

CALIFORNIA LANDSCAPE CONSERVATION COOPERATIVE DEVELOPMENT AND OPERATIONS PLAN

Introduction

Landscape Conservation Cooperatives (LCCs) are self-directed conservation partnerships among the U.S. Fish and Wildlife Service (USFWS), the United States Geological Survey (USGS), other federal agencies, States, Tribes, nongovernmental organizations, and other entities to address the challenges of climate change in an integrated fashion. LCCs provide scientific and technical support for landscape-scale conservation in an adaptive management framework that emphasizes science-based biological planning, conservation design, research, inventory and monitoring. LCC products help to inform and improve conservation delivery efforts on the ground.

California LCC

Working with partners, the USFWS Pacific Southwest Region will establish the California LCC in 2010. The LCC will consist of two subunits, the **Central Valley-Bay/Delta (CVBD)** subunit and the Coastal Southern subunit. The CVBD subunit contains lands and waters within the watersheds of the Sacramento and San Joaquin Rivers, Tulare Lake, and San Francisco Bay (see map). It includes the Central Valley, foothills and western slopes of the Sierra Nevada, and coastal headlands that border San Francisco Bay. The **Coastal Southern subunit** consists of the coastal mountain ranges of central California, southern California and northern Mexico, lands between the Mojave Desert and the Pacific Ocean, and numerous offshore islands. The Pacific Southwest Region will begin working with partners in this subunit in 2010 and achieve full implementation in 2011. The CVBD and Coastal Southern subunits support distinctive ecological communities and local partnerships that have formed based on common ecological goals.



Geographic Description of CVBD Subunit

Flanked by the Sierra Nevada in the east and the California Coast Ranges in the west, the California Central Valley and adjacent foothills extends over 400 miles and covers more than 28 million acres. The subunit contains intensive agriculture in the Valley, rangelands in the foothills, wetlands, and streams as well as the highly urbanized areas surrounding San Francisco, San Jose, Oakland, and Sacramento. Two-thirds of all Californians (approximately 25 million people) and over 7 million acres of farmland that produce 45% of the nation's fruits and vegetables rely upon water from the Sacramento and San Joaquin Rivers. Historically, the Central Valley supported extensive wetlands, grasslands, oak savannahs, vernal pools, and major river systems with associated riparian habitat. Only 2-10 % of this historic habitat remains and its remnants are critically important to wildlife. The San Francisco Bay and Sacramento/San Joaquin River Delta, the nation's second largest estuary, support economically important commercial fisheries and provide essential habitat for several endangered fish species.

Geographic Description of Coastal Southern Subunit

The Coastal Southern Subunit includes diverse coastal resources from the vicinity of Monterey southward into Mexico. The main habitats within this area include coastal wetlands, coastal sage scrub, isolated native grasslands and vernal pools, and low- to mid-elevation uplands supporting oak woodlands. The subunit also includes coastal islands that provide habitat for a variety of pelagic birds, marine mammals, and numerous endemic species of plants and animals. The Coastal Southern subunit includes relatively undeveloped areas of California's central and southern coasts as well as highly urbanized areas surrounding Los Angeles and San Diego.

California LCC Partners

The USFWS Pacific Southwest Region has a long history of working in partnership with both public and private interests in pursuit of conservation interests in California. In 1988, the USFWS helped to establish the **Central Valley Joint Venture**, a coalition of 22 State and Federal agencies and private conservation groups working collaboratively to provide for the needs of migratory and resident birds in the Central Valley. The CVJV was established as a regional partnership focused on the conservation of waterfowl and wetlands under the North American Waterfowl Management Plan. It has since broadened its focus to include the conservation of habitats for other birds, consistent with national and international bird conservation plans and the North American Bird Conservation Initiative. More recently, the Service recognized the **San Francisco Bay Joint Venture**, a partnership formed to conserve the vast numbers of sea birds and shorebirds that migrate and winter in the vicinity of the San Francisco Bay. The San Francisco Bay Joint Venture was one of the last joint ventures sanctioned and is the smallest joint venture in terms of geographic size.

With the decline of commercial and sport fisheries in central California, numerous collaborations have formed to pursue common interests in fish and water conservation. These include such diverse groups as the **Bay-Delta Conservation Plan, California-Federal (CALFED) Bay-Delta program**, and the Central Valley Project Improvement Act conservation program. The USFWS Pacific Southwest Region participates in these groups as they provide vital support for projects that enhance the habitat value of California waters for native fish and other aquatic species.

The foothills surrounding the Central Valley have been under pressure from developers during the prosperous economic times of the 1990's. This situation has given rise to an appreciation by both the environmental community and private ranchers that native grasslands and oak woodlands found in the foothills are an important resource and vulnerable to being lost. Thus, the Pacific Southwest Region supported the creation of the **California Rangeland Conservation Coalition**, a partnership containing 90+ members including government agencies, conservation groups and agricultural interests.

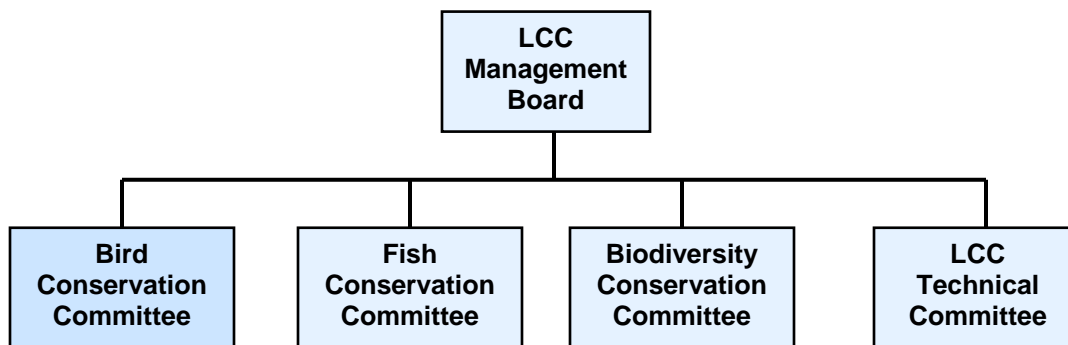
As a leader among the States in developing programs to address climate change, the State of California has an established network of science and management partners that have worked collaboratively to develop climate adaptation strategies in the fields of public health, agriculture, forestry, transportation, energy, biodiversity, and coastal and marine resources. The **California Department of Fish and Game (DFG)** sponsors joint public-private working groups to coordinate natural resource adaptation activities in research, management, and public outreach. Members of the USFWS Pacific Southwest Region staff participate in these working groups and, as a result, have developed close ties with the DFG and other state conservation organizations. As the Department takes steps to update the California State Wildlife Action Plan to incorporate climate change adaptation, the USFWS will have a major supporting role.

The Coastal Southern subunit includes numerous partnerships forged by the pressure of development and conflict with species listed under the Endangered Species Act. These partnerships have produced Habitat Conservation Plans (HCPs) and state Natural Community Conservation Plans (NCCPs) that identify the key habitats, corridors, and refugia needed to maintain populations of priority species in the area. In addition to public and private landowners involved in HCP and NCCP partnerships, the **Department of Defense** and **Bureau of Land Management** also control large areas with the Coastal Southern subunit.

A unique consideration regarding the subunit is that it contains the only area in the lower 48 states that is **not** covered by a migratory bird Joint Venture. Although the Service has engaged with numerous groups and individuals, the USFWS Pacific Southwest Region will need to forge a new collaboration among these groups in this area. Fortunately, many agencies and organizations are active in the region and highly supportive of USFWS conservation efforts.

Organizational Structure of the California LCC

Given the diverse range of conservation interests operating within the geographic area (Table 1), the USFWS Pacific Southwest Region plans to establish the California LCC using a committee structure. Three committees (Bird Conservation, Fish Conservation, and Biodiversity Conservation) will be organized around existing partnerships/coalitions that share common goals. A fourth group (LCC Technical Committee) will provide technical support to and take action to promote the integration of goals, plans, and strategies identified by the first three committees. Lastly, an LCC Management Board that includes representatives from the three conservation and technical committees will provide leadership for the LCC, identify priorities, and resolve policy issues.



The **Bird Conservation Committee** will include 37 public and private organizations that currently participate in the San Francisco Bay Joint Venture and/or the Central Valley Joint Venture. Following extensive consultation with the USFWS Pacific Southwest Region over several months, these two joint ventures have agreed to work in tandem to establish population objectives, conservation strategies, and monitoring programs for all birds within the CVBD subunit of the California LCC. The potential contributions of fiscal and in-kind resources by these partners remain to be identified.

The **Fish Conservation Committee** will include groups that have been established to support the conservation of fish and other aquatic species. As there are no fish habitat partnerships recognized by the National Fish Habitat Board within the boundaries of the LCC, the USFWS Pacific Southwest Region has approached California Trout (CalTrout) to provide leadership for this committee. CalTrout, a nongovernmental organization, is one of the nation's foremost statewide conservation groups dedicated to protecting and restoring trout and their habitat. In its 40-year history, CalTrout has a proven record of collaboration, having worked with more than 100 partners to conserve and restore fish habitat, including government agencies, environmental organizations, academic institutions, professional organizations, commercial interests, and industry. Those expected to join CalTrout on the Fish Conservation Committee include USFWS, Bureau of Reclamation, NOAA-National Marine Fisheries Service, California DFG, California Department of Water Resources, American Rivers, The Nature Conservancy, Salmonid Restoration Foundation, and Trout Unlimited, among others. Each of these groups has previously provided fiscal and in-kind support for joint conservation efforts.

The **Biodiversity Conservation Committee**, under the leadership of the California DFG, will include numerous public and private conservation groups that participated in developing the California State Wildlife Action Plan or are currently engaged in carrying it out. The DFG is preparing to update its plan to account for the effects of climate change and sees the synergistic value in linking this update to the development of spatially-explicit conservation plans and strategies by the California LCC. Discussions between leaders of the USFWS Pacific Southwest Region and California DFG are underway to identify specific contributions by each agency.

The **Technical Committee** will include scientists and technical specialists from LCC member organizations with expertise in fish and wildlife biology, landscape ecology, hydrology, modeling, remote sensing, and other fields needed to support biological planning, conservation design, conservation delivery, monitoring, and research for the integration of adaptation plans and strategies. This committee will work at the direction of the LCC Management Board and closely with LCC technical staff members. The USFWS Pacific Southwest Region has developed a close working relationship with key members of the USGS based in Sacramento that may lead to the co-location of LCC staff and USGS researchers at Sacramento State University. USFWS has also reached out to the California Cooperative Ecosystems Studies Unit, USDA-Forest Service research facilities in California, and the NOAA Southwest Fisheries Science Center to encourage their active participation on the Technical Committee.

The **LCC Management Board** will have representation from the three conservation and technical committees and will provide management direction, identify priorities, and resolve policy issues for the LCC. Senior leaders from the USFWS Pacific Southwest Region, other DOI bureaus, USDA-Forest Service, Natural Resource Conservation Service, NOAA, Tribes, California DFG, and the California Department of Water Resources would serve on the Management Board as ex-officio members.

The **LCC Coordinator** will serve in leadership role, facilitating linkages between science and management, coordinating Management Board activities and providing day-to-day leadership and direction of LCC staff. The LCC staff will include individuals with science expertise and skills in GIS, spatial data application, population modeling, statistics, and landscape ecology. The core staff will be located in Sacramento while additional staff and coordination capacity, particularly for the Coastal Southern subunit, will participate virtually from remote locations.

It is anticipated that at least 1/3 of funding for the LCC will come from partners by either fiscal or in-kind contributions. Fiscal contributions include funding for research, support for monitoring efforts, contributions to jointly funded staff, and development of outreach materials. Partner in-kind contributions include office space, data management, staff for monitoring and research analysis and hosting meetings and events.

Table 1. Conservation Partners in the California LCC. Groups with whom the Region has conferred either directly or through an existing coalition are shown in **black**. Those groups with whom the Region plans to confer in the future are shown in **blue**.

PARTNER	Biological Planning	Conserv Design	Conserv Delivery	Monitoring	Research
American Farmland Trust			X		
American Rivers	X	X	X		
Bay Area Ecosystems Climate Change Consortium	X			X	X
Bay Area Open Space Council					
Bay Conservation and Development Commission	X				
Bay Delta Science Consortium					X
Bureau of Indian Affairs	X			X	
Bureau of Land Management	X	X	X	X	
Bureau of Reclamation	X	X	X	X	
CALFED Bay-Delta Program	X	X		X	X
California Audubon	X			X	
California Coastal Conservancy			X	X	
California Dept of Fish and Game	X	X	X	X	X
California Dept of Water Resources	X	X			X
California Rangeland Conservation Coalition			X		
California State Parks			X		
California State University				X	X
California Trout	X	X	X	X	
California Waterfowl Association			X	X	X
California Wildlife Conservation Board			X		
Central Valley Joint Venture	X		X	X	
Defenders of Wildlife	X	X			
Ducks Unlimited			X	X	
National Fish and Wildlife Foundation	X		X	X	
National Park Service	X	X	X	X	X
Native American Tribes	X	X	X	X	
National Marine Fisheries Service	X	X	X	X	X
Pacific Gas & Electric			X	X	
PRBO Conservation Science	X	X		X	X
Regional Water Quality Boards				X	

River Partners		X	X		
SF Bay-Delta Science Consortium				X	X
Salmonid Restoration Federation	X	X	X		
San Francisco Bay Bird Observatory	X		X	X	
San Francisco Bay Joint Venture	X		X	X	
San Francisco Estuary Project	X			X	
Save the Bay			X		
Sierra Club				X	
Southern California Watershed Alliance	X	X			
The Bay Institute		X	X		
The Nature Conservancy	X	X	X		
Trout Unlimited	X	X	X		
Trust for Public Land			X		
USDA Forest Service	X	X	X	X	X
USDA NRCS		X	X	X	
U.S. EPA	X			X	X
U.S. Geological Survey	X	X		X	X

California LCC Priority Species and Habitats

The Central Valley is the most important wintering grounds for migratory waterfowl in the Pacific Flyway, an important area for migrating raptors, and critically important for song and grass birds. San Francisco Bay contains a large amount of coastal migratory winter grounds for seabirds, shorebirds, and waterfowl. Two thirds of California's salmon and many other species of fish and wildlife rely on the Delta. The CVBD subunit contains 68 federally listed plants and animals. Species in this LCC subunit are under immense pressure from urbanization and habitat modification.

More than half of California's vertebrate wildlife species (455) are at risk, as are 369 invertebrate species. At least 16 species are known to have become extinct in the last 150 years. Eight species of vertebrates and a number of species of invertebrates have become completely extirpated and four bird species no longer breed in the state.

One of the immediate needs of the California LCC will be a re-evaluation of existing priority lists based upon the vulnerability of species to the effects of climate change. The USFWS Pacific Southwest Region has collected priority species and habitat lists developed by partnership groups within the CVBD subunit. Priorities came from the CVJV and San Francisco Bay Joint Venture, the Bay Delta Conservation Program, and also from individual agencies including the California State Wildlife Action Plan and the USFWS Endangered Species program (See Tables 2, 3).

Due to the large of number of habitat and species priorities that have been identified within the CVBD LCC, it is apparent the LCC will need to define umbrella species that can represent a wide breadth of animals and plants and may cover more than one habitat type. Additionally, through the development of localized habitat vulnerability assessments and predictive models, the LCC will be able to prioritize habitats based on most recent climate change information.

Table 2. Priority Bird Species in the CVBD Subunit Identified by the Joint Ventures

Aleutian Canada Goose	Marbled Godwit
American Widgeon	Mountain Plover
American Coot	Northern Pintail
Black Rail	Northern Shoveler
Black Scoter	Pacific Greater White-fronted Goose
Black Turnstone	Red Knot
Blue-winged Teal	Redhead
Brown Pelican	Ring-necked Duck
Bufflehead	Ruddy Duck
Burrowing Owl	Snowy Plover (Western)
Cackling Canada Goose	Song Sparrow
Canvasback	Sora
Cinnamon Teal	Surf Scoter
Clapper Rail	Tricolored Blackbird
Common Goldeneye	Tulle White-fronted Goose
Common Moorhen	Tundra Swan
Common Yellowthroat	Vireo Bell's (Least)
Gadwall	Virginia Rail
Greater Scaup	Whistling-Fulvous Duck
Greater Yellowlegs	White-winged Scoter
Green-winged Teal	Wilson's Phalarope
Least Tern (California)	Wilson's Snipe
Lesser Scaup	Wood Duck
Lewis's Woodpecker	Wrangell Island Snow Goose
Mallard	Yellow-billed Cuckoo

Table 3. Special Status Species known to occur in the CVBD Subunit

Mammals

Vulpes macrotis mutica - San Joaquin kit fox

Reithrodontomys ravivenstris -Salt marsh harvest mouse

Neotoma fuscipes riparia - Riparian woodrat

Sylvilagus bachmani riparius- Riparian brush rabbit

Corynorhinus townsendii - Townsend's western big-eared bat

Sorex ornatus sinuosus - Suisun shrew

Birds

Agelaius tricolor - Tricolored blackbird
Melospiza melodia maxillaries- Suisun song sparrow
Icteria virens - Yellow breasted chat
Vireo belli pusillus- Least Bell's vireo
Athene cunicularia - Burrowing owl
Coccyzus americanus occidentalis - Western yellow-billed cuckoo
Sterna antillarum browni - California least tern
Grus canadensis tabida - Greater sandhill crane
Laterallus jamaicensis coturniculus-California black rail
Rallus longirostris obsoletus - California clapper rail
Elanus leucurus - White-tailed kite
Buteo swainsoni - Swainson's hawk

Amphibians

Rana aurora draytonii -California red-legged frog
Spea hammondi - Western spadefoot toad
Ambystoma californiense - California tiger salamander (Central Valley DPS)

Reptiles

Thamnophis gigas - Giant garter snake

Fish

*Oncorhynchus mykiss** - Steelhead, Central Valley DPS
*Oncorhynchus tshawytscha** - Chinook salmon, Sacramento River winter-run
*Oncorhynchus tshawytscha** - Chinook salmon, Central Valley spring-run
Oncorhynchus tshawytscha - Chinook salmon, Central Valley fall-/late fall-run
Spirinchus thaleichthys - Longfin smelt
*Hypomesus transpacificus** - Delta smelt
Pogonichthys macrolepidotus - Sacramento splittail
Acipenser transmontanus - White sturgeon
Acipenser medirostris – Green sturgeon
Lampetra tridenta - Pacific lamprey
Lampetra ayresii - River lamprey

Invertebrates

Desmocerus californicus dimorphus - Valley elderberry longhorn beetle
Lepidurus packardi - Vernal pool tadpole shrimp
Branchinecta conservation - Conservancy fairy shrimp
Branchinecta longiantenna - Longhorn fairy shrimp
Branchinecta lynchi - Vernal pool fairy shrimp
Branchinecta mesovalleyensis - Mid Valley Fairy Shrimp
Lindieriella occidentalis - California linderiella

Plants

Astragalus tener var. *tener* - Alkali milk-vetch
Atriplex cordulata – Heartscale
Atriplex depressa – Brittlescale
Atriplex joaquiniana - San Joaquin spearscale

Cirsium crassicaule - Slough thistle
Cirsium hydrophilum var. *hydrophilum* - Suisun thistle
Cordylanthus mollis ssp. *Mollis* - Soft bird's-beak
Downingia pusilla - Dwarf downingia
Eryngium racemosum - Delta button celery
Gratiola heterosepala - Boggs Lake hedge-hyssop
Isocoma arguta - Carquinez goldenbush
Lathyrus jepsonii var. *jepsonii* - Delta tule pea
Legenere limosa – Legenere
Lepidium latipes var. *heckardii* - Heckard's peppergrass
Lilaeopsis masonii - Mason's lilaeopsis
Limosella subulata - Delta mudwort
Scutellaria lateriflora - Side-flowering skullcap
Symphotrichum lentum - Suisun Marsh aster
Tropidocarpum capparideum - Caper-fruited tropidocarpum

An ongoing project sponsored by the California Department of Transportation, California DFG, and the nonprofit Gordon and Betty Moore Foundation offers a means for identifying priority habitats for acquisition and/or protection. The **California Essential Habitat Connectivity Project**, involves the identification, characterization, and mapping of federal, state, county, and local government protected areas, privately owned lands under conservation easement, and contiguous blocks of privately owned habitat over 6,000 acres in size in a GIS database. Using a transparent and replicable scientific process, the project identifies the spatial linkages among these habitats for a variety of focal species including plants, birds, mammals, fish, and invertebrates. The linkages, representing potential movement corridors between habitats, are scalable and can be used in developing a network of linked habitats for species of conservation concern. Such a network would be a key component of the regional adaptation strategy.

Developed and tested in the southern part of the state, the California Essential Habitat Connectivity Project will move to the San Francisco Bay area in 2010 with a series of data collection workshops, fish and wildlife expert panels, and user group meetings. The results of the project will be used by those responsible for creating city and county land use plans, conservation plans, and other spatially-explicit management plans.

Conservation Delivery Mechanisms

In addition to the conservation delivered by partners, the California LCC will also rely upon existing USFWS programs to deliver conservation projects based on the most recent science information. Nearly all programs will be involved, from the review of proposed development projects under Section 7 of the Endangered Species Act to the management of impoundment water levels on a National Wildlife Refuge. The conservation activities of the Endangered Species, Environmental Contaminants, Coastal, Partners for Fish and Wildlife, Fisheries and Habitat Conservation, Migratory Birds, and National Wildlife Refuge System programs will be implemented in a cohesive manner in pursuit of biological objectives applicable at local and regional scales.

South Bay Salt Pond Restoration: An Adaptation Case Study

The South Bay Salt Pond Restoration Project at the Don Edwards San Francisco Bay National Wildlife Refuge is the largest tidal wetland restoration project on the West Coast. When complete, the project will convert 15,100 acres of commercial salt ponds at the south end of San Francisco Bay to a mix of tidal marsh, mudflat and other wetland habitats. This unprecedented restoration effort, in the middle of a major urban center, will transform an area the size of Manhattan into a thriving wetland ecosystem— providing a critical natural buffer against the effects of climate change and sea level rise.

Tidal Marshes Grow as Sea Levels Rise

Because of historic land subsidence in Silicon Valley, some of California's most valuable business real estate is at risk of tidal flooding. Plans for the Restoration Project include a series of levees coupled with tidal marshes on their outboard side. These tidal marshes will provide the first line of flood defense and help protect the levees from storm wave action and tidal surge.

Once tidal marshes are established, they become very efficient sediment traps. In effect, they tend to preserve themselves as they age, provided that enough sediment is available. For this reason new tidal marsh areas are expected to keep pace with sea levels that are projected to rise between one and three feet in San Francisco Bay over the next century.

The South Bay is an excellent place for sediment deposition and this bodes well for the development of new tidal marsh. Studies have shown that undisturbed marshes in the South Bay remained intact, even between 1940 and 1960 -- a time when sea level was already rising and nearby land was subsiding rapidly due to groundwater extraction.

Tidal Marshes Capture Carbon

Because tidal marshes are such biologically productive habitats, they capture significant amounts of carbon from the atmosphere. Unlike many freshwater marshes, tidal saltwater marshes release only negligible amounts of methane, a powerful greenhouse gas. As a result, the carbon storage benefits of tidal salt marshes may exceed those of freshwater marshes. Tidal marshes may even be more efficient per unit area than trees when it comes to removing carbon from the atmosphere.

The geographic area covered by the California LCC contains 150 Habitat Conservation Plans (HCPs), encompassing hundreds of plants and animals, giving this LCC the greatest number of HCPs in the nation. In most cases, each HCP is matched by a Natural Community Conservation Plan (NCCP), required under the California Endangered Species Act. HCPs and NCCPs are developed in a collaborative approach among landowners and interest groups to conserve species and their habitats while allowing for development activities. HCP and NCCP stakeholders will be instrumental in designing and delivering projects and updating current plans based on new climate information. Partners such as the California DFG and Wildlife Conservation Board, Natural Resources Conservation Service, Ducks Unlimited, The Nature Conservancy, National Audubon Society and many others will be partners in delivering conservation.

Adaptation and mitigation projects envisioned for the California LCC include dam removals to restore fish habitat, water acquisition for refuges to support migratory bird habitat and restoration of priority streams supporting anadromous fish. Emphasis will be placed on restoring natural stream systems in the Central Valley, protecting important oak woodlands and vernal pools along the foothills, returning tidal flow to the San Francisco Bay, and restoring habitat corridors within the LCC and beyond.

Providing fish passage in Central Valley rivers is considered the primary means of counteracting the decline of anadromous fish populations. Important habitat to sustain fish species has already been lost and will be exacerbated by climate change and increased water demands. In order to address underlying issues of inadequate spatial structure and diversity and quality of critical habitat, and therefore, increased risk of extinction over the long-term, fish passage is necessary to provide salmonid access to their historical habitat and sustain populations in the Central Valley.

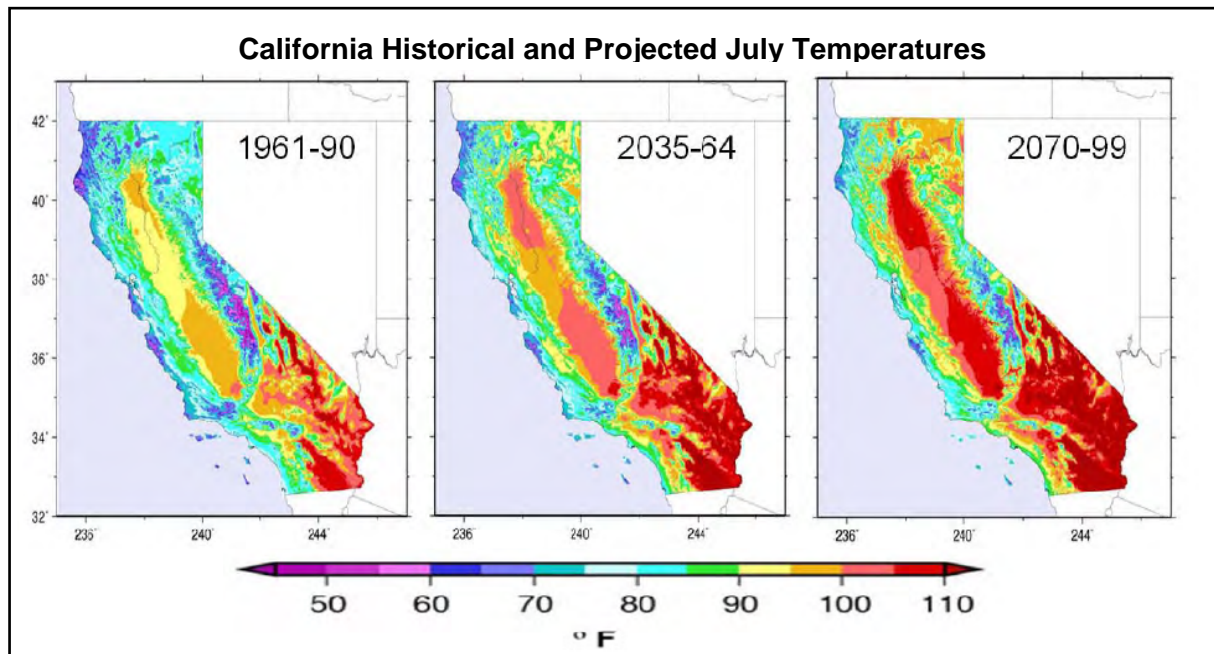
Additionally, water demands will increase exponentially as the climate becomes warmer and snow pack is smaller. Water acquisition will be a high priority to increase available habitat for in-stream fisheries use and at refuges to produce habitat for migrating and wintering waterfowl and other water birds in the Pacific Flyway.

Yet these resource actions will only move from planning and design to implementation because the local public has been informed and supports the concept of healthy living ecosystems and functioning corridors throughout the climate change era. Therefore, a significant amount of conservation delivery through the LCC will include communication and transfer of data and/or interpretation of data in regards to species populations and habitat vulnerabilities and adaptabilities.

Science Capacities and Resources Needed

In 2003, the State of California established the **California Climate Change Center**, a virtual organization with core research activities at Scripps Institution of Oceanography and the University of California-Berkeley, complemented by efforts at other research institutions. Priority research areas defined in the center's five-year Climate Change Research Plan are: monitoring, analysis, and modeling of climate; and assessment of physical impacts and adaptation strategies; among other topics.

The California Climate Change Center has published numerous studies that involve the downscaling of global climate models to state and regional scales using both dynamic and statistical techniques. These studies have yielded detailed projections of climate change effects on spatial and seasonal patterns of precipitation and temperature under a variety of future scenarios. Recent investigations at the California Climate Change Center have linked these projected changes to physical conditions and processes such as soil moisture, snowpack conditions, stream flow, and recharge of aquifers.



Studies by scientists with USGS, PRBO Conservation Science, USDA-Forest Service, and the University of California have documented shifts in the distributions of migratory birds, mammals, and plant species that have already occurred in the Sierra Nevada. This redistribution of species will inevitably lead to the breakdown of existing biological communities and upset ecological relationships in this region of high endemism.

Given these conditions, the Pacific Southwest Region will develop the capacity for ecological and population modeling needed to conduct landscape-scale adaptation. This capability is appropriate to the Service's role as the leading force for fish and wildlife conservation in the country.

To develop adaptation strategies for species vulnerable to climate and other landscape changes, it is essential to understand the effects of projected change on the species' habitats, ecological relationships, and demographics. The synthesis of climate, ecological, and population data in models that inform the adaptive management of these species will be critical. Working with the USGS, the Pacific Southwest Region will recruit and retain trained modelers who can integrate climate, land use, and ecological models to provide defensible projections of the population effects for species of conservation concern in California.

As part of this effort, the Region will need to acquire or develop **baseline demographic and habitat condition data** for these species. While information already exists regarding the demographic and habitat conditions for many threatened or endangered species, the same is not true for many other species of concern. There is an urgent need for baseline information regarding fish, wildlife, and plant species that are of conservation concern on local and regional scales.

Anticipated Successes

The Service has always excelled at developing partnerships and working toward common goals with other agencies, environmental interests, and private landowners. Programs such as the Partners for Fish and Wildlife Program, Coastal Program, Joint Ventures and others have a history of reaching out to neighbors and bringing groups together for improving wildlife populations. The National Wildlife Refuges serve as a forum where the public can engage with the Service.

Even in California where endangered species litigation often limits the activities of the Service, many strong partnerships have been developed and continue to flourish. In early 2010, the California LCC will bring together more than 150 different groups with varying interests in the California to discuss and contribute to the LCC effort. Most partners have already met through different meetings and workshops.

Unique Features of the California LCC

The California LCC encompasses some of the most diverse habitats in the nation. California has more species than any other state in the United States and also has the greatest number of endemic species, those that occur nowhere else in the world. Many of these species have very narrow distributions and high potential vulnerability to landscape change. California leads the nation in numbers of native and endemic plant species. Its 5,047 native plant species represent 32 percent of all vascular plants in the United States.

It is also one of the most populous LCCs in the U.S with an estimate of 38 million people living among USFWS trust resources. Many of California resources are threatened by rapid urban growth and development, particularly in the Sierra foothills, the Central Valley, the San Francisco Bay Area, and the South Coast Region.

Examples of plant communities in the path of urban expansion include valley oak woodland, native perennial grasslands, and coastal sage scrub. Additionally, forest communities, including mixed evergreen and conifer forests, are increasingly being fragmented by rural residential development. Highly water-dependent plant communities, including riparian areas, wetlands, and vernal pools, are also at risk. These communities not only suffer from the pressure of land conversion but are also subject to changes in water availability due to water management actions and water quality issues as a result of climate change.

Perhaps due to the significant number of people and diverse habitats, this California LCC contains the greatest number of complex organized groups that are tackling large scale environmental issues. Contained in ***just the CVDB subunit*** are the following groups or Initiatives:

- California Rangeland Conservation Coalition, a group of 90+ members composed of government agencies, agricultural industry, environmental groups, and ranchers who are working together for the protection of oak woodlands;
- San Joaquin River Partnership, empowered with restoring a major river system in the Central Valley;
- Bay Delta Conservation Program, tasked with restoring the Delta while maintaining water to agriculture;
- More than 40 complex HCPs are in progress or complete;
- The largest Natural Resources Damage Assessment program in the nation;
- Bay Area Ecosystems Climate Change Consortium, a group of 11 agencies and organizations addressing climate change in the San Francisco Bay area;
- California Climate Action Programs;
- San Francisco Bay Joint Venture, the smallest in geographic area but having the largest management board; and
- Central Valley Joint Venture, one of the first JVs put in place because of the importance of the valley to wintering waterfowl.

Additional Support

USFWS programs within the Pacific Southwest Region have been instrumental in standing up the Region's first LCC and starting to develop the second. All programs are represented on the Regional Climate Team and are assisting with the LCC effort.

North Pacific LCC – The coastal mountain range of California north of San Francisco falls within the boundaries of the USFWS Pacific Southwest Region as well as the North Pacific LCC being organized by the USFWS Pacific Region. From the beginning, the Pacific Southwest Region has proactively supported the Pacific Region in their efforts. A regional point of contact has been identified for the North Pacific LCC and the Region has provided information regarding the resources, partners, and research in the area that will help form habitat and species priorities for the southern region of the LCC.

Great Basin LCC – The Pacific Southwest Region has begun planning for the creation of the Great Basin LCC by introducing potential future partners to the LCC concept and reaching out to counterparts in Regions 1 and 6, both of which also have responsibility for portions of the geographic area. In partnership with USGS, NPS, USEPA, and others, the Pacific Southwest Region is developing a climate change science and management workshop for the Great Basin and Mojave Desert to be held in April 2010 at the University of Las Vegas, Nevada. This workshop will provide exposure for the Great Basin LCC planning effort and engage a wider range of potential LCC partners.

Desert LCC – The Mojave Desert is a major ecological zone in the southeastern part of California that falls within the administrative boundaries of the Pacific Southwest Region as well as the Desert LCC being organized by the USFWS Southwest Region. Regional staff members have coordinated with the counterparts in the Southwest Region and are in the process of identifying local leads within the Regional staff for that area.