There have been more efforts for direct species rather than habitat restoration because we only have so much available habitat. In the future, there may be a shift in mitigation strategy from individual species conservation to habitat restoration.*
Coordination, Collaboration, and Stakeholder Engagement	f. Federal, State, and local agencies should provide greater resources and coordinate efforts to control existing occurrences of invasive species and to prevent new introductions. (Statewide) e. Public agencies and private organizations need to collaboratively protect and restore habitat connectivity along major rivers in the	The California Safe Passages Project is intended to become an ongoing forum for discussion concerning the planning and implementation of wildlife habitat connectivity conservation efforts throughout California. The Department hosted a seminar on Climate Change and Ecological Resources in California followed by a workshop of staff and key	*Pleasantly surprised with the collaborative projects associated with SWAP. There have been good efforts to get the CDFW to coordinate with infrastructure and transportation agencies.* *Our top priority has been to work with land owners and the Federal government. We have worked with BLM, which is a major land manager, as well as the Forest Service and the*

Recommended Conservation Actions	Example Conservation Actions	Example Grant Planned or Implemented Activities	Interviewee Examples of Actions/Activities Supporting SWAP 2005 Conservation Action
	Central Valley. (Central Valley and Bay-Delta region)	agencies and stakeholders in June 2008 and in September 2009 to initially consider climate change implications for the priority actions identified in the Plan and provide updates on CDFW efforts on these subjects.	*State Parks Department.* *We have done a really good job coordinating with agencies and other non-profits and land stakeholders. We have worked well with non-profits, but I think we could interact even more.*
Addressing Conservation Priorities and Stressors in the SWAP 2005	l. Public agencies and private organizations should protect, restore, and improve water dependent habitats (including wetland, riparian, and estuarine) throughout the region. Design of these actions should factor in the likely effects of accelerated climate change. (Central Valley and Bay-Delta region) 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. (Statewide)	Extensive work was completed for the treatment and removal of invasive species including the spraying of pampas grass (spot treatments within eight acre area), onionweed (spot treatments within 16 acre area), annual exotic grasses, and iceplant, and the physical removal of mustard, and invasive cultivars of Monterey and Torrey pines (approximately 55 trees). Monitored available information on climate change effects on Western burrowing owls in California	*We have made more progress than we thought we would on issues related to climate change. Farmers and ranchers in the central valley are noticing the affects and are starting to create climate adaptation plans to mitigate potential impacts.*
Education, Outreach, and Capacity-building	j. The State and Federal governments should give greater priority to wildlife and natural resources conservation education. (Statewide) k. The State should strengthen its capacity to implement conservation actions and to assist local agencies and landowners with planning and implementation of wildlife and habitat restoration and conservation efforts. (Statewide)	Conducted training and provided oversight of staff and volunteers in the appropriate application of herbicides to restore wildlife habitat, and collated and submitted regulatory reports. Developed new web mapping tool with added functionality and ability to assist in more efficient decision-making. We had a feedback session on this Beta tool, and have incorporated significant changes based on the feedback to create a more functional and intuitive web mapping tool.	*There has been more effective outreach in Sacramento, most likely through improved technologies or better leadership.* *DFW has done a good job getting the word out about projects. We have an Office of Communication, Education, and Outreach. They are grossly underfunded, but are doing a good job with their resources.*

Recommended Conservation Actions	Example Conservation Actions	Example Grant Planned or Implemented Activities	Interviewee Examples of Actions/Activities Supporting SWAP 2005 Conservation Action
Wildlife Resource Assessment/ Research	d. Fish and Game should continue fisheries restoration and watershed assessment efforts. (North Coast-Klamath region) n. To address habitat fragmentation and avoid the loss of key wildlife corridors, Federal, State and local agencies, along with NGOs, should support scientific studies to identify key wildlife habitat linkages throughout the State. (Statewide).	A systematic, property-wide mesocarnivore survey, including special status carnivores, using remote camera traps was initiated in August 2009 and concluded in 2012. During the breeding season of 2009, with a team of 27 Department staff, surveyed 125 randomly selected landscape blocks within the study area, each measuring five km^2, for all active Swainson's hawk nests – a total of over 3,000 square kilometers surveyed. Analyzed images collected at camera stations for detections of fishers to estimate naïve occupancy rates as follows: Sampled eight units in Humboldt Redwoods State Park, consisting of 32 track plate-hair snare hybrid stations and 32 remote cameras for a minimum of 15 days.	*In the North Central CDFW region, we have made great progress, primarily through our research and assessment group. We are very science oriented and do a good job at identifying species of conservation needs, research proposals and getting funding to implement the projects. We have one long-term monitoring project that has been going on for six years. Progress has been made on wildlife resource assessments, specifically through SWG funding to support an increase in human capacity.*
Conservation Planning/Plans	a. The State should provide scientific and planning assistance and financial incentives to local governments to develop and implement regional multi-species conservation plans for all of the rapidly developing areas of the Sierra Nevada and Cascades. (Sierra Nevada and Cascades region) g. The State should systematically review and monitor the distribution and abundance of nonharvested marine fish and invertebrates. (Marine region)	SWG-supported assessments of high mountain lakes have been used to develop seven watershed-based aquatic biodiversity management plans, with five approved and finalized to date. These plans direct Department resource managers to improve the status of native fauna, including the mountain yellow-legged frog and Yosemite toad, through habitat restoration via removal of non-native species. Coordinated regional and statewide conservation planning by providing policy and technical guidance on NCCPs focused on the Bay	*Good progress made towards doing regional comprehensive conservation planning. From our standpoint there have been valuable efforts made to integrate transportation planning to conservation planning.* *The habitat planning branch made some movement lately for standardizing different measures and how to develop and meet conservation planning at a species level that is consistent across the State.* *The biggest efforts have occurred through HCCPs.*

Recommended Conservation Actions	Example Conservation Actions	Example Grant Planned or Implemented Activities	Interviewee Examples of Actions/Activities Supporting SWAP 2005 Conservation Action
		Delta Conservation Plan, a complex plan that crosses multiple county jurisdictions, some with their own developing regional conservation plans.	
Funding and Leveraging	o. The State should provide scientific and planning assistance and financial incentives to local governments to develop and implement regional multi-species conservation plans for all of the rapidly developing areas. (Statewide) p. Fish and Game should expand funding and coordinate efforts to prevent the establishment of invasive species and to reduce the damage of established invasive species. (Central Valley and Bay-Delta region)	Project funds were leveraged with other stakeholder efforts including surveys funded by the Imperial Irrigation District and Pasadena Audubon.	*We have been very good at finding partners to get our work done.* **Interviewees provided limited on funding and leveraging examples*
Knowledge to Implement SWAP 2005	i. Federal and State agencies should work to understand the natural fire regimes of different ecosystems and how the ecological role of wildfire can be replicated with prescribed fire and other forest management practices. (North Coast-Klamath region)	Surveys have been initiated to determine presence, and in some cases distribution, of special status species, to establish an index of population trend of "indicator" species, and to assess habitat. The primary objectives of this element of the grant were to monitor habitat use, survival, and reproductive ecology of fishers translocated to a portion of their historic range in the southern Cascades and northern Sierra Nevada.	*The Department Director has put together the science team and we are promoting a website that shares literature by CDFW with stakeholders. Caltrans and CDFW worked on wildlife mapping connectivity project. We paid attention to areas of high priority and helped identify regional assessment priorities. One of the actions of that project was to implement smaller scale regional mapping for targeted areas.* *Progress has been made towards applied relevant science that has been used to influence decision-making.*
Monitoring and Evaluation	l. Fish and Game should be allocated the resources to monitor the distribution of sensitive fish and other aquatic species populations and to engage effectively in	Evaluation process and tools in place to assess progress by integrating monitoring results and other learnings, as a basis for decision-making under adaptive management.	*We started long term monitoring project in our regions in the Sierra Nevada, going on for six years, we have tried to educate the need for baseline data monitoring,*

Recommended Conservation Actions	Example Conservation Actions	Example Grant Planned or Implemented Activities	Interviewee Examples of Actions/Activities Supporting SWAP 2005 Conservation Action
	water-rights decision processes, water diversion issues, land-management planning, and conservation planning actions to restore and enhance aquatic systems. (Sierra Nevada and Cascades region) f. Where historical or active gravel mining has had substantial effects on river systems that are important for sensitive aquatic species, Federal, State, and local agencies should continue monitoring and restoration efforts to minimize the negative effects of mining. Active mining operations should employ the most ecologically sensitive practices possible. (North Coast-Klamath region)	During 2012, we monitored approximately 57 Sierra Nevada sites for bird and mammal species, habitat characteristics, and woody plant species. We used low-cost, high-return methods that produce archival records: audio recordings were made and archived for birds; infrared- and motion-triggered camera data were collected for mammals.	*especially with years like this year and the drought. It is really hard, can only run so many as money. Inventory monitoring is becoming more developed across all NCCP and the ecoregions, which is evolving to become a more of a comprehensive region wide effort.*
Adaptive Management	i. In their conservation planning and ecosystem restoration work, State and Federal wildlife agencies and land managers should consider the most current projections of the effects of global warming. (Statewide)	The Contractor developed a white paper (Shilling and Waetjen, 2011) delineating several approaches for assessing and prioritizing connectivity on a regional scale and completed a case study from the San Joaquin Valley illustrating an alternative to "core and linkage" modeling. *No other grants mentioned processes in place	*Depending on the action or project, all NCCP's have to have some kind of adaptive management component included.*

Appendix 8: Publications Developed through SWG Funded Projects

Bean, William T., Robert Stafford, and Justin S. Brashares. "The Effects of Small Sample Size and Sample Bias on Threshold Selection and Accuracy Assessment of Species Distribution Models." *Ecography* (2011).

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Bland, James. "First Repeat Census of Sierra Sooty Grouse." Annual Meeting of the Western Section of the Wildlife Society: Sacramento, Feb. 2012.

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Bonham, Charlton. *Report to the Fish and Game Commission: A Status Review of the Mountain Yellow-legged Frog*. Rep. California Department of Fish and Wildlife, 2011. Web. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=40357.

Bunn, D., A. Mummert, M. Hoshovsky, K. Gilardi, and S. Shanks. *California Wildlife Conservation Challenges: California's Wildlife Action Plan*. Rep. Sacramento: University of California, Davis Wildlife Health Center and California Department of Fish and Wildlife, 2007. http://www.dfg.ca.gov/SWAP/2005/.

Burkett, E. E. and B.S. Johnson. "*Development of a conservation strategy for Burrowing Owls in California*." Proceedings of the California Burrowing Owl Symposium. The Institute for Bird Populations and Albion Environmental, Inc., Nov. 2007.

California Department of Fish and Wildlife. *Aquatic Biodiversity Management Plan for the South Yuba River Management Unit (Administrative Draft)*. Rep. Rancho Cordova: California Department of Fish and Wildlife, 2012.

California Department of Fish and Wildlife. *Aquatic Biodiversity Management Plan for the Stuart Fork Creek Management Unit (Administrative Draft)*. Rep. Redding: California Department of Fish and Wildlife, 2012.

California Department of Fish and Wildlife. *Bucks Lake Wilderness Aquatic Resource Management Plan.* Rep. North Central Region: California Department of Fish and Wildlife, In progress.

California Department of Fish and Wildlife. *Canyon Creek Management Unit Aquatic Resource Management Plan*. Rep. North Central Region: California Department of Fish and Wildlife, In progress.

California Department of Fish and Wildlife. *Central Coast Lands Inventory Project*. [Note that this comprehensive report also includes the kit fox, burrowing owl, and American badger studies supported through T-1-5].

California Department of Fish and Wildlife. *Central Coast Resource Assessment Program: CDFG Lands and Special Status Grassland Species Inventories 2004-2008*. Rep. California Department of Fish and Wildlife

California Department of Fish and Wildlife. *Climate Change Research Considerations*. Rep. California Department of Fish and Wildlife, 2011.

California Department of Fish and Wildlife. *Desolation Wilderness Aquatic Biodiversity Management Plan*. Rep. North Central Region: California Department of Fish and Wildlife, In progress.

California Department of Fish and Wildlife. *Draft Survey Protocol for Sooty Grouse in the Sierra Nevada Mountains*. Rep. California Department of Fish and Wildlife and U.S. Forest Services, 2008.

California Department of Fish and Wildlife. *Guidance for Burrowing Owl Conservation*. Rep. Sacramento: Habitat Conservation Branch, Wildlife Branch, and Bay Delta Region, 2008.

California Department of Fish and Wildlife. *Jeff Davis Creek Management Unit Aquatic Resource Management Plan*. Rep. North Central Region: California Department of Fish and Wildlife, In progress.

California Department of Fish and Wildlife. *Lake Spaulding Management Unit Aquatic Resource Management Plan*. Rep. North Central Region: California Department of Fish and Wildlife, In progress.

California Department of Fish and Wildlife. *Memorandum to Fisheries Branch: Big Pine Lake #4 Meadow Rana sierrae Population Monitoring Report*. Rep. Bishop: California Department of Fish and Wildlife, 2012.

California Department of Fish and Wildlife. *Memorandum to Fisheries Branch: Sam Mack Meadow Rana sierrae Population Monitoring Report*. Rep. Bishop: California Department of Fish and Wildlife, 2012

California Department of Fish and Wildlife. *Memorandum to Fisheries Branch: Big Pine Lakes #6 and #7 Restoration Report*. Rep. Bishop: California Department of Fish and Wildlife, 2012.

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California Department of Fish and Wildlife. *Memorandum to Fisheries Branch: Eastern Brook Lakes Restoration Report*. Rep. Bishop: California Department of Fish and Wildlife, 2012.

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California Department of Fish and Wildlife. *Memorandum to Fisheries Branch: Beebe Lake Restoration Report*. Rep. Rancho Cordova: California Department of Fish and Wildlife, 2012.

California Department of Fish and Wildlife. *Memorandum to Fisheries Branch: Gold Lake Restoration Report*. Rep. Rancho Cordova: California Department of Fish and Wildlife, 2012.

California Department of Fish and Wildlife*. North Central Region Lands Assessment*. [Note that this comprehensive report includes projects supported by T-1-3 as well as T-1-5].

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[26] Data collected from the "California Species and Natural Communities Monitoring and Assessment Project" was mentioned as being analyzed as part of a Ph.D. dissertation through the University of California Berkeley, and was likely publically released through the University of California Berkeley; however, the only information we have is that the data collected would be incorporated into a dissertation.

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Appendix 9: SWG Funded Grants, Grant Period, Funding Amount, and Final Outputs

Information provided below drawn directly from final grant reports. Of the 69 completed grants, 15 final grant reports were shared with Blue Earth. In the table below we provide the grant title and grant number, length of the grant's implementation, total value of the project (SWG and State government match), and stated outputs from the grant as shared in the final grant reports.

Grant Title (and Grant #)	Length	Value	Outputs
California Species and Natural Communities Monitoring and Assessment Project (T-1-3)	4 years	$3,314,000	• Department staff led field efforts on several priority projects reported on previously in annual performance reports and used SWG funding to support temporary field staff during the grant period. • Transmitted all completed databases to the Department's Biogeographic Data Branch for incorporation into the State's data warehouse (BIOS) for analysis, use, and decision-making support. • Produced two publications.
Conservation Grant Coordination Project (T-1-4)	5 years	$413,075	*Final performance report does not list any outcomes, outputs, or publications*
California Species and Natural Communities Monitoring and Assessment Project-Phase 3 (T-1-5)	3 years	$2,284,798	• Primarily completed fieldwork goals from 2005 through 2008 according to schedule with a few changes that were results of staffing limitations and time constraints. • Added passerine point counts in the fall of 2007 to monitor differences in avian use between grazed and ungrazed areas within Lower Cottonwood Creek Wildlife Area, as well as avian use within various stages of riparian and wetland restoration on the Los Baños Wildlife Area. • Resumed waterfowl pair and brood surveys. • In 2008 expanded search area for the Tricolored Blackbird onto State Parks property in an area that had a breeding colony in 2005. • Mapped changes in alkali sink habitats and effects on Hispid Bird's-beak, *Cordylanthus mollis hispidus*, on the Los Baños and Volta Wildlife Areas each summer from 2005 – 2007. • Mapped habitat changes within the San Joaquin River flood plain on the China Island Unit of the North Grasslands Wildlife Area. • Mapped the distribution of invasive weeds, primarily perennial pepperweed (*Lepidium latifolium*), within riparian and grassland habitats on selected properties. • Produced seven publications.
Development of a California Comprehensive Wildlife	4 years	$1,726,701	• The CDFW conducted additional coordination and solicited public comments by modifying the website to receive comments electronically, as well as through holding three public meetings in Sacramento, Redding, and Riverside.

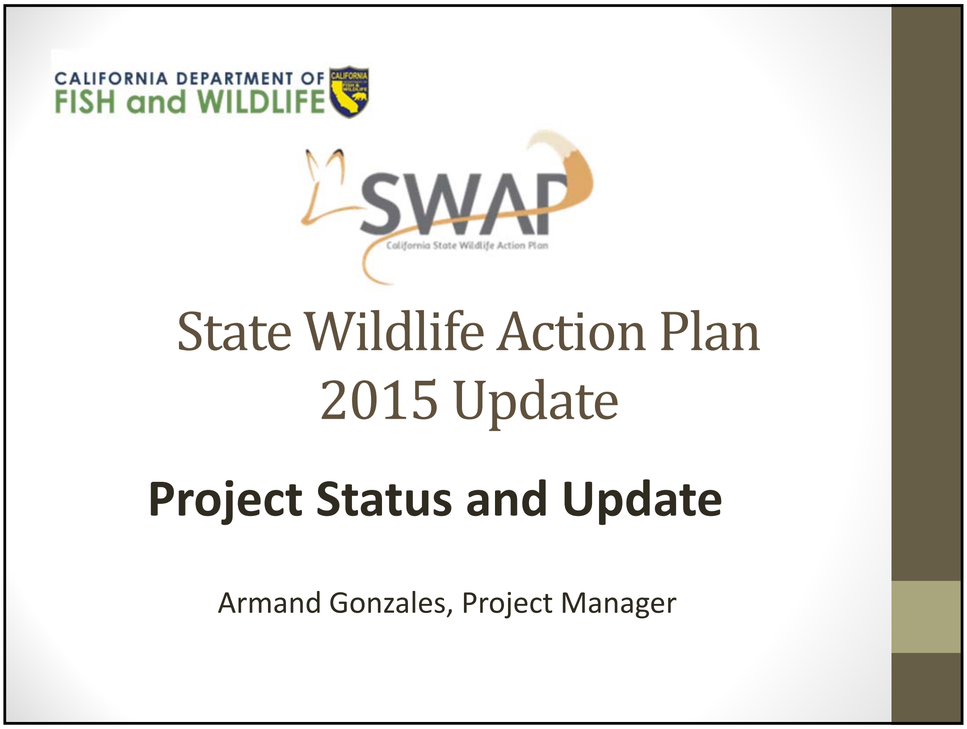
Conservation Plan (T-2-1)			• Contacted California tribes by mail and telephone and invited them to comment on the plan. The CDFW addressed the comments received and revised sections of the plan as appropriate. • The CDFW created a new chapter (Chapter 5) on monitoring and adaptive management. • The CDFW hosted a seminar on climate change and ecological resources in California followed by a workshop for staff, key agencies, and stakeholders. • The project involved conducting a statewide assessment of essential habitat connectivity by using the best available science, data sets, spatial analyses and modeling techniques to produce a functional network of connected wildlands. Used results from the project in plan implementation. • Produced one publication.
Department of Fish and Game Lands Resource Assessment and Monitoring Project (T-3-1)	3 years	$1,604,000	• Used funding to write collaborative agreements with California State University foundations and to hire temporary research/technical assistants. • In the Northern California region, field crews collected data at 250 randomly chosen plots in nine Wildlife Areas. Field crews collected information on habitat, small mammals present, bird species present and amphibian and reptile species present. • Collected data in the North Central region. Performed a field inventory on forty-one CDFW properties in the region. Performed inventory surveys for habitats, birds, mammals, and to a limited extent reptiles and amphibians. • Conducted surveys in the Central CDFW region for threatened and endangered vertebrate species on six CDFW properties. Recorded incidental observations for a number of other sensitive species during the establishment and completion of the formal surveys. • Following three years of reconnaissance, established two small mammal grids and one blunt-nosed leopard lizard grid at the Northern Semitropic Ridge property. • Generated maps illustrating the locations and relative densities of sensitive vertebrate species targeted during survey efforts.
Southern California DFG Lands Management Project (T-6-1)	1 year	*No value included in documents shared by the CDFW*	• Implemented a variety of projects on CDFW lands in the South Coast and Inland Deserts regions with the goal of achieving site security and habitat improvements. • Area planning and reporting, coordination with outside groups, species monitoring and research, and annual and ongoing maintenance and repair. • Land management plans, restoration plans, and accompanying documents for 10 properties were in a variety of stages during the grant-reporting period.
Develop Initial Components for a Western Burrowing Owl Conservation Strategy (T-7-1)	7 years	$384,351	• Revised the Western burrowing owl guidance document solicited peer review. • Produced and edited a draft conservation strategy and range maps. • Reworked internal policy document entitled “Guidance for Burrowing Owl Conservation.” • Added 233 new Western burrowing owl records into the California Natural Diversity Database. • Institute for Bird Populations published the results of their statewide surveys for Western burrowing owls in California.

			• Coordinated with CDFW regional staff to help conserve Western burrowing owls and secure mitigation for habitat loss during development and maintenance projects. • Participated in development and implementation of NCCPs and other large-scale conservation efforts that cover burrowing owls. • Produced six publications.
Development of a Conservation Strategy for the Western Pond Turtle (T-10-1)	5 years	$271,506	• Produced one publication, which incorporated input from a variety of agency biologists and regional turtle experts.
T-11-1 Strengthening California's Resource Assessment Capability (T-11-1)	6 years	*No value included in documents shared by the CDFW*	• Identified leads in the Northern, North Central, and the Central CDFW regions where the project occurred. Each project lead was responsible for hiring a field crew and conducting surveys within their respective region and producing an annual and a final report of their findings. • Two other sub-projects evolved out of Project 1A, and provided individual reports of their findings. • Initiated a motion-detection camera survey protocol that emulated methods described by Zielinski and Kucera (1995). • Completed 530 camera station surveys within 265 sampling units across 14 counties, 10 National Forests, and four CDFW regions. • Created a centralized database to house the meso-carnivore project data.
Heavy Metal Contamination in Sentinel Wildlife Species (T-12-1)	4 years	*No value included in documents shared by the CDFW*	• Documented lead exposure and compared exposure levels to live-trapped turkey vultures in areas with varying hunting activities. • Received blood samples and carcasses from golden eagles, turkey vultures, and common ravens collected opportunistically from wildlife rehabilitation centers and agency biologists throughout California. Calculated estimates for cause-specific mortality for the overall sample and for each species separately. • Compared stable lead isotope ratios of blood from golden eagles and lead samples collected from carrion found as available prey for eagles and published lead isotope ratios from ammunition purchased within California. • Documented lead exposure in golden eagles and turkey vultures within the condor range before and after the ban of lead ammunition.
High Mountain Aquatic Resource Assessment and Management (T-15-1)	4 years	$182,116	• Submitted a final draft of the Desolation Wilderness Area Based Management Plan (ABMP) for agency review. • Nearly completed the first draft of the South Fork Yuba ABMP. • Completed coordination and planning efforts with USDA-FS and USFWS partner agencies for four additional plans. • Project biologist consulted on three USDA-FS fish removal projects conducted in the CDFW North

			Central region. • Project biologist developed monitoring plans that field personnel implemented.
Long term monitoring strategy for the Western Riverside County Multi-Species Habitat Conservation Plan (T-17-1)	5 years	$655,000	• Coordinated and conducted Biological Monitoring program surveys, as well as funded personnel time for development of the long-term monitoring strategy document. • Provided funding for the Biological Monitoring program Administrator, a Lead Biologist, a Program Lead, and up to seven Field Biologists. • Conducted an inventory of the 146 covered species on accessible conserved land to determine current distributions and status. • Survey work to document the distribution of covered species in the Conservation Area from 2007- 2012 included surveys for all taxa covered under the MSHCP (i.e., birds, mammals, reptiles, amphibians, fish, insects, crustaceans, and plants). • Developed survey protocols and detection probabilities for select covered species. • Tested and refined long-term monitoring protocols and calculated detection probabilities for feasible species (e.g., coastal sage scrub birds, Quino checkerspot butterfly). • Combined surveys for multiple taxa within a covered vegetation/habitat type to test a long-term monitoring strategy that tracks the status, trend, and condition of covered species over time. • Implemented a long-term monitoring strategy within at least one upland vegetation/habitat type (tentatively coastal sage scrub) across the Conservation Area. • Began to develop a monitoring strategy within one aquatic vegetation/habitat type. • Evaluated survey strategies and procedures to determine optimal efficiency. • Began an expanded pilot to assess the condition of coastal sage scrub, chaparral, and grassland vegetation communities within the Conservation Area. • Provided data to the adaptive management program and to the wildlife agencies to evaluate species and habitat goals. • Monitoring Program Administrator coordinated monthly meetings of land managers and representatives from affiliates and partner organizations including the wildlife agencies. • The MSHCP Biological Monitoring program prepared summary reports of all surveys conducted from 2007-2011. • The Western Riverside County RCA prepared annual reports of all MSHCP activities including those carried out by the Biological Monitoring program.
Focused Regional and Statewide Conservation Planning (T-19-1)	3 years	$900,000	• Funded one permanent CDFW employee to coordinate regional and statewide conservation planning, including working with field planning staff on NCCPs. • Coordinated efforts to develop a Swainson's hawk Conservation Strategy and worked with other agency employees, environmental groups and landowner representatives to develop a State Safe Harbor-like Agreement. • Funded a CDFW employee from August 2009 to March 2010, who provided policy and technical

			guidance on NCCPs.
The Safe Passages Project: Planning for Wildlife Connectivity in California (T-25-1)	3 years	$88,001	- Created a statewide connectivity forum of Federal, State, and local agencies involved in wildlife management, transportation and land-use planners, scientists and researchers, and conservation organizations. - Created a consensus document from the connectivity forum, which identifies lessons learned from past work and produces a set of recommendations – both technical and policy recommendations – to guide and inform future regional connectivity efforts. - Held a series of regional habitat connectivity workshops to develop and refine a comprehensive and systematic approach to identifying barriers to wildlife movement. - Developed an approach to connectivity design for this region that the agencies and other stakeholders could implement. - Produced one model linkage design for the San Joaquin Valley and foothills.
State Wildlife Action Plan Implementation: Resources and Capacity-building Tools for Amphibian and Reptile Conservation (U-26-R-1)	3 years	*No value included in documents shared by the CDFW*	- Completed the SGCN and climate change vulnerability tasks, primarily via a separate SWG grant (T-28-R-1) - Produced an analysis titled “Identifying Priority Amphibian and Reptile Conservation Areas in California: Pilot Implementation.” The report contains numerous range maps and species richness figures. - Attended a nationwide symposium, and assisted with the compilation of regulations pertaining to amphibians and reptiles in the U.S. - Produced a final regulatory assessment report, State of the Union: Legal Authority over the Use of Native Amphibians and Reptiles in the U.S.

Appendix J



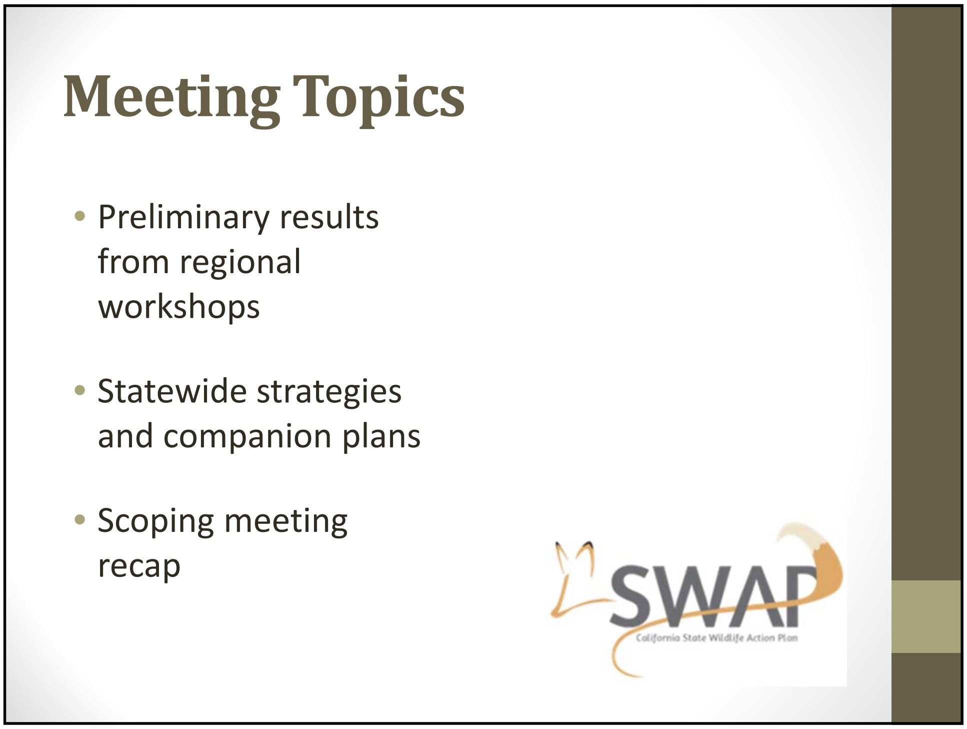
CALIFORNIA DEPARTMENT OF FISH and WILDLIFE

SWAP California State Wildlife Action Plan

State Wildlife Action Plan 2015 Update

Project Status and Update

Armand Gonzales, Project Manager



Meeting Topics

- Preliminary results from regional workshops
- Statewide strategies and companion plans
- Scoping meeting recap

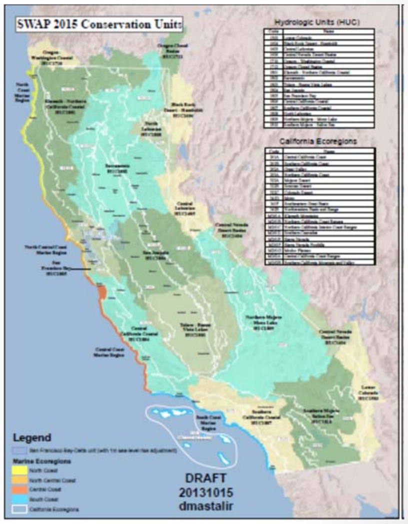
SWAP California State Wildlife Action Plan

Workshop Summaries

- >120 staff
- 13 agencies/organizations

- 40 Conservation Units
- 64 Conservation projects

- >250 Strategies
- Goals
- Objectives
- Actions
- Monitoring


SWAP 2015 Conservation Units
Hydrologic Units (HUC)
California Ecoregions
Legend
Marine Ecoregions
North Coast
North Central Coast
Central Coast
South Coast
California Ecoregions
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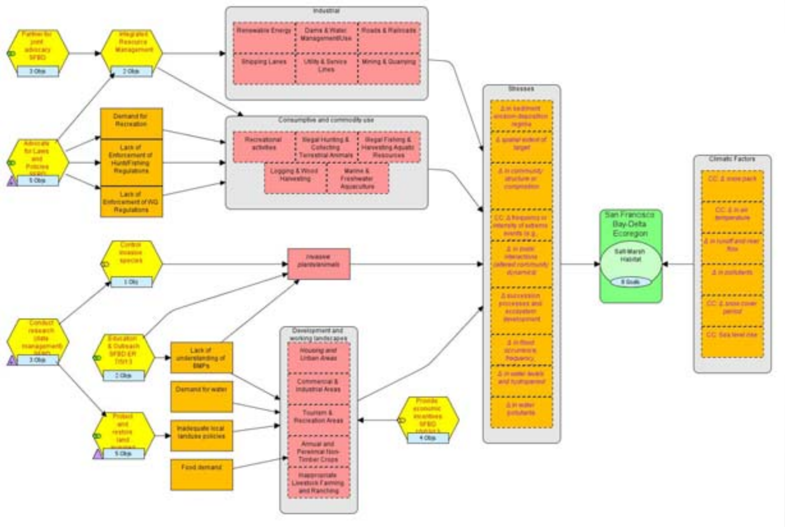
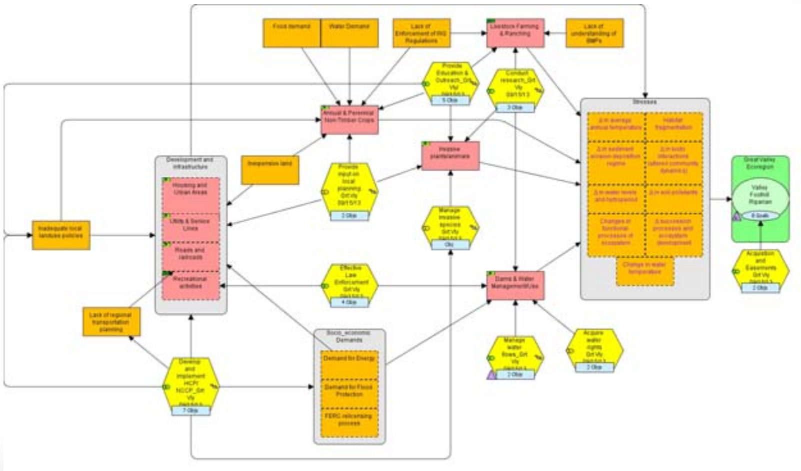
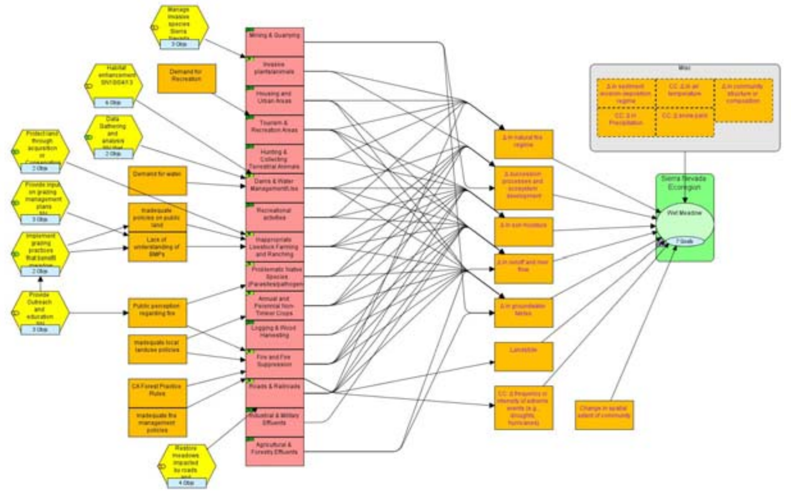
San Francisco Bay-Delta


Partner for joint advocacy SFBD
3 Obs
Integrated Resource Management
2 Obs
Industrial
Renewable Energy
Dams & Water Management/Use
Roads & Railroads
Shipping Lanes
Utility & Service Lines
Mining & Quarrying
Advocate for Laws and Policies
5 Obs
Demand for Recreation
Lack of Enforcement of Hunt/Fishing Regulations
Lack of Enforcement of WG Regulations
Consumptive and commodity use
Recreational activities
Illegal Hunting & Collecting Terrestrial Animals
Illegal Fishing & Harvesting Aquatic Resources
Logging & Wood Harvesting
Marine & Freshwater Aquaculture
Control invasive species
1 Obs
Invasive plants/animals
Conduct research
3 Obs
Education & Outreach SFBD ER
2 Obs
Lack of understanding of BMPs
Demand for water
Protect and restore land
5 Obs
Inadequate local landuse policies
Food demand
Development and working landscapes
Housing and Urban Areas
Commercial & Industrial Areas
Tourism & Recreation Areas
Annual and Perennial Non-Timber Crops
Inappropriate Livestock Farming and Ranching
Provide economic incentives SFBD
4 Obs
Stresses
Δ in sediment erosion-deposition regime
Δ spatial extent of target
Δ in community structure or composition
CC: Δ frequency or intensity of extreme events (e.g.,
Δ in biotic interactions (altered community dynamics)
Δ succession processes and ecosystem development
Δ in flood occurrence frequency
Δ in water levels and hydroperiod
Δ in water pollutants
San Francisco Bay-Delta Ecoregion
Salt Marsh Habitat
8 Goals
Climatic Factors
CC: Δ snow pack
CC: Δ in air temperature
Δ in runoff and river flow
Δ in pollutants
CC: Δ snow cover period
CC: Sea level rise

Great Valley


Food demand
Water Demand
Lack of Enforcement of WQ Regulations
Livestock Farming & Ranching
Lack of understanding of BMPs
Provide Education & Outreach_Grt Vly
5 Obj
Conduct research_Grt Vly 09/15/13
3 Obj
Annual & Perennial Non-Timber Crops
Inexpensive land
Provide input on local planning Grt Vly 09/15/13
2 Obj
Invasive plants/animals
Manage invasive species Grt Vly
Obj
Development and Infrastructure
Housing and Urban Areas
Utility & Service Lines
Roads and railroads
Recreational activities
Inadequate local landuse policies
Effective Law Enforcement Grt Vly
4 Obj
Dams & Water Management/Use
Lack of regional transportation planning
Develop and implement HCP/ NCCP_Grt Vly
7 Obj
Socio_economic Demands
Demand for Energy
Demand for Flood Protection
FERC relicensing process
Manage water flows_Grt Vly
2 Obj
Acquire water rights Grt Vly
2 Obj
Stresses
Δ in average annual temperature
Habitat fragmentation
Δ in sediment erosion-deposition regime
Δ in biotic interactions (altered community dynamics)
Δ in water levels and hydroperiod
Δ in soil pollutants
Changes in functional processes of ecosystem
Δ succession processes and ecosystem development
Change in water temperature
Great Valley Ecoregion
Valley Foothill Riparian
6 Goals
Acquisition and Easements Grt Vly
2 Obj

Sierra Nevada


Manage invasive species Sierra Nevada
3 Obj
Habitat enhancement SN10/04/13
6 Obj
Demand for Recreation
Data Gathering and analysis
2 Obj
Protect land through acquisition or Conservation
2 Obj
Demand for water
Provide input on grazing management plans
3 Obj
Inadequate policies on public land
Lack of understanding of BMPs
Implement grazing practices that benefit meadow
2 Obj
Provide Outreach and education
3 Obj
Public perception regarding fire
Inadequate local landuse policies
CA Forest Practice Rules
Inadequate fire management policies
Restore meadows impacted by roads and
4 Obj
Mining & Quarrying
Invasive plants/animals
Housing and Urban Areas
Tourism & Recreation Areas
Hunting & Collecting Terrestrial Animals
Dams & Water Management/Use
Recreational activities
Inappropriate Livestock Farming and Ranching
Problematic Native Species (Parasites/pathogens)
Annual and Perennial Non-Timber Crops
Logging & Wood Harvesting
Fire and Fire Suppression
Roads & Railroads
Industrial & Military Effluents
Agricultural & Forestry Effluents
Δ in natural fire regime
Δ succession processes and ecosystem development
Δ in soil moisture
Δ in runoff and river flow
Δ in groundwater tables
Landslide
CC: Δ frequency or intensity of extreme events (e.g., droughts, hurricanes)
Change in spatial extent of community
Misc
Δ in sediment erosion-deposition regime
CC: Δ in air temperature
Δ in community structure or composition
CC: Δ in Precipitation
CC: Δ snow pack
Sierra Nevada Ecoregion
Wet Meadow
7 Goals

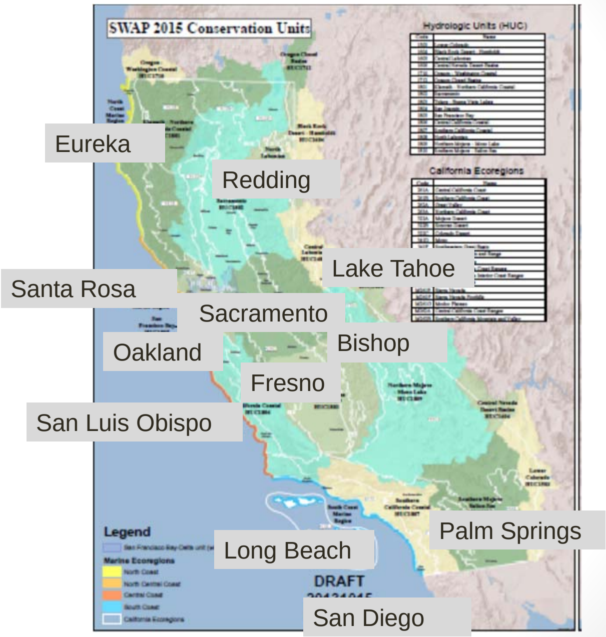
Statewide Strategies

- Anadromous fish
- Climate Change
- Invasive species
- Invertebrates
- Law enforcement
- Marine Environment
- Plants
- Pollution
- Pests and Nuisance Species

Companion Plans

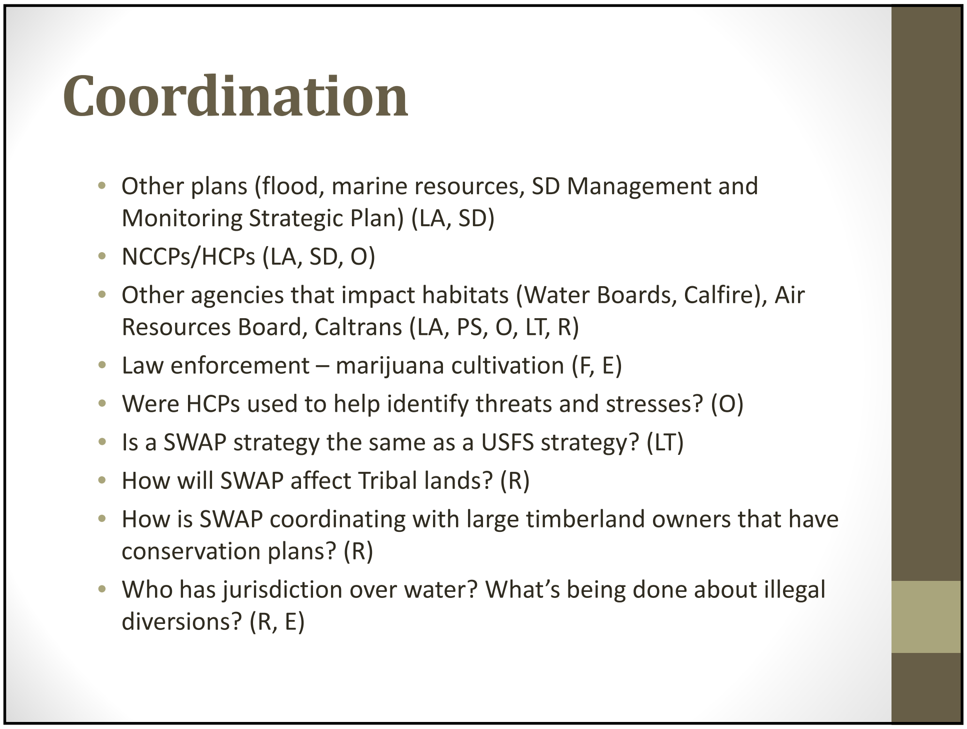
- Agriculture
- Consumptive & Recreational Uses
- Energy Development
- Forests & Rangelands
- Land Use Planning
- Transportation Planning
- Tribal Lands
- Water Management

Scoping Meetings


SWAP 2015 Conservation Units
Hydrologic Units (HUC)
California Ecoregions
Eureka
Redding
Lake Tahoe
Santa Rosa
Sacramento
Bishop
Oakland
Fresno
San Luis Obispo
Palm Springs
Legend
Long Beach
DRAFT
San Diego

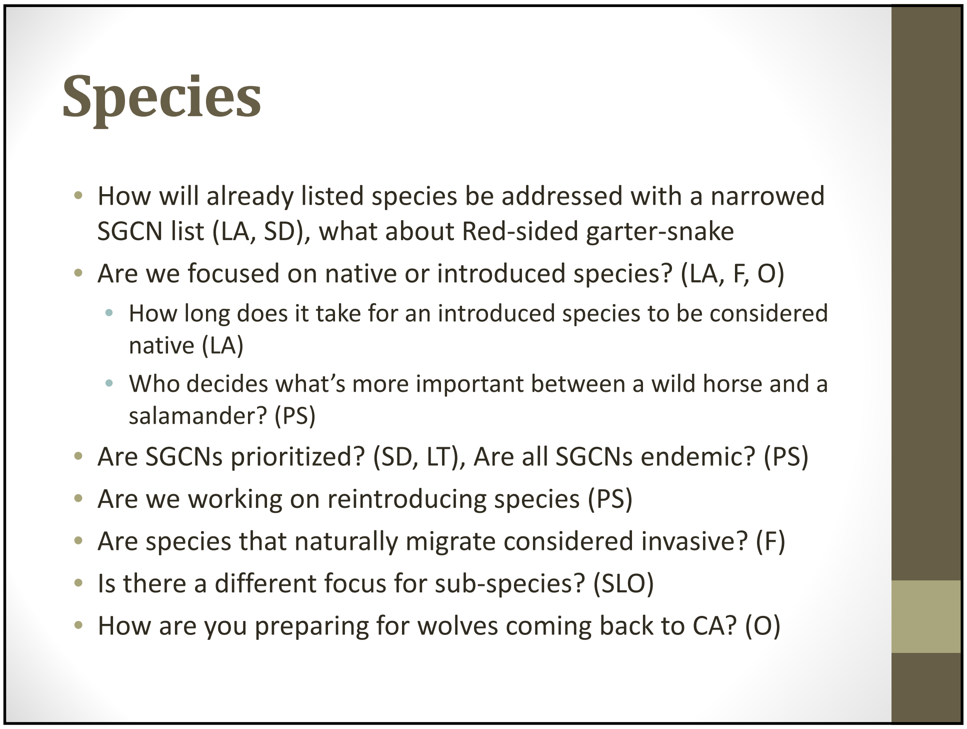
Comment Categories

- Coordination
- Species
- Process
- Partnership
- Funding
- Scientific Integrity
- Suggestions
- Climate Change
- Education and Outreach
- Recreation
- Agenda 21



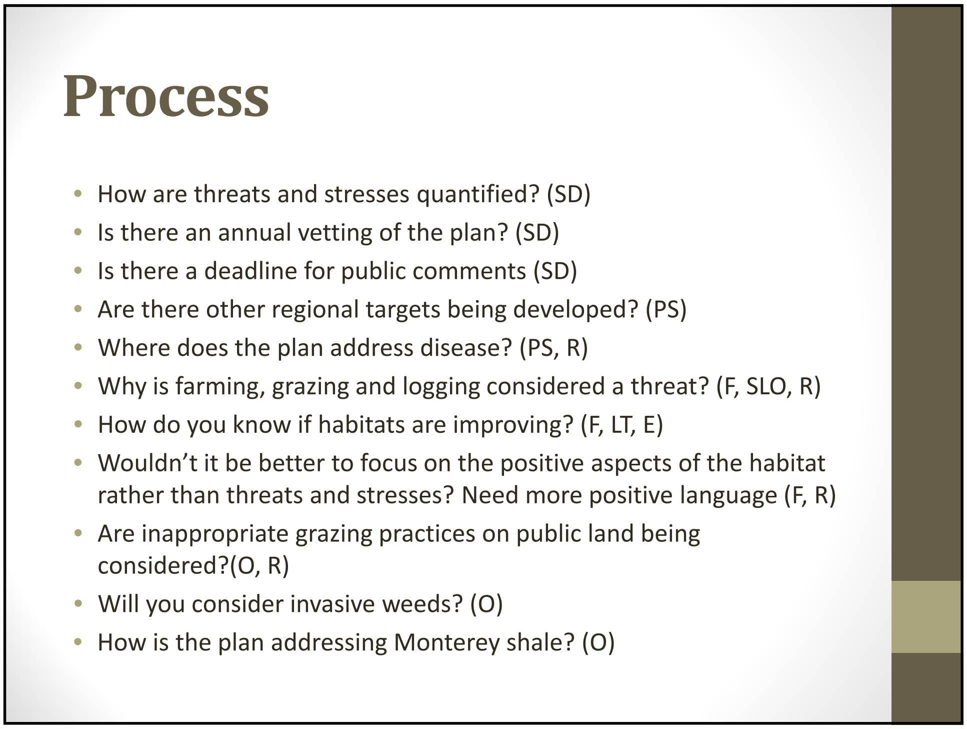
Coordination

- Other plans (flood, marine resources, SD Management and Monitoring Strategic Plan) (LA, SD)
- NCCPs/HCPs (LA, SD, O)
- Other agencies that impact habitats (Water Boards, Calfire), Air Resources Board, Caltrans (LA, PS, O, LT, R)
- Law enforcement – marijuana cultivation (F, E)
- Were HCPs used to help identify threats and stresses? (O)
- Is a SWAP strategy the same as a USFS strategy? (LT)
- How will SWAP affect Tribal lands? (R)
- How is SWAP coordinating with large timberland owners that have conservation plans? (R)
- Who has jurisdiction over water? What's being done about illegal diversions? (R, E)



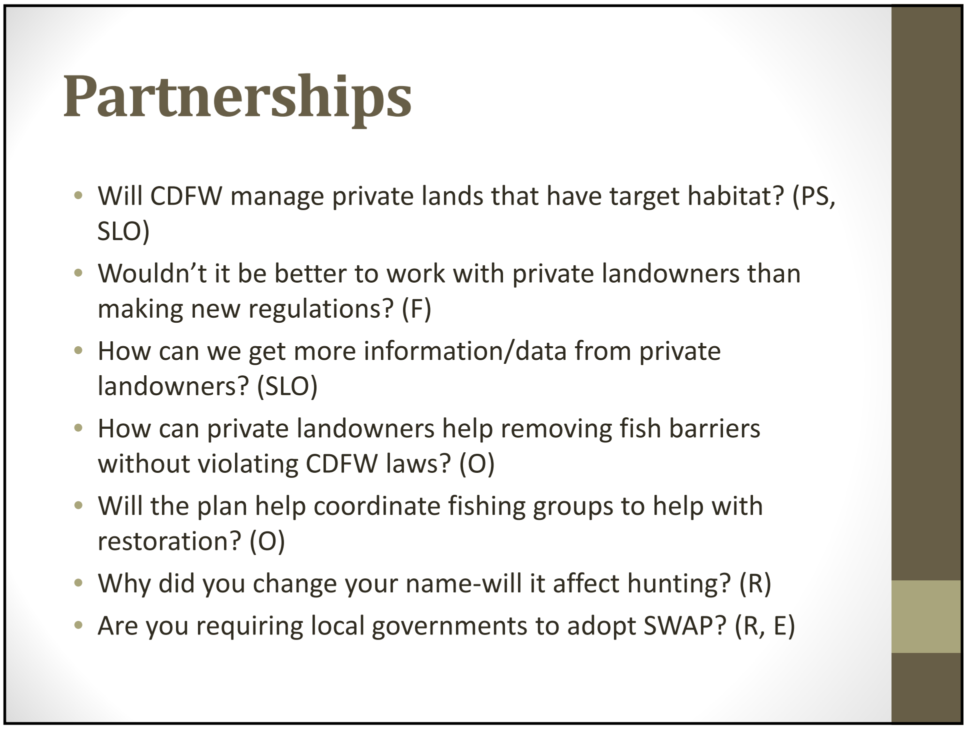
Species

- How will already listed species be addressed with a narrowed SGCN list (LA, SD), what about Red-sided garter-snake
- Are we focused on native or introduced species? (LA, F, O)
  - How long does it take for an introduced species to be considered native (LA)
  - Who decides what's more important between a wild horse and a salamander? (PS)
- Are SGCNs prioritized? (SD, LT), Are all SGCNs endemic? (PS)
- Are we working on reintroducing species (PS)
- Are species that naturally migrate considered invasive? (F)
- Is there a different focus for sub-species? (SLO)
- How are you preparing for wolves coming back to CA? (O)



Process

- How are threats and stresses quantified? (SD)
- Is there an annual vetting of the plan? (SD)
- Is there a deadline for public comments (SD)
- Are there other regional targets being developed? (PS)
- Where does the plan address disease? (PS, R)
- Why is farming, grazing and logging considered a threat? (F, SLO, R)
- How do you know if habitats are improving? (F, LT, E)
- Wouldn't it be better to focus on the positive aspects of the habitat rather than threats and stresses? Need more positive language (F, R)
- Are inappropriate grazing practices on public land being considered?(O, R)
- Will you consider invasive weeds? (O)
- How is the plan addressing Monterey shale? (O)



Partnerships

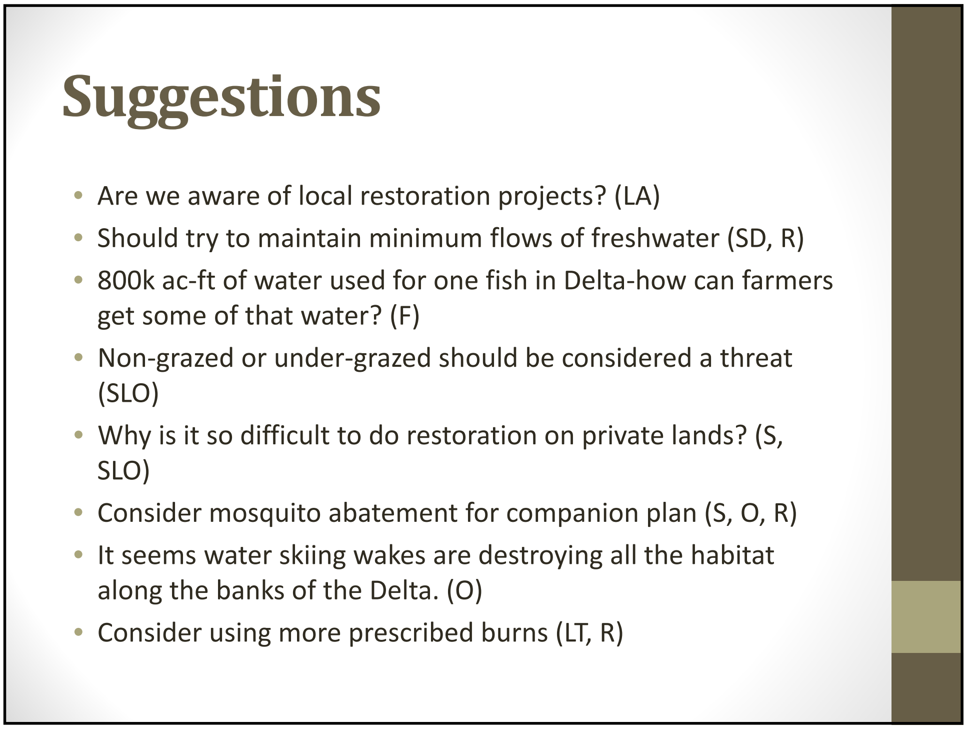
- Will CDFW manage private lands that have target habitat? (PS, SLO)
- Wouldn't it be better to work with private landowners than making new regulations? (F)
- How can we get more information/data from private landowners? (SLO)
- How can private landowners help removing fish barriers without violating CDFW laws? (O)
- Will the plan help coordinate fishing groups to help with restoration? (O)
- Why did you change your name-will it affect hunting? (R)
- Are you requiring local governments to adopt SWAP? (R, E)

Funding

- Source of funding? (LA)
- Will hunting and fishing funds be affected? (LA, R)
- What is the funding match requirements (SD)
- Is there funding for conservation easements? (F)
- Why don’t we have funding like Colorado (1% sales tax)? (F)
- Are funds form WCB involved in SWAP? (E)

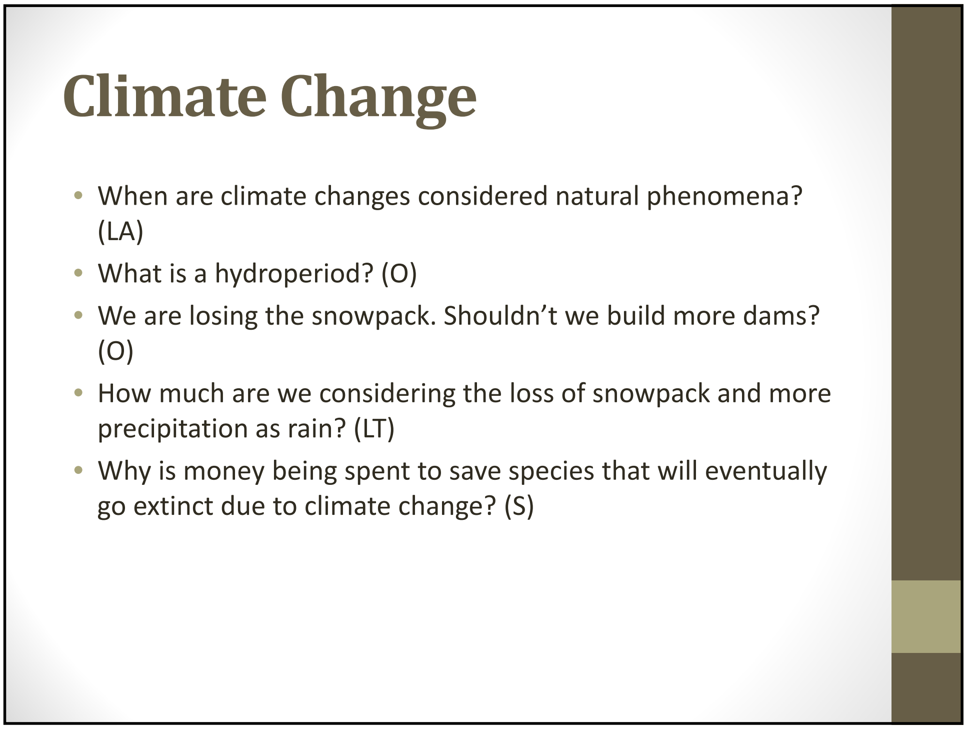
Scientific Integrity

- Will there be peer review ?(LA)
- How will Citizen science (LA), Volunteers (LA) be involved?
- Who will do the data collection? (PS)
- Will SWAP create a clearinghouse data-base? (LT)



Suggestions

- Are we aware of local restoration projects? (LA)
- Should try to maintain minimum flows of freshwater (SD, R)
- 800k ac-ft of water used for one fish in Delta-how can farmers get some of that water? (F)
- Non-grazed or under-grazed should be considered a threat (SLO)
- Why is it so difficult to do restoration on private lands? (S, SLO)
- Consider mosquito abatement for companion plan (S, O, R)
- It seems water skiing wakes are destroying all the habitat along the banks of the Delta. (O)
- Consider using more prescribed burns (LT, R)



Climate Change

- When are climate changes considered natural phenomena? (LA)
- What is a hydroperiod? (O)
- We are losing the snowpack. Shouldn’t we build more dams? (O)
- How much are we considering the loss of snowpack and more precipitation as rain? (LT)
- Why is money being spent to save species that will eventually go extinct due to climate change? (S)

Education and Outreach

- Route 66 Goldminers (LA)
- Are conservation easements meant to close an area for human use? (PS)
- If E&O is so important, why doesn’t the CDFW fund it? (F)
- Lack of public support for some of USFS recommendations has stalled their implementation. How will SWAP deal with gaining public support? (LT)
- Programs in the past that have involved the types of programs such as finding willing partners in the private sector and developing successful conservation programs to see if they were successful and quantify them? (E)

Recreation

- Where will hunting and fishing be addressed? (SD)
- What are the recommendations related to OHVs? (SD)
- Won’t fishing opportunity will be lost by removing non-native fish (PS, LT)
- Are the conservation efforts designed to eliminate all people and end all fishing? (O)
- Why isn’t striped-bass included as an SGCN?
- Are non-consumptive recreation activities considered in plan? (LT)
- Why not change the fishing regulations for non-native fish to allow anglers to take more? (R)

Agenda 21

- Were the Standards for the Practice of Conservation developed by the UN? (F)
- How will large swaths of land shown on the maps affect public access? (O)
- How can you justify using private lands to create a corridor system for wildlife? (O)
- Has the legislature given you authority to implement this plan? (O)
- How does your map affect private property rights? (O)
- Why is law enforcement a part of the plan if its non-regulatory? (R)

How to Submit Comments

- Via email: SWAP@wildlife.ca.gov
- Via Mail: Armand Gonzales
  California Department of Fish and Wildlife
  1416 Ninth Street, Suite 1341-B
  Sacramento, CA 95814

SWAP Website: www.dfg.ca.gov/SWAP

CALIFORNIA DEPARTMENT OF FISH and WILDLIFE

SWAP California State Wildlife Action Plan

California State Wildlife Action Plan (SWAP) 2015

Great Valley Region

Riparian Habitat

About Our Region and Riparian Habitat Riparian habitat is found along rivers and streams across the state forming green belts along the running watercourses. Riparian habitat is home for many species providing water, food, escape, and nesting areas. Some species spend their entire life within the habitat (riparian endemic species), while some are frequent visitors from the adjacent lands and some are yet from distance migrating from across the borders.

What are the sensitive species found in the riparian habitat? The following 43 riparian dependent species from this region are found to be sensitive:

Invertebrate [1]
VALLEY ELDERBERRY LONGHORN BEETLE

Amphibian [4]
CALIFORNIA GIANT SALAMANDER
COMMON ENSATINA
FOOTHILL YELLOW-LEGGED FROG
RED-LEGGED FROG

Reptile [5]
GIANT GARTER SNAKE
GOPHER SNAKE
RINGNECK SNAKE
WESTERN POND TURTLE
WESTERN SKINK

Bird [20]
BALD EAGLE
BANK SWALLOW
BEWICK'S WREN
BLACK-CROWNED NIGHT HERON
CALIFORNIA QUAIL
COMMON YELLOWTHROAT
GOLDEN EAGLE
GREAT BLUE HERON
GREAT EGRET
GREATER WHITE-FRONT
HUTTON'S VIREO
LONG-EARED OWL
OSPREY
SONG SPARROW
SPOTTED TOWHEE
SWAINSON'S HAWK
TRICOLORED BLACKBIRD
YELLOW BILLED CUCKOO
YELLOW-BREASTED CHAT
YELLOW WARBLER

Mammal [13]
BROAD-FOOTED MOLE
DEER MOUSE
FRINGED MYOTIS
LONG-EARED MYOTIS
MOUNTAIN LION
NORTHERN RIVER OTTER
PORCUPINE
RINGTAIL WESTERN MASTIFF BAT
RIPARIAN BRUSH RABIT
RIPARIAN WOODRAT

WESTERN SMALL- FOOTED MYOTIS
WESTERN SPOTTED SKUNK
YUMA MYOTIS

What do we find important for recovering and sustaining healthy riparian habitat? Ecological conditions that are found to be most critical to sustain healthy riparian habitat in this region are:

- Area and extent
- Connectivity
- Hydrological regime
- Surface Water Flow Regime
- Soil/ sediment erosion deposition regime

Degraded ecological conditions that are found to be impacting the riparian habitat in this region are:

- Changes in spatial extent of the riparian habitat
- Habitat fragmentation
- Changes in biotic interactions (altered community dynamics)
- Changes in successional processes and ecosystem development
- Changes in functional processes of ecosystem
- Change in annual average temperatures
- Changes in precipitation
- Change in snow pack
- Change in snow cover period
- Change is water temperature
- Changes in runoff and river flow
- Changes in water levels and hydro-period
- Changes in flood occurrence, frequency, intensity, and area flooded
- Changes in sediment erosion and deposition regime
- Changes in soil chemistry
- Increase in water and soil pollutant amount and concentration
- Changes in natural fire regime
- Changes in extreme events

Human related activities and issues that are found to be sources of potential impacts to the riparian habitat are:

- Roads & railroads
- Housing & urban areas
- Utility & Service Lines
- Livestock farming & ranching
- Invasive plant & animal species
- Dams & water Management and uses
- Annual & Perennial Non-Timber Crops
- Recreational activities

More questions?

1. Come talk to us and ask questions at scoping meetings!
2. Check our Website: http://www.dfg.ca.gov/SWAP/
3. Provide written comments

By email to: SWAP@wildlife.ca.gov
By mail: Armand Gonzales
California Department of Fish and Wildlife
1416 Ninth Street, Suite 1341-B
Sacramento, CA 95814

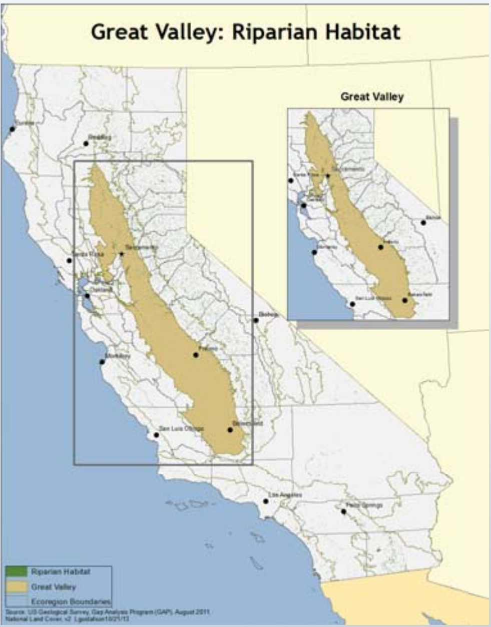
California State Wildlife Action Plan Update 2015

Great Valley Ecoregion

DRAFT STRATEGY: Great Valley Riparian

GOALS

1. By 2025, the area of protected riparian habitat increases by 2%
2. By 2025, establish a flow regime that is sufficient to support existing and future desirable habitat condition.
3. By 2025, establish buffers between agriculture activities and river corridors
4. By 2025, identify and fill gaps in riparian vegetation along major rivers
5. By 2025, increase the amount of riparian habitat in the ecoregion by 20,000 acres over ten years.
6. By 2025, plan and implement direct management, eradication, or adaptive management of invasive species to optimize native habitats.
7. By 2025, begin moving away from sheet irrigation and tile drains in SJ valley
8. By 2025, treat invasive species on CDFW lands



The State Wildlife Action Plan examines the health of wildlife and prescribes actions to conserve wildlife and vital habitat before they become more rare and more costly to protect. The plan also promotes wildlife conservation while furthering responsible development and addressing the needs of a growing human population.

SENSITIVE SPECIES

Giant garter snake
Yellow billed-cuckoo
Swainson's hawk
Bank swallow
Golden eagle
Ringtail
Bewick's wren
Black-crowned night heron
Broad-footed mole
California giant salamander
California quail
Common ensantina
Common yellowthroat
Deer mouse
Foothill yellow-legged frog
Fringe myotis
Gopher snake
Great blue heron
Great egret
Hutton's vireo
Long-eared myotis
Long-eared owl
Mountain lion
Northern river otter
Osprey
Ringneck snake
Song sparrow
Spotted towhee
Tricolored blackbird
Western mastiff bat
Western pond turtle
Western skink
Western small-footed myotis
Western spotted skunk
Yellow warbler
Yellow-breasted chat
Porcupine
Riparian woodrat
Greater white-front goose
Valley elderberry long-horned beetle
Bald eagle
Red-legged frog

Giant garter snake © 2004 Jeremiah Easter

California quail. H. Vannoy Davis © California Academy of Sciences

Foothill yellow-legged frog © 2004 Pierre Fidenci

California condor © 2008 Ram Vasudev

Western pond turtle © 2003 Pierre Fidenci

Spotted skunk Alden M. Johnson © California Academy of Sciences.

ENVIRONMENTAL STRESSES

Change in annual average temperatures

Change in Annual average precipitation

Change in snow pack

Change in snow cover period

Changes in sediment erosion-deposition regime

Changes in natural fire regime

Changes in extreme events

Change in pollutants

Changes in soil chemistry

Change in runoff and river flow

Changes in water levels and hydroperiod

Change in flood occurrence, frequency, intensity, and area flooded (including hydroperiod)

Loss or change in biotic interactions (altered community dynamics)

Changes in functional processes of ecosystem

Changes succession processes and ecosystem development

Habitat fragmentation

Change in water pollutants

Change is water temperature

Dusky-footed woodrat © 2010 Rob Schell

HUMAN RELATED IMPACTS

Bull thistle. Photo courtesy of Bob Case

Development

OHV use

(c)Walter Feller – MojaveDesert.NET
Railroads

Roads and railroads

Utility & service lines

Recreational activities

Housing and urban areas

Dams & water management/use

Invasive plants/animals

Annual & perennial non-timber crops

Livestock farming & ranching

TEAM

Name	Organization	Roles
Joshua Bush	CDFW-R2	Team Lead
Bob Parris	FWS	Team Member
Erin Tennant	CDFW-R4	Team Member
Krista Tomlinson	CDFW-R4	Team Member
Greg Yarris	Central Valley Joint Venture	Team Member

STRATEGIES, OBJECTIVES AND ACTIVITIES

1. Develop and implement HCP/NCCP
   - a. Objectives
     - i. Ensure riparian habitats are included in the development of valley floor HCP
     - ii. Ensure riparian habitat is covered in BDCP
     - iii. Advocate for wildlife
     - iv. FERC re-license process streamlined and includes conditions support ecosystem conservation
     - v. Ensure projects identified in the HCPs/NCCPs are compatible to ecosystem conservation.
   - b. Activities
     - i. Coordinate with stakeholders
     - ii. Obtain funding for implementation and staffing
     - iii. Provide funding grants for coordination and feasibility study
2. Effective Law Enforcement
   - a. Objectives
     - i. Compliance with water rights and F&G Code 1600 agreements
     - ii. Reduced illegal diversions
     - iii. Increase LED staffing levels
   - b. Activities
     - i. Include BMPs as enforceable condition of SAA and water right permit/license
     - ii. Advocate for opportunities to improve prosecutions of environmental laws and illegal diversions
     - iii. Identify partners to improve enforcement capabilities
     - iv. Evaluate and increase LED staffing levels
     - v. Obtain funding for implementation and staffing
3. Provide Education & Outreach
   - a. Objectives
     - i. Educate private landowners on invasive species identification and management
     - ii. Raise public awareness of the values of riparian habitats
     - iii. Recruit public participation in monitoring invasive species and rapid response
     - iv. Inform public of grazing BMP and wildlife friendly land use policy
   - b. Activities
     - i. Develop goals and objectives, core message
     - ii. Identify target audience
     - iii. Develop program for the general public, and partnering agencies/organizations
     - iv. Conduct public training workshops
     - v. Obtain funding for implementation and staffing
4. Conduct research
   - a. Objectives
     - i. Provide adequate data necessary for the development of invasive species and grazing BMPs
     - ii. Provide adequate data necessary for the water flow best management.
   - b. Activities
     - i. Identify study questions, develop study design
     - ii. Conduct literature review, coordinate with experts
     - iii. Obtain funding for implementation and staffing
5. Manage water flows
   - a. Objectives
     - i. Restore critical flow dynamics to benefit riparian ecosystem function
   - b. Activities
     - i. Obtain funding for implementation and staffing
     - ii. Coordinate with State, Federal, counties and local water districts
     - iii. Coordinate with Floodsafe and local flood agencies
     - iv. Identify and prioritize critical streams to restore flow dynamics
     - v. Conduct assessment of needed flows
     - vi. Assess opportunities for dam removal on smaller streams
     - vii. Identify working groups focused on flow and ecological function
     - viii. Identify and review existing local groundwater policies to inform future policy recommendations
     - ix. Encourage setback levees to restore hydrological and geomorphic function.