

California State Parks

Representative Keystone Watersheds

A guidance tool to help prioritize natural resource management actions and highlight healthy watersheds throughout the State Park System.



Natural Resources Division
April 2007

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I. Introduction

The California State Park System (SPS) is a diverse land-based system, comprised of over 275 separate parks on about 1.5 million acres of land. The state's complex geography and underlying geology have yielded a wide variety of landscapes, with corresponding plant and animal resources--adapted to the physical structures, exposures and climates from Mexico to the south, Oregon to the north, Nevada and Arizona to the east, and the Pacific Ocean's shores to the west. Most parks possess regional, statewide, national, or international natural or cultural qualities. In an ideal world, funding and staffing support would be sufficient to restore and maintain all important park natural and cultural values and manage recreational uses. Unfortunately, such financial resources do not exist and hard decisions must be made to strategically direct most all natural resource management efforts. Many factors influence financial, acquisition and management decisions, such as vulnerability of resources, collaborative partnerships, legislative support, management tool availability and administrative mandates.

The purpose of this report is to provide California State Park managers with important information when making natural resource management and acquisition decisions. The report identifies representative watersheds and aquatic systems that embody the special characteristics of the state's ecological regions. By designating these watersheds and aquatic systems, managers can work toward strategic coverage and treatments throughout the SPS as well as contribute to the statewide effort of other land-managing state agencies to develop priority areas for collaboration on restoration, acquisition, and conservation actions.

Recognition of park watershed areas in this report will assist in setting system-wide priorities for a variety of natural resource management actions. Efforts expected to benefit from information in this report include park selection for general planning; unit management plans (including exotic species control, wildfire management, prescribed fire, watershed management and restoration); staffing, interpretation; funding of ongoing maintenance, deferred maintenance and stewardship; monitoring of watershed health; and defensive land-use planning and acquisitions.

The California Public Resources Code Section 5019.53 charges the Department of Parks and Recreation (DPR) with preserving representative and outstanding natural resource values in the ecological regions of the state. To assist in carrying out this requirement this report focuses on watersheds and aquatics system that are or can be fully preserved from most land conversions, and that represent the watershed values of the various regions. Many of the state's large and significant watersheds are not identified since they are not capable of being protected from land conversion and the state park ownership is relatively small. However, many of these watersheds will continue to be a priority for state park natural resource management efforts contributing to restoring onsite values and

collaborating with other interested parties to improve impaired water quality. Examples of these important yet “off of the list” watersheds include: Malibu Creek, Tule River, Mono Basin, South Yuba River, Upper Truckee River, Upper San Joaquin River, Pescadero Creek and San Mateo Creek (San Onofre SB).

Other State agency watershed programs focus on regulatory aspects of water quality, promoting regional integrated watershed management, and encouraging collaboration driven by local needs and values. Water quality (impairment) and regulatory actions drive the management strategy; however, the broad goals recognize the corollary need to preserve and maintain high quality watersheds. Through the CalEPA and Resources Agency MOU for Implementation of the Framework for Protecting California’s Watersheds¹, DPR can contribute to the task of identifying priority watersheds for resource preservation and use, fishery recovery, and water quality.

The DPR list included herein is not static; it will be periodically reviewed, modified, and improved by the Natural Resources Division. This report relies on readily available data, has been subjected to external review by scientific experts to determine validity, and has received district field staff verification. Updates and revisions are anticipated, biennially.

II. Selection Process

The factors considered in identifying the Representative Keystone Watersheds listed in this report are described below. The selection process included compiling source information, applying GIS-based data from the department's centralized electronic files, and overlaying DPR ownership, U.S. Forest Service (USFS) ecoregion delineations, hydrology, topography and other public land ownership with the Calwater watershed mapping layers. Use of the Calwater watershed layers presented some problems, since the watershed polygons were not strictly based on physical watershed delineations. Watershed names were assigned to minor drainages, and polygons were lumped, especially along the coast where small drainages flow directly to the ocean. For this reason, after initial use of the statewide watershed database, physical watershed boundaries and dominant drainage-naming conventions were chosen, rather than the hierarchical Calwater system. Calwater watershed delineations were employed where they matched the Department’s purposes and needs.

Several classification systems are used to describe the natural ecological diversity of the state. For the purposes of this evaluation and report, the decision was made to use the USFS ecological classification system described and mapped in "Ecological Units of California" by Miles and Goudey, U. S. Forest Service, 1997. This scheme is used by many land-managing agencies. Nineteen major terrestrial ecological divisions are described in California under

¹ Signed November 30, 2004 by Mike Chrisman and Terry Tamminen, and available at: http://cwp.resources.ca.gov/uploads/images/53/MOU_watershed.pdf

this system. Ecological divisions and subdivisions are referred to as “sections” and “subsections” in the U. S. Forest Service publication, but are called “regions” and “subregions” in this report to reflect more common usage. Due to the ownership pattern of DPR, watersheds were identified in only nine of the 19 USFS ecological divisions in California. That is not to say that DPR lacks ownership/presence in 10 of the ecological regions; but that the DPR units either did not contain sufficient watershed acreage, or the other criteria were not met. In addition, a special accommodation for Angel Island was made as the only island park unit, in a special ecological setting (Bay/Delta) that was not recognized by the USFS.

The table below lists the ecological regions and identifies those ecological regions that do not contain a DPR representative watershed. The Department will request other land-managing agencies with holdings in these regions to similarly identify representative watersheds and aquatic systems that are or can be preserved.

Name (DPR watershed included)	Name (No DPR watershed included)
Central California Coast	Great Valley
Southern California Coast	Sonoran Desert
Northern California Coast	Mono
Mojave Desert	SE Great Basin
Colorado Desert	NW Basin and Range
Klamath Mountains	Northern California Coast Ranges
Sierra Nevada	Northern California Interior Coast Ranges
Central California Coast Ranges	Southern Cascades
Southern California Mountains and Valleys	Sierra Nevada Foothills
	Modoc Plateau

Table 1. USFS Ecological Regions

Representative Keystone Watersheds

The watersheds listed in this report were selected based on how well they exemplified the characteristic physiographic and biological elements of the ecological regions and how likely they were to sustain their value and qualities over time. The watersheds were not selected purely on characteristic representations or average exemplifications, but also based on relative qualities, special characteristics and natural resource conditions. In one sense these watersheds represent priority watersheds as well as "keys" in the sense of keystones supporting a system of resource management, natural resource acquisition and restoration.

The following criteria were employed to select the watersheds for each ecoregion:

- Represent physical/biological, especially aquatic, values characteristic of ecoregion.
- Healthy aquatic system, good water quality; does not require costly water quality improvement measures.
- Land in good condition, e.g. free from serious/very expensive exotic species problems, free from serious, extensive land alterations.
- Watershed with notable DPR presence/meaningful park ownership--at least 500-1000 acres.
- Protected or capable of being fully (or near fully, i.e. 90%) protected over time in public ownership or other guarantees from land conversion.
- Watershed linked or capable of being linked to other protected areas large enough to sustain species abundance and variety.

Sustainability of quality characteristics and conditions was an important factor in selecting the listed watersheds. When physical watersheds shared drainage divides and ecological qualities, they were combined to form watershed "complexes". In this way, larger areas with compatible management and natural resource qualities were promoted.

Because of the DPR ownership pattern with concentrated presence along the coast, these areas are more strongly represented. Where multiple watersheds in an ecoregion met the above screening criteria, judgments were applied to select the best, highest quality watersheds, in order to avoid over-emphasis of particular landscapes. These decisions were made in consultation with district field ecologists and other experts in the fields of aquatic biology, ecology, and conservation ecology.

Information Sources

This report relied heavily on the work of many others; particularly the October 2005 DPR Natural Parks Report and the USFS Ecological Subregions of California (1997). In addition, DPR general plans and inventories of features, watershed assessments and watershed management plans by many local watershed groups, The Nature Conservancy ecoregional plans and assessments, Regional Water Quality Control Board Watershed Management Initiative chapters, and various resource conservation district and consultant reports were invaluable and provided solid information that could not otherwise have been obtained. All staff and colleagues in resource conservation activities were generous in sharing information and very supportive of this DPR effort.

III. Representative Keystone Watersheds by Ecological Region

This section identifies the 33 watersheds and watershed complexes selected as best exemplifying the criteria developed to characterize representative, priority, keystone watersheds throughout the SPS. The list includes watersheds located in nine of the nineteen USFS-designated ecological regions in California. Each watershed has significant State Park ownership, and each complex consists of physical watersheds joined at ridgelines or drainage divides, to encompass a composite block of land that shares biological and physical characteristics, land management philosophies, and qualities. A narrative for each watershed has been prepared to describe the physical, ecological and biological characteristics. These descriptions vary in depth and specificity, according to the information readily available. Watershed descriptions are arranged according to ecological region, north to south, and west to east.

There are no watersheds designated for the Great Valley, Sonoran Desert, Mono, Southeast Great Basin, Northwest Basin and Range, Northern California Coast Ranges, Southern Cascades, or Modoc Plateau Ecological Regions. This is due to either topographic conditions (watersheds become very large and not particularly useful designations in areas with low relief such as the Great Valley and the desert areas) or lack of ownership or presence (such as in the southern Cascades, Northwest Basin and Range, and Northern California Coastal Interior Coast Ranges).

Map 1 displays the boundaries of the Ecological Regions, and pinpoints each of the 33 watersheds and watershed complexes. An attempt was made to select the watersheds across the state, and to avoid excessive representation where DPR ownership is most concentrated. Consequently, there are many worthy watersheds that were not included in this initial effort. The best condition watersheds were selected where there was more than one that met the stated criteria.

Table 2 lists the watersheds and watershed complexes by ecological region and park unit. The appendix includes maps delineating each watershed or watershed complex, with State Parks and other public ownership. These maps are derived from available DPR GIS data layers. While the maps are simple portrayals, the underlying GIS databases are a rich tool for querying a wide range of geographically-based information requests. Table 3 (included in the appendix) is a summary table, showing important natural parks, highlighting representative, outstanding, and key watershed areas in the State Park System.

Key Watersheds in The State Park System



Map 1. Key Watersheds in the State Park System by USFS Ecoregion.

Key Watersheds in The State Park System



Map 2. Key Watersheds in the State Park System by California Biodiversity Council Bioregions.

Table 2. DPR Representative Keystone Watersheds, by Ecological Region

(Alpha numerics refer to USFS Ecological Units of California, August 1994)

Northern California Coast Ecological Region (263A)

1. Mill Creek Complex (Jedediah Smith Redwoods SP, Del Norte Coast Redwoods SP)
2. Prairie Creek Complex (Prairie Creek Redwoods SP)
3. McDonald Creek Watershed (Humboldt Lagoons SP, Harry A. Merlo SRA)
4. Bull Creek Complex (Humboldt Redwoods SP)
5. Jackass (Wolf) Creek-Whale Gulch Complex (Sinkyone Wilderness SP)
6. Big River Watershed (Big River Unit of Mendocino Headlands SP, Mendocino Woodlands SP, Montgomery Woods SR)
7. Willow Creek Watershed (Sonoma Coast SP)
8. Lagunitas Creek Watershed (Samuel P. Taylor SP)
9. Redwood Creek Complex (Mount Tamalpais SP)

Klamath Mountains (M261 A)

10. Castle Creek Watershed (Castle Crags SP)

Bay Delta

11. Angel Island SP

Sierra Nevada (M261E)

12. Jamison Creek Complex (Plumas-Eureka SP)
13. Burton Creek Watershed (Burton Creek SP)
14. General Creek Watershed (Ed Z'berg-Sugar Pine Point SP)
15. Beaver Creek Watershed (Calaveras Big Trees SP)

Central California Coast (261A)

16. Mitchell Creek Complex (Mount Diablo SP)
17. Waddell Creek Watershed (Big Basin Redwoods SP)
18. Wilder Creek Watershed (Wilder Ranch SP)
19. Aptos Creek Watershed (The Forest of Nisene Marks SP)
20. Malpaso-San Jose Creek Complex (Point Lobos Ranch SP, Carmel River SB, Point Lobos SR, Garrapata SP)
21. Big Sur River Watershed (Andrew Molera SP, Pfeiffer Big Sur SP)
22. Islay Creek Complex (Montaña de Oro SP)

Central California Coast Ranges (M262 A)

23. Coyote Creek Watershed (Henry W. Coe SP)
24. Orestimba Creek Watershed (Henry W. Coe SP)

Southern California Coast (261B)

25. Gaviota Creek Watershed (Gaviota SP)
26. Moro Canyon Watershed (Crystal Cove SP)
27. Big Sycamore Canyon Complex (Point Mugu SP)
28. Upper Santa Ynez Canyon Complex (Topanga SP)

Southern California Mountains and Valleys (M 262 B)

- 29. Aliso Canyon Watershed (Chino Hills SP)
- 30. North Fork San Jacinto River Watershed (Mount San Jacinto SP)
- 31. Sweetwater River Complex (Cuyamaca Rancho SP)

Mojave Desert (322A)

- 32. Upper Red Rock Canyon Watershed (Red Rock Canyon SP)

Colorado Desert (322C) and Southern California Mountains and Valleys (M262B)

- 33. Coyote Canyon Watershed (Anza-Borrego Desert SP)

Northern California Coast Ecological Region (263A)

The Northern California Coast Ecological Region is characterized by steep mountains of the Northern California Coast Ranges with a climate substantially influenced by the ocean. The mountains have rounded ridges, steep and moderately steep sides, and narrow canyons. Most of the mountains are elongated in a north-northwest to northwest direction and have subequal summits. Elevations range from sea level to 3,000 feet.

1. Mill Creek Complex (Map A-1)

Jedediah Smith Redwoods SP
Del Norte Coast Redwoods SP

The Mill Creek and adjacent Rock Creek watersheds consist of approximately 34,125 acres of mountainous forested land five miles southeast of Crescent City, Del Norte County. The streams are important tributaries to the federal and state listed Wild and Scenic Smith River. The watersheds drain steep forested terrain that has been incised by narrow drainages, typical of the northern Coast Ranges. Streams include Mill Creek, Rock Creek, West Branch Mill Creek, East Fork Mill Creek, and Bummer Lake Creek.

The Mill Creek watershed (the adjacent Rock Creek watershed drains directly to the Smith River, and is implicitly included in this discussion) includes lands of Jedediah Smith Redwoods State Park to the north and Del Norte Coast Redwoods State Park to the west; and is within the congressionally authorized boundary of Redwood National Park. Six Rivers National Forest lands are adjacent to the Mill Creek watershed, east of the eastern-most divide. Portions of the watershed have been logged; however, it is now entirely publicly owned.

The Mill Creek watershed occupies a transitional position at the eastern edge of the Coast Ranges and the western-most flank of the Klamath Mountains. The South Fork Mountain fault and related schist (sheared rock) mark the boundary between the Coast Ranges and Klamath Mountains. The fault intersects the eastern corner of the Mill Creek basin at Bald Hill, then follows the northwestern trend of Rattlesnake Ridge through the Rock Creek drainage. Recent geological interpretations ascribe plate tectonic interactions, subduction, and accretion as the driving forces responsible for the massive sandstones west of the fault and the highly sheared and foliated metagraywacke (metamorphosed lithic sandstone), argillite (metamorphosed siltstone), and semi schist east of the fault. The ridges, steep hillsides, and narrow canyons which make up the watershed are prone to significant landslides and mass wasting.

The elevation in the watershed ranges from near sea-level up to slightly above 2,000' along Bald Hills and reaching 2,300' on Childs Hill. The Mill Creek watershed stream morphologies vary from colluvial, boulder-cascade, step-pool, and bedrock channels in upper basin positions to forced pool-riffle and plane-bed alluvial channels in lower basin position. Runoff is rapid and many of the smaller streams are dry by the end of the summer. Large woody debris has been an

important component in channel forming, and provides habitat, cover, and cool stream temperatures.

Mill Creek is a tributary of the Smith River watershed which is recognized as one of the more pristine watersheds in the North Coast Region. The Smith River is not listed as an impaired water body; however, due to the timber harvest history of the Mill Creek drainage, and the extensive road network for timber access and removal, sediment production is a concern. The Smith River and tributaries are valued for their substrate habitats which support spawning conditions for anadromous fish and their food sources. Excess sediment and turbidity (from both natural and human-caused events) are the water quality issues of most relevance.

Vegetation in the watershed generally includes a diverse assemblage of plants with as many as 300 species present, including redwood (120 acres of old growth), red alder, Western white pine, knobcone pine, Sitka spruce, and Jeffrey pine. Herbaceous plant series include bulrush, bulrush-cattail, and California annual grassland. Shrub-dominated series include the blue blossom and huckleberry oak. Other series present include the Darlingtonia and fen.

The streams provide habitat for anadromous salmonids including coho, chinook, and chum salmon, steelhead, and coastal cutthroat trout. Coho salmon are federally listed as threatened and are currently the only [federally] listed fish species found in the Mill Creek watershed. Coho salmon are candidates for listing by the State of California. Chinook salmon, coastal cutthroat trout, and Pacific lamprey are also species of concern that use habitat similar to the state and federally listed species.

The Mill Creek watershed also contains habitat for the federally listed endangered marbled murrelet and federally listed threatened northern spotted owl. Surveys have confirmed the presence of northern spotted owls and nesting of marbled murrelets.

Acres of Watershed: 34,125

Ownership:

DPR ~ 30,125

NPS ~ 4,000

Names of Streams:

Mill Creek and its tributaries: West Branch Mill Creek, East Fork Mill Creek,
Bummer Lake Creek

Rock Creek

Watershed location: Headwaters in the North Coast Ranges to the Smith River
(Rock Creek enters the South Fork Smith River.)

2. Prairie Creek Complex (Map A-2) Prairie Creek Redwoods SP

The Prairie Creek watershed complex is in a steep mountainous coastal area north of the small town of Orick in Humboldt County. Most of the mountains follow a north-northwest to northwest structural grain and have subequal summits with increasing elevations toward the interior. While the dominant structural grain of the region is north-northwest, cross-cutting “wrench” features account for high angle connections between the mapped faults.

The valley of Prairie Creek is broad enough near its confluence with Redwood Creek to contain an appreciable floodplain. The elevation range in the watershed is from about 34’ at the confluence with Redwood Creek to over 1400’ along the divide between the Ah Pah drainage and Brown Creek. Prairie Creek watershed is underlain by intensely folded and faulted Jurassic and Cretaceous Franciscan sedimentary, minor volcanic, and metamorphic rocks, and overlain with much younger (Plio-Pleistocene) fluvial and marine sediments of the informally designated Prairie Creek group. The younger sediments (Prairie Creek group) blanket the entire watershed and are thought to have been deposited by a proto Klamath or Trinity River. There are small areas of Recent alluvium along Prairie Creek.

Runoff is rapid and many of the smaller streams are dry by the end of the summer. Tectonic activity and faulting have resulted in profound changes in drainage connections, with streams and rivers responding by carving new courses down through the sheared and uplifted materials. Erosion and mass wasting (landslides and debris flows) are active agents in the watershed.

Nearly 300 species of club mosses, ferns, conifers, and flowering plants occur in the Redwood State and National Parks, of which Prairie Creek watershed is a part; 84% of these species occur in the watershed complex. Special interest plant species include old growth coast redwoods, western red cedar, Port Orford cedar, rhododendron, and western azalea. Nine biotic communities occur in the Prairie Creek watershed complex, including: coastal strand, freshwater marsh and lagoons, coastal scrub, coastal spruce forest, coastal prairie, riparian forest, broad-leaved deciduous forest, broad-leaved evergreen forest, and redwood forest.

Chinook salmon, Coho salmon, steelhead, Southern torrent (seep) salamander, tailed frog, marbled murrelet, Northern spotted owl, and American peregrine falcon are known to inhabit the Prairie Creek watershed complex. Roosevelt elk, the largest of California’s native terrestrial animals, thrive in the meadows, prairies, and forests of the Prairie Creek watershed complex.

Godwood Creek and Prairie Creek upstream of Brown Creek have also been listed as reference watersheds by the California Department of Forestry and Fire Protection (CDF). They are included in an interactive watersheds mapping web-

site maintained by the Fire and Resource Assessment Program that highlights California's most pristine watersheds.

Acres of Watershed: 28,853

Ownership:

NPS ~15,800

DPR ~13,050

Names of streams:

Prairie Creek and its tributaries: Hope, Little, Brown, Boyes, May, Lost Man, Godwood, Skunk Cabbage and Johnson Creeks

Ossagon, Butler, Boat, Home, Squashan and Major Creeks (all flow directly to the Pacific Ocean)

Watershed location:

Prairie Creek: Headwaters of Prairie Creek and tributaries (Hope, Little, Brown, Boyes, May, Lost Man, Godwood, Skunk Cabbage, and Johnson) to confluence with Redwood Creek.

Ossagon, Butler, Boat, Home, Squashan and Major Creeks: Headwaters to the Pacific Ocean.

3. McDonald Creek Watershed (Map A-3)

Humboldt Lagoons SP

Harry A. Merlo SRA

McDonald Creek is a small coastal stream draining a watershed area of about 5.3 mi² (excluding hillslopes that drain directly into the lagoon). It flows into Stone Lagoon, a 0.81 mi² brackish body of water that opens to the ocean several times per year. Located on the coast of Humboldt County, California, about 35 miles north of Eureka, the McDonald Creek watershed consists of two main sub-watersheds: the main channel McDonald Creek and the North Fork, which join together in the valley bottom about 2,200 feet upstream from Stone Lagoon. The mainstem drains 3.3 mi² and has a channel length of 5 miles, while the North Fork drains 2.0 mi² and is 2 miles long. Total basin relief is approximately 1,900 feet (20 to 1,920 feet above mean sea level). The watershed is characterized by steep slopes forested with redwood, Douglas-fir, Sitka spruce, red alder, and occasional open grassy areas on southwest-facing slopes. Lush wetland meadows provide prime habitat for a large herd of Roosevelt Elk.

The underlying geology of hillslopes in McDonald Creek is the Redwood Creek schist, which weathers to highly erodible soils when disturbed. The main channel within the upper watershed follows a northwesterly trend consistent with major faults in the region, suggesting strong structural control on channel alignment. Portions of the North Fork of McDonald Creek also exhibit this trend, although to a lesser degree.

Valley bottom areas are composed of modern alluvium of fine to coarse-grained sediments. As with adjacent coastal areas, coastal erosion and sea level rise exert a strong influence on the lower watershed. The lower watershed has lost drainage area due to coastal erosion and has experienced valley filling due to sea level rise over the Quaternary geological period. In addition, timber harvest-related activities have resulted in slope failures which have delivered sediment to the lower reaches of the creek and have contributed to the formation of the creek's delta in Stone Lagoon.

The climate is maritime, strongly influenced by ocean weather. Precipitation in the local area is about 50 inches per year, falling mostly between November and April. Snow is rare and accumulation is of short duration.

Lands west of US Highway 101, including Stone Lagoon and the lower 3,120 feet of McDonald Creek, are part of the Humboldt Lagoons State Park. Lands east of US Highway 101 are privately owned and managed for a variety of uses. Although the watershed has been logged in the past with commensurate skid trails and roads, the area has not been re-entered for logging purposes for many decades, and significant forest canopy has grown in the intervening time. This compact and complex watershed has great potential for watershed health improvements, if treatment of the upper watershed impacts is conducted before additional slope failures develop and conditions for restoration deteriorate.

Stone Lagoon is the most pristine of the regional lagoons. Bald eagles are frequently seen foraging on the lagoon. There is an active nest on the ridge inland of the north end of Stone Lagoon. Hundreds of brown pelicans feed and rest around the lagoon.

Cutthroat trout and tidewater goby are found in the lagoon; as well as a rich assemblage of brine shrimp, copepods and other aquatic life.

Valley bottom sedimentation is a long-term geomorphic process in McDonald Creek. Tectonic subsidence, coupled with sea level rise and high natural erosion rates, is the driving process that, over the millennia, both created Stone Lagoon and advanced the valley-filling process to the present degree. In addition, land use in the watershed within the past six decades has elevated sediment yield from the upper watershed and continues to do so as old haul roads and other features (skid roads, landings) deteriorate. This, combined with human developments on the valley floodplain (US Highway 101, private residences and commercial developments) has resulted in flooding on private property and the highway, lagoon sedimentation, loss of channel conveyance capacity, and degradation of fish habitat.

Acres of Watershed: 472

Ownership:

Private: ~240

DPR: ~180

NPS: ~50

Names of streams:

McDonald Creek
North Fork McDonald Creek
Stone Lagoon

Watershed location: Headwaters in north Coast Ranges to Stone Lagoon and Pacific Ocean.

4. Bull Creek Complex (Map A-4) Humboldt Redwoods SP

Bull Creek, a tributary to the South Fork Eel River in Humboldt Redwoods State Park, is about 40 miles south of Eureka. Bull Creek watershed is within the Coast Ranges Geomorphic Province. The mountains were formed as remnants of the Pacific tectonic plate collided with the North American tectonic plate. Ocean floor remnants and deposits were literally scraped off and added to the northwestward-traveling North American plate. This process is ongoing. In addition, the smaller Gorda tectonic plate is colliding with both the Pacific and North American plates offshore about ten miles from the park, forming the Mendocino Triple Junction. This seismically active zone is capable of producing Richter magnitude 9 earthquakes. Due to the geotectonic “address”, the mountainous areas in the headwaters of Bull Creek are experiencing rapid uplift (the most rapid uplift rate in the lower 48). Consequently there is substantial channel erosion and inner gorge development as running streams try to achieve dynamic equilibrium in the down cutting and depositional cycles.

Numerous active faults could also affect the watershed. Slopes in the watershed are steep and have been destabilized by intensive land uses such as logging. Sediment and debris from these land uses have exacerbated flooding and impacted fisheries, vegetation, and structures. Extensive landform restoration efforts have been conducted in the watershed, and miles of logging roads and trails have been removed in an effort to restore the watershed’s form, function, and resource qualities.

The watershed complex is within the Coastal Franciscan ecological subregion. Seven vegetation types, or series, have been mapped within the watershed: redwood series; Douglas-fir–tanoak series; black cottonwood series; red alder series; Eastwood manzanita series; and California annual grassland series. The watershed supports two plants that are recognized by the California Native Plant Society as rare in California: maple-leaved checkerbloom and robust monardella. Howell’s montia is recognized as being rare in California, but is more common elsewhere.

The watershed complex supports several sensitive fish species: chinook, coho, and steelhead. These fish are listed as Threatened under the federal Endangered Species Act. Forests of the watershed support one of the largest remaining blocks of marbled murrelet habitat in this ecologic subregion. In

addition, northern spotted owls nest within the watershed, and it provides habitat for Pacific fisher and red tree voles.

This watershed complex is renowned for its large contiguous block of ancient forest. It is within the Klamath North Coast bioregion. Although almost completely surrounded by private property, the park is of sufficient size to wholly contain several complete watersheds. In addition, both Canoe Creek and Squaw Creek have been recognized as possessing high quality natural values and have been listed by the CDF Reference Watersheds database for California.

Humboldt Redwoods State Park was in the initial group of outstanding areas in California recommended by Frederick Law Olmstead, Jr. in 1929 for creation of the California State Park System.

Acres of Watershed: 39,816

Ownership

DPR ~39,816

Names of streams:

Bull Creek and its tributaries: Panther Creek, Preacher Gulch, Slide Creek, Burns Creek, Cuneo Creek, Mill Creek, Albee Creek, Gopher Creek, Harper Creek, Squaw Creek, Miller, Creek, Calf Creek, Connick Creek, Cow Creek, Tepee Creek,

Decker Creek, Corner Creek, and Canoe Creek: flow to South Fork Eel River and share ridge divides with Bull Creek watershed.

Watershed location: Headwaters to the South Fork Eel River

5. Jackass (Wolf) Creek-Whale Gulch Complex (Map A-5)

Sinkyone Wilderness SP

The watersheds within Sinkyone Wilderness State Park are relatively short and poorly developed (no extensive, complex branching), indicating a youthful geomorphologic stage. The drainages are strongly influenced by seismic and fault activity, especially at Whale Gulch, which contains a classic sag pond on the coastal terrace before the stream descends to the ocean beach below.

Sinkyone Wilderness State Park contains significant biological resources, including old growth redwood stands; numerous undammed native coastal fish-bearing streams; habitat for threatened and endangered plant, wildlife, and fish species; and a mosaic of native vegetation types. The park provides an important link and essential wildlife corridor to other protected areas in the region. Outstanding scenic values are provided by the park's breathtaking sweeping ocean vistas, dramatic high bluffs, isolated offshore islands, and black sand beaches.

Vegetation types include annual grassland, Bald Hills prairie, coastal Douglas-fir-Western hemlock forest, Coastal terrace prairie, mixed evergreen forest, Northern coastal bluff scrub, and Northern coastal scrub.

Analysis: Sinkyone Wilderness State Park adjoins the King Range National Conservation Area to the north, administered by the federal Bureau of Land Management (BLM). The combined properties preserve a relatively pristine stretch of wild California coast, ocean terraces, and coastal mountains. Although historic logging and ranching activities have occurred in the area, the landscape form and function remain relatively unimpacted by modern day human activities. The Whale Gulch-Jackass (Wolf) Creek watersheds also border and include lands managed by the Intertribal Sinkyone Wilderness Council, which has partnered with DPR for land management and restoration activities. Whale Gulch at the northern end of the area represents very rare geomorphic examples of fault-related features, such as a sag pond (defined as a body of water, formed by collection of water in the depression between two strands of a geologic fault). This unusual feature is often ephemeral and may host special plant and animal species adapted to the unusual environment.

Acres of Watershed: 11,564

Ownership

DPR ~8,764

BLM ~1,800

Intertribal Sinkyone Wilderness Council ~2,000

Names of streams:

Whale Gulch, Low Gap Creek, Flat Rock Creek, Jackass Creek, North Fork Jackass Creek, Little Jackass Creek, Northport Gulch, Anderson Gulch, Dark Gulch

Watershed location: Small, steeply incised coastal streams, draining directly to the ocean.

6. Big River Watershed (Map A-6)

Big River Unit of Mendocino Headlands SP

Mendocino Woodlands SP

Montgomery Woods SR

The Big River drains a 181 mi² watershed located in the northern California Coast Ranges of western Mendocino County, entering the Pacific Ocean at the town of Mendocino, about 10 miles south of Fort Bragg. The watershed drains primarily from the east to the west, sharing ridges with the Noyo and Caspar Creek watersheds to the north and the Albion River watershed to the south. Other than the town of Mendocino, there is relatively little human occupation in the watershed, with only scattered ranches and residences.

Elevations within the Big River watershed range from sea level at the basin outlet to 2,725 feet. The watershed ownership is dominated by private timber

companies and the State (83% of the watershed). Thirty-one property owners, with ownerships varying from 160 to 3,760 acres, own 14% of the watershed. These include smaller industrial and non-industrial timberland owners, several ranches, and several public and quasi-public parcels. No other property owner owns more than 5% of the watershed. The remaining parcels are primarily residences.

The Mediterranean climate in the watershed is characterized by a pattern of low-intensity rainfall in the winter and cool, dry summers with coastal fog. Mean annual precipitation varies from about 38 inches at Fort Bragg near the western margin of the watershed to over 50 inches at Willits to the east. Mean annual rainfall for the entire watershed is 56 inches, with portions receiving in excess of 65 inches at the higher elevations. Snowfall occurs occasionally in the higher elevations of the watershed and rarely accumulates. Snow is thus not considered to have any appreciable effect on the watershed hydrology.

Limited stream flow records for the Big River watershed were collected by the USGS from 1961 to 1971. The watershed's topography is diverse, varying from flat estuarine environments and uplifted marine terraces to rugged mountains with high relief in the eastern portion. The watershed is characterized by narrow ridgelines separated by deeply incised inner gorges of the major river channels and streams. The western end of the Big River drainage is distinguished by a drowned and filled estuary occupying a relatively narrow inner gorge, with steep slopes that extend up to the flat coastal terraces. Tidal influence extends inland from the mouth three miles in the winter and eight miles in the summer. Upstream, there are mudflats which become narrow floodplains, brackish and freshwater bogs and freshwater marshes.

The geology of the Big River watershed is primarily comprised of Coastal Belt Franciscan complex. This portion of the Franciscan complex is relatively stable compared to the mélange terrane of the Central Belt, which is found only in the uppermost parts of the watershed. A small portion of Tertiary-aged sandstone is found in the Greenough Ridge-Montgomery Woods State Reserve area, in the southeastern portion of the watershed.

The predominant land use in the Big River watershed is habitat for wildlife and timber harvest. The property supports animals with large ranges such as black bear and mountain lion. Former logging roads within the park property are used as trails to access the interior of the region. Canoeists and kayakers use the estuary and the river for boating and for exploring the inland's natural wonders.

Analysis: Streamside landslides from inner gorge landforms are a major source of sediment, and altered drainage pathways associated with roads are a major cause of instability. Road-related erosion represents one of the significant preventable sources of sediment in the Big River area. Inventories of roads and adjacent hillslope conditions indicate that most sediment yield is from failure of road and landing sidecast fill, erosion at or associated with stream crossings, and road surface and ditch erosion.

Sediment and high water temperatures impair the Big River. A technical TMDL (total maximum daily load of pollutant to an impaired water body) has been completed for sediment, but not for temperature.

The Big River watershed supports both anadromous and resident salmonid populations, including coho, salmon and steelhead. The watershed also supports other native aquatic species including three-spined stickleback, coastrange sculpin, prickly sculpin, several species of lamprey, pacific giant salamander, several species of newt, and tailed frog.

Acres of Watershed: 115,865

Ownership

DPR ~16,000

CDF ~11,000

Other ~89,000

Names of streams:

Big River, and its many tributaries including : Martin Creek, North Fork Big River, East Branch North Fork Big River, South Fork Big River, Laguna Creek, Daugherty Creek, Hare Creek, Two Log Creek, Montgomery Creek, Tramway Gulch, Thompson Gulch, Clementine Creek, Russell Brook.

Watershed location: headwaters to Big River Estuary

7. Willow Creek Watershed (Map A-7)

Sonoma Coast State Park

Willow Creek flows from an 8.7 square mile watershed into the Russian River approximately 2 miles upstream of its mouth at Jenner. Located on the western edge of the Coast Ranges, Willow Creek flows in a northwesterly direction following an inactive fault trace. Watershed elevations range from zero feet at the confluence to 1,481 feet at Koerber Peak.

The upper section of the watershed is characterized by precipitous, forested canyons of redwood and Douglas-fir that enclose steep, boulder step-pool channels. The precipitous ridges and gorges transition into broader, rounded ridges of mixed forest and grasslands. In the lower section, the broad ridges and valley slopes are separated by a wide, flat, alluvial valley through which Willow Creek flows.

The geology and climate have shaped the topography and vegetation of the Willow Creek watershed. The underlying rock formations are the Franciscan complex, with zones of igneous rocks and green serpentines within and between. These geologic formations are highly erodible and subject to slope failures.

The present-day vegetation of the Willow Creek watershed consists of north coast mixed forest, dominated by Douglas-fir and/or redwood with substantial

cover (shaded areas) provided by hardwood species, including coast live oak, tanoak (*Lithocarpus densiflorus*), California bay and madrone. Additional associations include patches of redwood forest, bay forest, valley grassland, coastal terrace grassland, isolated relict patches of chaparral, coastal sage scrub, freshwater marsh, tidal brackish marsh, willow scrub, and alder-dominated riparian forest. None of these communities is considered pristine, since the watershed has been subjected to human disturbance. In general, these communities retain the species composition of the original forest, although the trend has been toward dominance by plant species that can withstand repeated disturbance.

The Willow Creek watershed supports habitat for Chinook salmon, coho salmon, and rainbow trout.

The most intense 20th century logging in the upper watershed occurred between 1953 and the early 1970s, with extensive removal of second growth and remaining old growth. Recorded human land use in the Willow Creek watershed that began with the Russian road system and was followed by logging and disturbance to the riparian corridor associated with Russian settlement and agricultural uses (grazing and crop production) between 1833 and 1841 set the stage for later activities that have resulted in the limiting factors facing the watershed today. Timbering resulted in clear-cutting as early as the mid 19th century, and extensive clear-cutting and tractor-yarding are reported in the mid 20th century. Various trains were used to move timber from the watershed, some of which are reported to have been in the creek bed itself. Grazing is recorded to have been very intensive in the later 19th century. Historic activities have had tremendous impacts on the watershed. With State Parks' takeover of much of the upper watershed, the prognosis for restoration and protection is hopeful.

Acres of Watershed: 5,484

Ownership

DPR ~4,200

Other ~1,280

Name of stream:

Willow Creek

Watershed location: Headwaters to the Russian River

8. Lagunitas Creek Watershed (Map A-8)

Samuel P. Taylor SP

Golden Gate NRA

Lagunitas Creek watershed is located in the steep rolling hills of Marin County north of San Francisco. Mass wasting and fluvial erosion are typical of the Marin Hills and Valleys ecological subregion it represents. Lagunitas Creek is also known as Papermill Creek in the lower reaches where it flows through Samuel P. Taylor State Park. Lagunitas Creek is fed by six main tributaries. Much of the

stream flow in the mainstem of Lagunitas Creek is regulated by dams and collected into various reservoirs upstream of the San Geronimo confluence, with Olema and San Geronimo creeks being the largest uncontrolled tributaries. Olema Creek is the largest tributary in the Lagunitas Creek watershed, flowing for nine miles along the San Andreas Fault Zone, with a catchment area of 14.5 square miles. Olema Creek and tributaries provide significant fisheries and aquatic habitat. Over half of the watershed is in public ownership with a corresponding increase in opportunities for consistent, comprehensive management. Ranching, both on private lands and on land leased from the NPS, continues in the Olema and Nicasio Valleys, and in lower Lagunitas Creek.

The Lagunitas Creek watershed is the largest watershed in Marin County. Primary tributaries are San Geronimo, Devil's Gulch, Nicasio, and Olema creeks. A large part of the watershed is within State and Federal parklands; the largest landowner is the National Park Service. The second largest landowner is Marin Municipal Water District (MMWD), and Marin County Open Space District holds about 2,000 acres in the watershed. There are a number of small towns along the San Geronimo Creek tributary, which is excluded from this watershed listing, due to extensive development and non-compatible land-uses.

Lagunitas Creek watershed is of statewide significance for coho salmon and California freshwater shrimp, as well as for steelhead. The fish community also includes native species like California roach, Sacramento sucker, Pacific lamprey, three-spine stickleback, prickly sculpin, riffle sculpin, and coastrange sculpin. The watershed's vegetation includes white alder and big leaf maple along the riparian forest, and Douglas-fir, oak, tanoak, madrone, live oak, California bay, buckeye, salal, huckleberry, and coyote brush. Habitat exists for northern spotted owl. Lagunitas Creek watershed connects Point Reyes National Seashore and MMWD Lands.

Most of the land along the main stem of Lagunitas Creek is publicly owned. Landowners include MMWD, DPR, which owns Samuel P. Taylor State Park, and NPS, which owns Golden Gate National Recreation Area (GGNRA) and Point Reyes National Seashore (PRNS). There are a few private landowners between the NPS boundary and the mouth of Lagunitas Creek. Land use in the watershed is primarily open space, with livestock grazing on some NPS lands.

Approximately 40 percent of the Lagunitas Creek watershed is open space, including: 20,000 acres that are owned by MMWD; a 42 acre wildlife preserve on Olema Marsh owned by ACR; the 2,010 acre Samuel P. Taylor State Park; and six properties owned by the Marin County Open Space District, totaling approximately 2,040 acres. MMWD owns about 30 percent of the watershed (mostly in the southern portion near the headwaters), and most of this property is not grazed except for small areas in the Nicasio Creek watershed.

Compared to other streams throughout coastal California, coho and steelhead runs in Lagunitas Creek are in good condition. Lagunitas Creek is said to support 10% of the remaining coho run in the entire state. Despite this positive

circumstance, habitat and fish populations in Lagunitas Creek have declined greatly over the years. Construction of water supply reservoirs by MMWD has played a major role in degrading the habitat conditions in Lagunitas Creek. These impoundments have resulted in the drowning of habitat; undependable stream flows for migration, spawning, and juvenile rearing; reduction of habitat by the accumulation of sand in the stream bottom, and reduction of coarse sediment; and increased frequency of egg losses by scour.

Acres of Watershed: 23,481

Ownership

Marin Municipal Water District ~18,000

NPS ~ 3,000

DPR ~ 2,710

Names of streams:

Lagunitas Creek and its tributaries: Kent Reservoir, Devils Gulch, Olema, Nicasio, San Geronimo, Bear Valley, Deadman's Gulch

Watershed location: Headwaters lakes and springs to Tomales Bay

9. Redwood Creek Complex (Map A-9)

Mount Tamalpais SP

Muir Woods NM

Golden Gate NRA

The Redwood Creek Watershed Complex is within the Marin Hills and Valleys ecological subregion. Mass wasting and fluvial erosion are the primary active geomorphic processes in this setting. Most of the mountains are elongated in a north-northwest to northwest direction, but Mt. Tamalpais is oriented southwest to northeast.

The watershed includes vegetation typical of the subregion: California annual grassland, foothill needlegrass, purple needlegrass, chamise, black oak, California bay, coast live oak, Douglas-fir-tanoak, and redwood.

Wildlife habitats of the Redwood Creek Complex include annual grassland, barren, coastal scrub, Douglas-fir, eucalyptus, marine, mixed chaparral, montane hardwood-conifer, montane riparian, perennial grassland, redwood, riverine, valley foothill riparian woodland, and park facilities. Sensitive species include coho salmon and steelhead.

Redwood Creek Watershed Complex is almost surrounded by other public lands including Point Reyes National Seashore, Golden Gate National Recreation Area (GGNRA), Marin Municipal Water District watershed, a small U.S. military reservation, Muir Woods National Monument, and the California Department of Fish and Game Mount Tamalpais Game Refuge.

The watershed supports habitat for steelhead trout, coho, red-legged frog, and Western pond turtles. It connects with Muir Woods NM, GGNRA and Marin Municipal Water District watershed protection lands.

Acres of Watershed: 6,794

Ownership

DPR ~4,000

NPS ~1,500

Marin Municipal Water District ~1,200

other

Names of streams:

Fern Creek, Redwood Creek, Lone Tree Creek

Watershed location: Headwaters to the Pacific Ocean

Klamath Mountains Ecological Region (M261A)

The Klamath Mountains of northwestern California and southwestern Oregon is one of the most distinctive and complex ecological zones in the western United States. The area covers dramatic topography, extensive watercourses, unusual and varied geologic formations, often-abrupt climate changes, diverse vegetation, and sensitive plant and animal habitats. The combination of these unique physical characteristics with the region's complex fire history has created a region rich in endemic plant communities. The dominant vegetation of the ecoregion is coniferous forest; however, the environmental and floristic diversity, combined with a long history of prehistoric and historic disturbances has created over 400 natural vegetation communities and associations.

The ecological region contains over 22,784 miles of streams and rivers. While most watercourses drain directly into the Pacific Ocean and the Klamath River system, those on the southern end of the ecoregion (such as Castle Creek) drain into the San Francisco Bay via the Sacramento River. Historically, this ecoregion is known for some of the best anadromous fish habitat in Oregon and California.

Ownership in the ecoregion is dominated by public land that is managed for various purposes by federal and state agencies. The U.S. Forest Service manages 46% of the ecoregion, the Bureau of Land Management manages 10%, and 42% of the ecoregion is private land. Other agencies such as the National Park Service and CDF (in state forests) manage almost 2% of the area.

10. Castle Creek Watershed (Map A-10)

Castle Crags SP (adjoins Shasta-Trinity National Forest)

Castle Creek flows to the Sacramento River just south of the town of Dunsmuir in Shasta County. The creek derives its name from the towering granitic rock domes known as Castle Crags. The Castle Creek watershed is representative of the Lower Scott Mountains and Eastern Klamath Mountains ecological subregions. Both of these subregions are typified by mountains with rounded

summits, steep sides, and narrow canyons. Hillsides of the Eastern Klamath tend to be more moderate than those of the Lower Scott subregion.

Much of the watershed is dominated by Douglas-fir and mixed conifer forest with meadows and shrublands on alluvial, granitic, and serpentine parent materials. Stands of California black oak are interspersed within this forest. The watershed serves as a landscape bridge and corridor across the Sacramento River and between the southern Cascades and Klamath Mountains.

Castle Crags State Park was in the initial group of outstanding areas in California recommended by Frederick Law Olmstead, Jr. in 1929 for creation of the California State Park System. Although the state park does not actually include the magnificent peaks and domes of the Castle Crags granodiorite batholith, it adjoins Castle Crags Wilderness, and provides public access and trails into the federal wilderness. Part of the Pacific Crest Trail (PCT) bounds the Castle Creek watershed at its uppermost elevations above the Seven Lakes Basin. The PCT follows the watershed divide into the Castle Crags federal wilderness. Castle Creek watershed includes parts of Siskiyou and Shasta counties; the Trinity County line is defined as the watershed boundary in this area.

Alpine lakes and springs occur in the upper reaches of the watershed, with surrounding peaks up to 7,000'. The lowest elevation of the watershed is where Castle Creek joins the Sacramento River at 2,000'.

The following wildlife habitats were identified in the 2001-02 Natural Resources Condition Assessment: barren, Douglas-fir, Klamath mixed conifer, montane chaparral, montane hardwood-conifer, montane riparian and perennial grassland.

Dominant vegetation includes mixed conifer, with ponderosa pine, Douglas-fir, white fir, cedar and sugar pine. Shrub species include tanoak, brush chinquapin and green leaf manzanita. California black oak is a component of the mixed conifer type below 3,500, and Port-Orford cedar is present along some perennial streams within the watershed.

Acres of Watershed: 22,939

Ownership

USFS ~12,660

Sierra Pacific Industries and Hawthorne Lumber Company ~8,960

DPR: ~1,280

Names of streams:

Castle Creek and its tributaries: North Fork Castle Creek, South Fork Castle Creek

Watershed location: Headwaters springs and alpine lakes to the Sacramento River.

Bay Delta

The present San Francisco Bay is a youthful feature—only about 10,000 years old, a product of post-glacial melting, faulting, and plate tectonic interactions, modified by fluvial erosion. Technically part of the Northern California Coast Ecological Region, the bay is treated separately here due to its obvious unique characteristics. Sea level rise has resulted in the inundation of lands that were formerly connected, such as Angel Island and the Tiburon Peninsula, and San Francisco and the Marin Peninsula. The Sacramento and San Joaquin rivers join to flow into the bay, carrying the runoff from 40 percent of California's geographic land area.

11. Angel Island SP (Map A-11)

Angel Island is the largest island in San Francisco Bay, located about one mile south of the Tiburon peninsula. The island represents a unique phenomenon in the State Park system—its isolation in the middle of San Francisco Bay, combined with the spectacular views of the San Francisco skyline, the Golden Gate Bridge, Bay Bridge and Tiburon peninsula produce a compelling contrast between natural beauty and the built environment. The inherent geographic isolation of an island in the middle of San Francisco Bay also represents a unique (for the State Park System) biological and ecological platform, particularly valuable for native aquatic and amphibious species to thrive, free from additional fragmentation and land-use changes.

The island consists of spectacular outcrops of Franciscan red radiolarian cherts, shale, serpentine, graywacke, and pillow basalts encapsulated in a pervasively sheared matrix. The metamorphic rocks are the result of tectonic plate collisions, as the North American Plate has “consumed” and run over the subducted Farallon Plate. The island is really a flooded mountain that was inundated following the last ice age. It was connected to the Tiburon Peninsula, but was separated by the cleft eroded by the proto Sacramento and San Joaquin rivers which formed the deep channel known as Raccoon Strait. Fresh water on the island is from springs and wells. There are no perennial streams.

Vegetation of the island includes grassland, coastal scrub, mixed evergreen forest, chaparral, coastal strand, riparian, coast live oak, madrone, and California bay. Recent resource management projects have reduced forests of bluegum eucalyptus trees which were originally planted by the army (24 acres), but which expanded to over 86 acres, out-competing native vegetation.

Wildlife habitats are annual grassland, chamise-redshank chaparral, closed-cone pine cypress forest, coastal oak woodland, coastal scrub, eucalyptus, perennial grassland, and park facilities. Island fauna includes a unique subspecies of mole, the Angel Island mole.

Outstanding features: With the exception of the developed historic areas, Angel Island is the only nearly pristine island in one of the world's most significant bays,

San Francisco Bay. The island has outstanding views from the recently re-contoured and restored top of Mount Livermore.

Analysis: The island's shape has been modified to accommodate roads, military installations, and the Nike Missile site at the top of Mount Livermore, the highest point on the island. The army shaved the peak off for construction of the Nike Missile site in the 1950's, flattening the top of the island. A stewardship project to re-contour the island's flattened top was conducted in 2002. Consequently, the island no longer sports a "flat top" but through the use of the same sort of machines that altered its profile, the island now stands 16 feet taller than in recent years (peak elevation is now approximately 788' above sea level).

Beach and cliff erosion from ocean waves and mass wasting from subaerial erosion (wind and rain) are active processes at work on Angel Island, continuing the modification of the island's surface and conditions.

Acres of Watershed: 756

Ownership

DPR: 752

Coast Guard: 4

Names of streams: N/A. There are no perennial streams on the island; some seasonal springs occur.

Watershed location: Headwaters to the San Francisco Bay. This is the only island unit of the State Park System.

Sierra Nevada Ecological Region (261E)

The Sierra Nevada is a north-northwest aligned mountain range with a resistant core of deep-seated Mesozoic granitic intrusions and a discontinuous thin topping of Cenozoic volcanic mudflows and ash deposits. The mountain range has been steeply tilted on its eastern flank, with a relatively gentle ramp of foothills leading from the Sacramento and San Joaquin Valleys to the crest of the range. The range elevations are highest in the south, with the highest point of the continental United States at Mount Whitney (14,505').

Fire has changed from historic frequent, low intensity ground fires at lower and mid-elevations, to infrequent, high intensity stand replacing fires. At higher elevations, wildfires have changed from historically infrequent, low and moderate intensity ground fires to infrequent, low, moderate and high intensity surface or stand replacing fires.

Seismically active areas occur along the eastern boundary of the Sierra Nevada with strong shaking and ground rupture.

Wide fluctuations in precipitation and temperature for periods of years result in significant or catastrophic changes in biological communities. Multi year droughts and back-to-back wet years are a common occurrence. Snow is

common at the higher elevations between November and March. Snow avalanches are common at higher elevations, and are responsible for landscape forms and vegetative patterns.

Land Use: Composition and successional sequence of some communities has changed because of plant and animal species introduced between the mid 1800's and early 1900's related to mining, grazing, forestry and recreational activities. Expanding urban uses occur scattered throughout foothills and some high elevation areas. Water diversions for hydroelectric power, agriculture, and municipal and domestic use are common within and between river systems.

12. Jamison Creek Complex (Map A-12)

Plumas-Eureka SP (adjoins Plumas National Forest)

Jamison Creek drains a twelve square mile watershed tributary to the Middle Fork Feather River in the northern Sierra Nevada. The watershed ranges from 7,447' high Eureka Peak to about 5,000' where the creek flows to the Middle Fork Feather River. Steep slopes confine the narrow valley, and glacial moraines bear witness to the dramatically different climate and physiography of the region during the Pleistocene. The upper reaches of the creek are bedrock-controlled, with cascades and waterfalls. The creek then flows through a meadow (Solari) which is probably the remnant of a Pleistocene glacial meltwater lake, and which has been modified by gold-mining activities and subsequent stream down-cutting and entrenchment.

Jamison Creek is located in Plumas County approximately 23 miles south of Quincy in the Sierra Nevada. The watershed is representative of the geomorphology of the Upper Batholithic and Volcanic Flows and Greenville-Graeagle ecological subregion with its gently sloping to moderately steep plateaus with steep mountains, canyons and hill slopes.

Vegetation/habitat types characteristic of the Sierra Nevada Ecological Region found within the watershed include Sierran mixed conifer, montane hardwood, montane hardwood-conifer, montane riparian, freshwater emergent wetland, wet meadow, riverine and lacustrine.

Jamison Creek watershed serves as an important wildlife corridor and habitat linkage to other protected lands in the vicinity including lands in the Tahoe and Plumas National Forests.

Jamison Creek is a significant tributary to the federally-designated Wild and Scenic Middle Fork Feather River. Eureka Lake is a scenic feature that has been modified to store water; however it could be modified to a more natural condition, if water rights and policies permit. Jamison Creek has a water diversion below the State Park campground to support a golf course. Some park-sponsored creek restoration work has been conducted, to address bank erosion from historic stream/channel modifications.

Acres of Watershed: 18,224

Ownership

USFS ~8,000

DPR ~6,000

Other ~4,224

Names of streams:

Jamison Creek and its tributaries: Little Jamison Creek, Eureka Creek,
Florentine Canyon, Bear Creek

Watershed location: Headwaters to confluence with the Middle Fork Feather River.

13. Burton Creek Watershed (Map A-13)

Burton Creek SP (adjoins Lake Tahoe Basin Management Unit, USFS)

The Burton Creek watershed is on the north shore of Lake Tahoe, approximately 2 miles east of Tahoe City. Most of the Burton Creek 5.7mi² watershed is public, with most of the land in DPR, USFS and some California Tahoe Conservancy (CTC) ownership. A small but important parcel of land near the creek's outlet to Lake Tahoe is in private ownership. The upper watershed is mostly undeveloped, with primitive roads for logging and grazing.

The Natural Resources Conservation Service (NRCS), in cooperation with Friends of Burton Creek (FOBC), DPR, United States Forest Service–Lake Tahoe Basin Management Unit (USFS), and CTC, is preparing a comprehensive ecosystem assessment for the Burton and Polaris Creek watersheds. This assessment will investigate all aspects of ecosystem function within the watersheds. The assessment will lead partner agencies to develop restoration plans for their respective lands in order to restore ecosystem function in a collaborative and integrated fashion.

Issues in this area involve a dam on Burton Creek that is used to divert water to a golf course and subsequently contributes to dewatering of the channel. This creates fish passage issues and a negative impact on aquatic habitat. The disturbance history (roads, fire suppression, logging, and grazing) in the upland environment on the public land in these watersheds has had significant impacts on water quality, wildlife and fisheries habitat, and forest health. Additionally, there is a fish passage barrier from a constructed waterfall on Burton Creek. Antone Meadow Natural Preserve is a significant vegetation and landscape feature that provides habitat and protection for native plant and animal species.

Acres of Watershed: 3,331

Ownership

DPR ~ 1,500

USFS ~1,500

California Tahoe Conservancy: ~300

Names of streams:
Burton Creek

Watershed location: Headwaters to Lake Tahoe

14. General Creek Watershed (Map A-14)
Ed Z'berg Sugar Pine Point SP

General Creek is located approximately 10 miles south of Tahoe City on the western shore of Lake Tahoe. This watershed is representative of the geomorphology of the Upper Batholithic and Volcanic Flows ecological sub-region with its gently sloping to moderately steep plateaus with steep canyon slopes. Elevations in the watershed range from approximately 6,200 feet along its two miles of lake frontage up to 6,900 feet in the headwaters.

Vegetation/habitat types characteristic of the Sierra Nevada Ecological Region found within the watershed include Sierran mixed conifer, montane hardwood, montane chaparral, perennial grassland, montane riparian, freshwater emergent wetland, wet meadow and lacustrine.

General Creek Watershed serves as an important wildlife corridor and habitat linkage to other protected lands in the vicinity including lands in Tahoe and El Dorado National Forests and D. L. Bliss, Emerald Bay and Washoe Meadows State Parks.

Acres of Watershed: 5,609

Ownership

DPR ~2,500

USFS ~2,500

Other ~ 600

Name of stream:
General Creek

Watershed location: Headwaters to Lake Tahoe

15. Beaver Creek Complex (Map A-15)
Calaveras Big Trees SP (adjoins Stanislaus National Forest)

Beaver Creek Complex is located approximately 75 miles east of Stockton in the Sierra Nevada Ecological Region. This watershed is representative of the geomorphology of the Batholithic and Volcanic Flows sub-region with its gently sloping to moderately steep plateau with some steep hills. Elevations in the watershed range from approximately 3,400 feet to 5,600 feet.

Vegetation/habitat types characteristic of the Sierra Nevada ecological region found within the watershed include Sierran mixed conifer, montane hardwood-

conifer, montane chaparral, aspen, annual and perennial grassland, montane riparian and riverine.

Calaveras Big Trees State Park was in the initial group of outstanding areas in California recommended by Frederick Law Olmstead, Jr. in 1929 for creation of the California State Park System.

Beaver Creek Complex serves as an important wildlife corridor and habitat linkage to other protected lands in the vicinity including lands in Stanislaus National Forest and lands managed by the Bureau of Land Management.

Acres of Watershed: 20,299

Ownership

DPR ~5,000

USFS (Stanislaus National Forest) ~5,000

Other ~10,000

Names of streams:

Beaver Creek and its tributaries: Big Trees Creek, Grizzly Creek, Little Beaver Creek, and Crane Creek

Watershed location: Headwaters to the confluence with the North Fork Stanislaus River

Central California Coast Ecological Region (261 A)

This ecological region consists of mountains, hills, valleys, and plains in the southern Coast Ranges of California. It is close enough to the Pacific Ocean for the climate to be modified greatly by marine influence. Sub-parallel ranges and valleys follow folded, faulted and metamorphosed strata; with rounded crests of subequal height. The structural grain of the Central California Coast follows the dominant influences of the San Andreas fault and the tectonic interactions of the relative movements along the fault which marks the boundary between the North American and Pacific tectonic plates. The rocks of the Central California Coast include Cenozoic marine and nonmarine sedimentary rocks and alluvial deposits, deposited on top of Mesozoic granitic and ultramafic rocks.

Dominant natural plant communities include blue oak, purple needlegrass, Coast live oak, chamise, Valley oak, redwood, Douglas-fir-tanoak and California sagebrush.

The elevation ranges from sea level to 3,800 feet, and annual rainfall ranges from 12 to 60 inches. Due to the influences of the ocean, summer daytime temperatures are often modified by morning fog and sea breezes.

16. Mitchell Creek Complex (Map A-16) Mount Diablo SP

Mount Diablo State Park is located about four miles east of the city of Walnut Creek in central Contra Costa County. The park covers 20,103 acres. It is representative of the East Bay Hills–Mount Diablo ecological subregion. This is a subregion of northwest-trending hills with subequal summits, rounded ridges, steep sides, and narrow canyons. Mass wasting and fluvial erosion are the main geomorphic processes.

Landslides are abundant on the steep slopes of Mount Diablo, especially when rainfall is heavy. Ancient landslides are particularly vulnerable to additional slope failure. Relief for Mitchell and Donner Creek watersheds ranges from 3,849 to 400' at the confluence with State Park Creek in Clayton.

The peak of Mount Diablo acts as an island, with radial drainages forming outward in all directions from the summit. Most creeks and streams are intermittent, reflecting the seasonal distribution of rainfall.

Vegetation at the unit includes coastal scrub, chaparral, valley and foothill grasslands, riparian forests and woodlands, broadleaf evergreen forest, closed-cone conifer (knobcone pine) forest, and lower montane coniferous forest of Coulter pine. The state-listed rare plants Mt. Diablo bird's-beak and rock sanicle are found within the unit.

The following wildlife habitats in Mount Diablo have been identified (in descending order of acreage): annual grassland, montane hardwood, blue oak woodland, chamise-redshank chaparral, mixed chaparral, montane chaparral, pinyon-juniper, blue oak-foothill pine, barren, and juniper. Special animals known from the unit include California red-legged frog and Alameda whipsnake.

Mount Diablo State Park was in the initial group of outstanding areas in California recommended by Frederick Law Olmstead, Jr. in 1929 for creation of the California State Park System.

Analysis: Of the headwater tributaries to Mount Diablo Creek, only Mitchell Creek has perennial flow. The perennial reaches provide a high level of habitat function including rearing for juvenile fish, riparian woodlands that support California red-legged frog, the rare Diablo helianthella and Mt. Diablo fairy lantern, and riparian woodlands that cool water temperatures, particularly in the summer months. The intermittent tributaries provide narrow bands of aquatic and riparian habitat, and provide a valuable movement corridor between the lower and upper watersheds for wildlife.

Mitchell Creek is in a thick riparian forest on State Park land. This is the largest and widest of the tributaries in the park. The creek flows through formerly grazed lands and is adjacent to Mount Zion, an actively mined rock quarry. The channel has a step-pool bedform dominated by cobbles and boulders. This high-quality

coast live oak riparian woodland provides approximately 15 feet of riparian corridor along each bank. Dominant species include California buckeye, arroyo willow, and valley oak, all of which are native species. In 1993, Leidy identified steelhead in Mitchell Creek on State Park land, implying that the species had passage from Suisun Bay all the way up the watershed. According to Park staff, this population no longer exists. It is possible that in 1993 the fish assumed to be steelhead were actually rainbow trout.

As most of Mitchell Creek is on State Park land, it is not likely to face significant development threats or pressures. Although somewhat incised, this tributary reach is a potential reference reach for other high gradient tributaries.

Donner Creek is in a moderately closed riparian forest on State Park land that was formerly grazed. The bed morphology is step-pools in steeper, higher elevation reaches and riffle-pools in less steep, lower elevation reaches. Large woody debris, shading from streamside trees, and diverse bed material (boulders, cobbles, and gravels) provide complex aquatic habitat. Small gravel bars suggest that there may be aggradation in the reach, while undercut banks, exposed roots, and signs of bank failure are indications of erosional forces. This high quality coast live oak riparian woodland provides approximately 15 feet of riparian corridor along each bank. Dominant species include California buckeye, valley oak, and poison oak. All are native species. As most of Donner Creek is on State Park land, it is not likely to face significant development threats or pressures. Despite evidence of degradation, likely impacts to the riparian vegetation and channel form due to past grazing or vegetation changes, this tributary reach is a potential reference reach for other high gradient tributaries.

Acres of Watershed: 10,087

Ownership

DPR ~ 8,000

Other ~ 2,000

Names of streams:

Upper Mitchell Creek, and its tributaries to Mount Diablo Creek:: Deer Flat Creek, Uncle Sam Canyon, White Canyon, Donner Creek, Back Creek, and Wild Oat Canyon

Watershed location: Headwaters to Mount Diablo Creek. Mount Diablo Creek flows through the recently closed Concord Naval Weapons Station and into Suisun Bay. Mitchell Canyon and Donner Creek join to flow into Mount Diablo Creek. Deer Flat Creek and Uncle Sam Canyon drain to Mitchell Creek. Wild Oat Canyon and Back Creek are tributaries to Donner Creek.

17. Waddell Creek Watershed (Map A-17)

Big Basin Redwoods SP

Big Basin, established in 1902, is California's oldest State Park and is the primary park in this complex. Home to the largest continuous stand of Ancient Coast

Redwoods south of San Francisco, the park consists of 18,032 acres of old growth and recovering redwood forest, with mixed conifer, oak, chaparral, and riparian habitats.

Elevations in the watershed vary from sea level to over 2,000 feet. The climate ranges from foggy and damp near the ocean to sunny, warm ridge tops. This watershed is within the Santa Cruz Mountains ecological subregion of the Central California Coast ecological region.

Wildlife habitats in the watershed are annual grassland, barren, closed-cone pine, cypress, freshwater emergent wetland, mixed chaparral, montane hardwood-conifer, redwood, and valley foothill riparian.

Big Basin Redwoods State Park was in the initial group of outstanding areas in California recommended by Frederick Law Olmstead, Jr. in 1929 for creation of the California State Park System.

Trails link Big Basin to Castle Rock State Park and the eastern reaches of the Santa Cruz range. The Skyline to the Sea Trail threads its way through the park along Waddell Creek to the beach and adjacent Theodore J. Hoover Natural Preserve, a freshwater marsh. The unit is within one of the 146 Important Bird Areas of California recognized by Audubon California.

Analysis: West Fork Waddell and Henry creeks have the highest coho use in the watershed. Coho, pond turtle and San Francisco garter snake are found on the main stem of Waddell Creek. Tidewater goby were present until 1973, re-introduced in 1991, gone by 1997.

Acres of Watershed: 15,437

Ownership

DPR ~15,000

Other ~400

Names of streams:

Waddell Creek, East Waddell Creek

Watershed location: Headwaters to the Pacific Ocean

18. Wilder Creek Watershed (Map A-18)

Wilder Ranch SP (adjoins UC Santa Cruz)

The Santa Cruz Mountains form the spine of the mountainous region between Santa Cruz at the northern end of the Monterey Bay and San Francisco. The mountains range in elevation from 1,800' to 2,400' with a general concordance of summits around 2,200 feet. The resistant core of the mountains is Cretaceous-aged crystalline rocks of the Salinian tectonic block and it is overlain by Miocene-aged sediments such as the Santa Cruz Mudstone and the Santa Margarita Sandstone. Quaternary terrace deposits occur on the southern flanks of the

mountains, adjacent to the ocean. These planar features are incised by small streams and are extensively used for agriculture.

The mountains are forested and steep, with mass wasting and landslide activities commonplace. Live oak forests, coastal redwoods, ferns, and madrone occupy the slopes above the stream; and willow dominates the riparian corridor.

The Wilder Creek watershed is the eastern part of the Majors Creek Planning watershed, as identified by the Calwater 2.2 hydrologic classification system. The watershed adjoins UC Santa Cruz property to the east. It includes small lagoon habitat and a variety of riparian and upland habitats in a compact area. The Wilder Creek watershed is bisected by Highway 1, and has been the subject of extensive watershed restoration and rehabilitation activities.

Species of concern: Steelhead, Western pond turtle, red-legged frog, tidewater goby

Acres of Watershed: 2,516

Ownership

DPR ~1,800

Other ~500

UC Santa Cruz ~500

Names of streams:

Wilder Creek, Cave Gulch, Peasely Gulch

Watershed location: Headwaters in the Santa Cruz Mountains to the small lagoon at the creek's mouth and to Pacific Ocean.

19. Aptos Creek Watershed (Map A-19)

The Forest of Nisene Marks SP

The Aptos Creek watershed is located in the Santa Cruz Mountains approximately 8.5 miles south of the City of Santa Cruz, and encompasses about 25 square miles. Most of the watershed (main stem of Aptos Creek) is within The Forest of Nisene Marks State Park. The remaining portion of the watershed is primarily privately owned, and includes timber harvesting and rural residential development, with the exception of Aptos Village Park (owned by the County of Santa Cruz). Sedimentation from historic timber harvest activities (1883-1923), unpaved roads, stream crossings and downstream residential urban and suburban development is affecting fish habitat and water quality.

Aptos Creek watershed is dominated by the presence of the northwest-trending San Andreas Fault, a strike-slip fault that is characterized by differential right lateral movement between the North American and Pacific tectonic plates. The San Andreas Fault and associated Rosalia Ridge cuts across the northeastern boundary of the upper watershed. The San Andreas Fault is considered to be very active in the study region, producing large magnitude seismic events, the

most recent occurring October 17, 1989. The Loma Prieta earthquake (7.1 magnitude) caused severe structural damage throughout the Bay Area and resulted in ground cracking and shallow landsliding throughout the Santa Cruz Mountains. The epicenter occurred within the Aptos Creek Watershed in the Forest of Nisene Marks State Park. The Miocene Purisima Formation is the dominant rock type, in the watershed. It is a thick-bedded tuffaceous siltstone subject to landslides and mass wasting. In the uppermost reaches of the headwaters, older sandstone deposits parallel the trend of the San Andreas fault.

The Aptos Creek Watershed historically supported healthy runs of both steelhead trout and coho salmon. Due to habitat impacts, such as construction of passage barriers, excessive fine sediment loads, reduction in streamflow, degradation of water quality, modification to the coastal lagoon, and loss of channel complexity (such as loss of floodplains and removal of woody material), the population of steelhead have declined, and the coho salmon have been lost completely. Recent fisheries assessments of perennial streams within the watershed suggest that sufficient habitat exists to support both steelhead and coho. Both species have been listed under the Federal Endangered Species Act and targeted for restoration in Aptos Creek.

Within the Aptos Creek watershed, coast redwood is a common component of the riparian forest. Other common riparian trees within the watershed include tanoak, big leaf maple, red alder, box elder and black cottonwood.

Acres of Watershed: 7,288

DPR ownership/management: ~ 4,370 (60% of the watershed)

Other ~2,918

Names of streams:

Aptos Creek, Bridge Creek

Watershed location: Headwaters in the Santa Cruz Mountains to Aptos Lagoon, and into the offshore waters of the Monterey Bay National Marine Sanctuary

20. Malpaso-San Jose Creek Complex (Map A-20)

Garrapata SP

Point Lobos SR

Point Lobos Ranch SP

Carmel River SB

Hardly any portion of the California coast can match the visual beauty of the shoreline from Point Lobos to Malpaso Creek. There are greenbelts and gentle slopes, rock cliffs, heavily wooded sections, and mountains rising sharply with imposing ridgelines. The area's charm is its natural grandeur. Superior scenic vistas abound. Between San Jose Creek and Malpaso Creek is "intermediate terrain", rising rather abruptly from an elevation of approximately 400 feet to 1,000 feet. This heavily forested terrain is characterized by steep slopes of 40 to 80 percent. The very steep canyons of San Jose, Gibson, Wildcat, and Malpaso

creeks essentially preclude development, thereby protecting the area's watersheds and riparian habitat. The watershed supports one of the world's largest native Monterey Pine forests, examples of the rare Gowen cypress and areas of the rare maritime chaparral plant community. Monterey County's land use plan and objectives for this area are to preserve the Monterey pine and coast redwood forest resources, the water quality of the coastal streams, and the rural character of the area. The watershed is recognized as a valuable public resource.

There are over 500 species of plants occurring in diverse habitats within the watershed, from the lowest reaches of San Jose Creek to the mixed hardwood forest on the slopes of 3,000-foot Palo Corona Peak. The watershed's grassland ecosystem supports some of the highest numbers of individual grass and wildflower species found anywhere along California's central coast.

Beginning at near sea level and rising to over 3,400 feet in elevation, the watershed provides an incredibly diverse wildlife habitat. The watershed supports permanent habitat for coastal trout, steelhead and rare amphibians, including the California red-legged frog and tiger salamander. The federally endangered Smith's blue butterfly occurs in the acres of buckwheat, and fully protected raptors nest and forage throughout the forest and grasslands. Deer, mountain lion, bobcat, golden eagle and California condor range over the watershed, and several unusual birds such as mountain quail and horned larks are residents. Black bear, peregrine falcon, and spotted owl have been documented on adjoining lands, are likely to be found in the watershed.

Acres of Watershed: 14,422

Ownership

DPR ~3,100

Palo Corona Regional Park: ~4,350

Joshua Creek Ecological Preserve (DFG) ~5,500

Other ~1,300

Names of streams:

Malpaso Creek, Soberanes Creek, San Jose Creek and its tributaries

Watershed location: Headwaters to the Pacific Ocean

21. Big Sur River Watershed (Map A-21)

Pfeiffer Big Sur SP

Andrew Molera SP

The Big Sur River watershed includes rugged lands of the Ventana federal Wilderness and more gentle landscapes along the coastal state parks. The watershed is characterized by steep-sided, sharp-crested ridges separating V-shaped youthful valleys. Most streams fall rapidly through narrow, vertical-walled canyons flowing on bedrock or a thin veneer of boulders. Waterfalls, deep pools and thermal springs are found along major streams. Elevations range from sea level to nearly 5,000 feet.

Marked vegetation changes occur within the watershed. These changes are attributed to dramatic climate and topographic variations coupled with an extensive fire history. Much of the damage to vegetation is only temporary, since fire is an integral part of this watershed as it is of other areas of the forest. Much of the watershed is covered by chaparral. This brushy vegetative cover is typical of that found throughout Southern California's fire-susceptible mountains. The contrast of annual grass meadows and open pine stands may be found throughout the watershed. Deep narrow canyons cut by the fast flowing Big Sur River supports virgin stands of coastal redwood.

The Big Sur River enters its lower basin through the Big Sur Gorge at the eastern boundary of Pfeiffer-Big Sur State Park, and thereafter flows in a northerly direction through the Big Sur Valley parallel to State Highway One to the river's mouth in Andrew Molera State Park, a distance of approximately 7.6 miles. Major tributaries from the eastern (west-facing) slope include Pfeiffer-Redwood Creek, Juan Higuera Creek, and Pheneger Creek. The Post Creek drainage defines the southern limit of the basin which is bounded on the east by Pine Ridge. At the north end of the valley, the Big Sur River again turns west across an extensive floodplain as it nears its mouth, where it forms a lagoon. The lagoon formed by the river mouth changes in size and shape as the sandbar between the river and the ocean changes with the seasons.

The only development of water for agricultural purposes is near the mouth of the Big Sur River. The largest single water system serves Pfeiffer-Big Sur State Park. Four mutual water companies transport and supply water out of the Lower Big Sur River Basin to supply properties on the west slope of Pfeiffer Ridge. Most of the isolated homesites in the Big Sur Valley have their own wells and/or springs.

A well-developed riparian community occupies the banks and portions of the alluvial flats along the entire length of the lower Big Sur River. The white alders, sycamores, big leaf maples, and California bays give way to black cottonwoods and willow thickets near the river mouth. Characteristic understory vegetation lines the river banks beneath the forest. A small patch of freshwater marsh occurs in the lagoon area near the river mouth.

There have been numerous fires in the watershed since the USFS began keeping fire history records for the area in 1911. The 1977 Marble Cone Fire burned 28,000 acres of the 30,000 acres in the Upper Big Sur River Basin. Although this fire did not enter the Lower Basin, the loss of virtually all of the vegetation in the watershed in a single event raised great concern over potential impacts of predicted flooding and sedimentation in the Lower Basin. In 1924, a large fire in the watershed burned most of the same area which was later burned by the 1972 Molera Fire. This fire also burned much of Pfeiffer-Big Sur State Park and the east-facing slope of Pfeiffer Ridge. An unmapped 1907 forest fire also burned the vegetation in the Pheneger, Juan Higuera, and Pfeiffer-Redwood Creek drainage basins.

The potential for fires with disastrous consequences in the Big Sur Valley has been increased through the systematic exclusion of fire. Many of the steep chaparral and wooded slopes have not burned for almost sixty years. Tree ring analysis has revealed an average fire frequency of 29 years prior to the effective suppression of most fires beginning around 1911. Mature chaparral stands actually create a set of conditions more conducive to fire.

Acres of Watershed: 37,393

Ownership

USFS ~ 32,600

DPR ~ 4,800

Other ~ 1,200

Names of streams:

Big Sur River and its tributaries: North Fork Big Sur River, South Fork Big Sur River, Pheneger Creek, Juan Higuera Creek, Doolans Hole Creek, Ventana Creek, Post Creek, Pfeiffer Redwood Creek, Mocho Creek, Redwood Creek, Cienega Creek, Terrace Creek, Logwood Creek

Watershed location: Headwaters to the Pacific Ocean.

22. Islay Creek Complex (Map A-22)

Montaña de Oro SP

Montaña de Oro's Islay and Coon Creek watersheds drain wild uplands of the Santa Lucia Range of the southern Coast Ranges geomorphic province. The rugged hills and low mountains are underlain by folded and faulted marine sedimentary rocks of the Pliocene and Miocene-aged Pismo Formation, older rocks of the Monterey Formation to the south and older still rocks of the Franciscan complex above the northeastern branches of Islay Creek. The rocks are brown claystone and siltstone, with beds of porcelaneous shale and diatomite, with sandstone and conglomerate beds near the base of the formation. These beds unconformably overlay older rocks of the Monterey Formation—a resistant hard siliceous shale with interbedded chert. Remnants of marine terraces are present on narrow benches along the coast. Sand dunes are common along the coast, both adjacent to the beach and on marine terraces.

Elevation ranges from 1700' at highest peaks inland (above Coon Creek) to sea level.

Bishop pine forest occurs in the watershed near this species' southern range limits. Steelhead trout can be found in Coon and Islay Creeks, as well as red-legged frog (likely, but not confirmed as of this writing), coast horned lizard and two-striped garter snake.

Islay Creek is in relatively pristine condition; together with Coon Creek the area has been considered for State Wilderness classification. The dense riparian

corridor, high stream oxygen levels, low temperatures, and good substrate condition make the creek suitable steelhead habitat.

To the south, Islay Creek's steep sided and much larger watershed of 5,980 acres encompasses 2,785 acres within the Park and the remainder includes remote private lands to the east. The 3.4-mile creek ranges in elevation from sea level to 1,200 foot. The creek has year-round water below 600 feet, whereas the upper reaches and the tributaries are intermittent. A scenic waterfall and sulfur spring occur on the south fork. Much of the watershed has no public access. At 6,460 acres, the Coon Creek watershed is the largest in the western part of the Irish Hills. Diablo Canyon lands encompass 4,520 acres of this watershed and the remaining 1,940 acres lie within Montaña de Oro State Park. This creek is 2.7 miles long and ranges in elevation from sea level to 1,280 feet. Below 1,000 feet, water is present in the stream year-round. Coon Creek provides a cool environment for southern steelhead, California red-legged frogs, western pond turtles, two-striped garter snakes, and a melanistic aquatic garter snake that is thought to be found only in coastal streams of San Luis Obispo County. The north-facing slopes are covered in Bishop pine forest with an understory of manzanita and huckleberry.

Acres of Watershed: ~11,475

Ownership

DPR ~4,725

Pacific Gas & Electric Company: ~4,520

Other (private): ~2,230

Names of streams:

Islay Creek, Coon Creek

Watershed Location: Headwaters to the Pacific Ocean

Central California Coast Ranges Ecological Region (M 262 A)

This ecological area occupies the interior part of the southern Coast Ranges of California, south of the Carquinez Strait. It is inland from the coast far enough that the climate is modified only slightly by marine influence. It is bounded on the northeast by the alluvial plain of the San Joaquin Valley and on the southwest by the coastal part of the southern Coast Ranges. It extends south all the way to the Transverse Ranges. The geology is characterized by parallel ranges, folded, faulted and metamorphosed strata and rounded crests of subequal height.

Dominant natural plant communities include the coast live oak series, blue oak series, purple needlegrass series, chamise series, valley oak series and mixed chaparral shrublands. Less-extensive series include: creeping ryegrass series, foothill needlegrass series, Mexican elderberry series, nodding needlegrass series, one-sided bluegrass series, and purple needlegrass series. The following series are restricted to riparian settings: arroyo willow series, buttonbush series,

California sycamore series, Fremont cottonwood series, mixed willow series, mulefat series, narrowleaf willow series, red willow series and white alder series.

The elevation ranges from 100 to 5,200 feet. Annual precipitation ranges from 6 to 40 inches. Wide fluctuations in precipitation and temperature for periods of years result in significant or catastrophic changes in biological communities.

This ecological region represents 6% of the state; 22% of the region is in public ownership. Fires play a significant role in the vegetation cover; they can be low, moderate or high intensity ground or stand-replacing fires. The region is seismically active, with strong shaking and ground rupture. The composition and successional sequence of some plant communities has changed due to exotic plant and animal species introduced between the mid 1800's and early 1900's related to grazing and agriculture.

23. Coyote Creek Watershed (Map A-23) Henry W. Coe SP

Henry W. Coe State Park is located approximately 13 miles west of Morgan Hill. This 89,042-acre park is representative of the geomorphology of the Diablo Range and Western Diablo Range sub-region with its rounded ridges, steep and moderately steep sides, and narrow canyons. Elevations in the watershed range from approximately 1,000 feet to 3,200 feet.

Vegetation/habitat types characteristic of the Central California Coast Ranges Ecological Region found within the park include chamise-redshank chaparral, sycamore alluvial woodland, annual and perennial grassland, blue oak-foothill pine, blue oak woodland, mixed chaparral, riverine, lacustrine, coastal oak woodland and ponderosa pine.

Coyote Creek watershed serves as an important wildlife corridor and habitat linkage to other protected lands in the vicinity including Department of Fish and Game and Nature Conservancy lands managed for wildlife protection.

Red-legged and yellow-legged frogs and western pond turtles are present in at least Middle Fork, Coyote Creek. Rainbow trout, Sacramento squawfish, suckers, and riffle sculpin make up the native fish species known from the watershed. Although the smaller tributaries dry up during the rainless months (November-April), perennial pools persist in the mainstem of the creek, and provide precious refuge for aquatic and water-dependent species.

Acres of Watershed: 40,855

Acres of Watershed in DPR ownership/management:

Ownership

DPR ~38,000

Other ~2,100

Department of Fish and Game ~400

The Nature Conservancy ~250

BLM ~150

Names of streams:

Coyote Creek and its tributaries: East Fork Coyote Creek, Middle Fork Coyote Creek, Hunting Hollow Creek, Kelly Cabin Canyon, Soda Springs Canyon, Little Fork Coyote Creek

Watershed location: Headwaters in the Diablo Range of the Coast Ranges to Coyote Creek mainstem, and to Coyote Lake and Anderson Lake. The creek flows along the east side of the Santa Clara Valley, and eventually into the southernmost tip of the San Francisco Bay.

24. Orestimba Creek Watershed (Map A-24)
Henry W. Coe State Park

The Orestimba Creek watershed drains the eastern limb of the Diablo Range through rugged foothills and rocky slopes to the San Joaquin Valley floor. The remote upper watershed area includes a State Wilderness, which supports a rich assemblage of native plant and animal species in an exquisite landscape. Elevations in the watershed range from over 2000 feet for the headwaters peaks to 50 feet on the valley floor. Although the area lacks abundant rainfall, the extensive drainage network is fed by natural springs. Most streams dry up during the long rainless period between May and November; however, perennial pools persist in the mainstem of Orestimba Creek, providing much-needed refuge for native aquatic species.

Western pond turtle, foothill yellow-legged frog, Pacific tree frog, Western toad, and spadefoot toad occur in the watershed. Native fish include California roach and Sacramento sucker. Wildlife include mountain lion, coyote, deer, gray fox, brush rabbits, bobcat, striped skunk, and black-tailed hare. Bald eagles, golden eagles, Swainson's hawks, Cooper's hawks, red-tailed hawks, peregrine falcon, owls, scrub jays, wrentits, kestrel, California quail, and several species of woodpeckers have been recorded in the watershed.

Plant communities include oak woodland, chaparral, riparian hardwood forest, emergent riparian, and grasslands. Native bunch grasses (deer grass) occur in the watershed. Riparian trees include Fremont cottonwood, Western sycamore, narrow-leaved, red, and black willow. Gray pines and blue oaks occur in the upper elevations of the watershed.

Acres of Watershed: 85,734

Acres of Watershed in DPR ownership/management:

Ownership

DPR ~25,000

The Nature Conservancy ~20,000

Other ~4,000

BLM ~ 640

Names of streams:

Orestimba Creek and its tributaries: Hartman Creek, Lion Canyon, Red Creek, Robinson Creek, South Fork Orestimba Creek

Watershed location: Headwaters tributaries in the Diablo Range to Orestimba mainstem, and eventually out onto the Central Valley floor and to the San Joaquin River lowlands.

Southern California Coast Ecological Region (261 B)

This region contains mountains, hills, valleys, and plains of the Transverse Ranges close enough to the Pacific Ocean for the climate to be modified greatly by marine influence.

The ranges are narrow with broad fault blocks; alluviated lowlands and coastal terraces. Predominant natural vegetation communities include the California sagebrush-California buckwheat series, mixed chaparral shrublands, coast live oak series, chamise series, valley oak series and mixed sage series. Less-extensive series include: alkali sacaton series, creeping ryegrass series, foothill needlegrass series, Mexican elderberry series, nodding needlegrass series, one-sided bluegrass series, purple needlegrass series, saltgrass series, and seep weed series.

Series restricted to riparian settings include arroyo willow, black willow, California sycamore, Fremont cottonwood, mixed willow, mulefat, narrowleaf willow, Pacific willow, red willow and white alder.

Mammals include mule deer, bobcat, fox, raccoon and opossum. Turkey vultures, quail, egrets, flycatchers, swallows and ravens are common birds. Birds of concern include the brown pelican, lesser tern, osprey, black rail, clapper rail, California gnatcatcher and savannah sparrow. Reptiles and amphibians include the western rattlesnake, common garter snake, alligator lizards and several species of salamanders and frogs. Marine and shore species include sea lions, seals, brown pelicans, gulls, cormorants, terns and various shore birds.

Elevation ranges from sea level to 3,000 feet, and annual average rainfall totals from 10-30 inches. Summer daytime temperatures are often modified by morning fog and sea breezes. This region represents 3% of the state's land, and about 17% of the region is in public ownership. Fire plays a significant role in the vegetation cover; historic occurrence has changed from fires of variable frequency, season and intensity to more frequent, larger and more intense fires. The region is seismically active with strong shaking and ground rupture.

The composition and successional sequence of some communities (especially grassland communities) has changed because of plant and animal species introduced between the late 1700's and early 1900's related to grazing, agriculture, and urbanization. Most of the area is densely urbanized.

25. Gaviota Creek Watershed (Cañada de la Gaviota) (Map A-25)

Gaviota SP

Gaviota Creek watershed is the largest (12,903 acres) of many north to south flowing streams in southern Santa Barbara County. It is bisected from north to south by U. S. Highway 101 and east to west by State Highway 1. Gaviota State Park entrance is located at the lower end of the watershed, approximately 11 miles south of Buellton and 28 miles west of Goleta. The principal tributaries to Gaviota Creek include Las Canovas, Hot Springs, and Las Cruces creeks. Except for the uppermost headwaters, all of the tributaries and the main stem have perennial flows that are sustained by numerous springs.

The watershed is generally very steep and geologically unstable because of faults, landslides, and the nature of the underlying geological material. In June 2004, a wildfire burned through the southern reach of the watershed consuming most of the vegetation.

The highest point in the watershed is Beacon Peak (2,856 feet). The peak is the easternmost point in the watershed, about three miles inland of the ocean. Gaviota Creek watershed is in a unique coastal environment because of its proximity to Point Concepcion. Point Concepcion is the confluence of south to north and north to south ocean currents that affect not only the marine ecosystem, but also the terrestrial environment. There are frequent high velocity winds due to the topography which acts as a funnel into Gaviota Pass. The region is among the highest rainfall areas in the southern coastal region of California; however, storm runoff peaks and recedes very rapidly because of the steep topography, steep stream gradients, and impervious rock outcroppings. Because of these conditions it can best be described as a “flashy” watershed, with rapid increases and decreases in flow, during and immediately following storm events.

Gaviota Creek watershed is one of the few coastal environments in southern California that has remained unchanged for the last century except for enlargement and relocation of transportation corridors. The watershed is relatively healthy; nonetheless, there are concerns about the apparent reduction from historic levels in spawning steelhead. Although there is little hard evidence of these reductions, long-time landowners agree that steelhead were much more numerous before creek modifications were made related to highway construction, and physical evidence in the form of instream barriers and streambank alterations support their claims.

About 29 percent of the watershed is public domain, and current zoning prohibits large scale urbanization of private holdings. There are no water diversions except for relatively modest amounts used to support public facilities. In general, long-term sediment yield due to excessive soil erosion is not a problem except for patrol roads within the park and effects from the recent wildfire. Flooding and subsequent sediment deposition in the lowest reaches of the watershed is a

problem where a low elevation road and bridge serving private inholdings and park public facilities cross the creek .

Approximately 71 percent of the Gaviota Creek watershed is private property; the majority of which is used to graze beef cattle or for infrastructure to support that industry. A few fields are dry-farmed in the Las Cruces sub-watershed. All of the public land, except for Vista del Mar School and the transportation corridors, is dedicated to natural resource preservation and low impact recreation. All roads in Gaviota State Park except the campground access are closed to private motorized vehicles; however, foot, mountain bike, and horseback traffic is permitted.

The Gaviota watershed supports the following federally listed endangered plant and animal species: Tidewater goby, Southern California steelhead, Red-legged frog, and Gaviota tarplant.

In addition to the federal listings, the California Department of Fish and Game has identified the San Diego woodrat, Southwestern pond turtle, Arroyo chub, California tree frog, and the two-striped garter snake as species of concern. The California Native Plant Society lists Davidson's saltscale, black-flowered figwort, and the Sonoran maiden fern as sensitive species.

Other listed species that may use the watershed include bald eagles, Swainson's hawks, California condors, and Southwestern willow flycatchers. In the near-shore area, likely use would be by California brown pelicans, Southern sea otters, and California least terns. A grove of eucalyptus trees located in the developed park area is a seasonal congregation site for monarch butterflies.

Oak trees (primarily coast live oaks) are an important vegetation resource in the Gaviota Creek watershed. They provide food and shelter for a great variety of wildlife as well as esthetic value. Oak trees are relatively abundant in scattered stands throughout the watershed, and are dominant on approximately 20% (2,608 acres) of the watershed.

Acres of Watershed: 12,921

Ownership (acres)

Private: 9,161

DPR: 1,893

USFS: 1,565

Caltrans: 284

Vista del Mar School: 18

Names of streams:

Gaviota Creek and its tributaries: Las Canovas, Hot Springs Creek, Las Cruces Creek

Watershed location: Headwaters in the Transverse Ranges through Gaviota State Park to the Pacific Ocean.

26. Big Sycamore Canyon Complex (includes La Jolla Valley) (Map A-26)
Point Mugu SP

The Big Sycamore Canyon Watershed Complex is located on the coast on the western edge of the Santa Monica Mountains 15 miles south of Oxnard. This 13,946-acre watershed complex is representative of the Santa Monica Mountains ecological subregion's geomorphology with its steep mountains with narrow to broad summits, narrow canyons and five miles of beach frontage.

Vegetation/habitat types characteristic of the Southern California Coast Ecological Region found within the watershed include coastal sage scrub, mixed chaparral, chamise-redshank chaparral, valley foothill riparian and annual and perennial grassland.

Point Mugu State Park was in the initial group of outstanding areas in California recommended by Frederick Law Olmstead, Jr. in 1929 for creation of the California State Park System.

Sycamore Canyon Watershed Complex serves as an important wildlife corridor and habitat linkage to other protected lands in the vicinity including Leo Carrillo State Park and Santa Monica Mountains National Recreation Area. The watershed is within one of the 146 Important Bird Areas of California recognized by Audubon California.

Acres of Watershed: 16,411

Ownership

DPR ~14,000

Other ~2,000

NPS ~250

Names of streams:

Big Sycamore Canyon and its tributaries

La Jolla Canyon (adjacent to Big Sycamore Canyon, shares a watershed divide ridge.)

Watershed location: Headwaters in the Santa Monica Mountains to the Pacific Ocean

27. Upper Santa Ynez Canyon Complex (Map A-27)
Topanga Canyon SP

Upper Santa Ynez Canyon, east of Topanga Canyon and west of Santa Monica, drains the southeastern flank of the Santa Monica Mountains. The area of watershed interest includes all the upper branches of Santa Ynez Canyon downstream to the water storage reservoir in the Palisades Highlands residential development, and then east to Rustic and Sullivan Canyons. This area represents one of the last remaining relatively undisturbed Mediterranean-type

ecosystems in the world. A unique climate, diverse topography, and other factors create a complex assemblage of vegetation types including oak woodland, several types of chaparral, coastal sage scrub, valley oak savanna, grassland, riparian woodland, wetland, and coastal marsh. This vegetation diversity provides abundant habitat for animal species. Wildfire plays a significant role in the ecosystem, and the vegetation reflects the mosaic patterns associated with past wildfire.

Acres of Watershed: 7,391

Acres of Watershed in DPR ownership/management:

Ownership

NPS ~2,400

DPR ~4,000

Other ~1,000

Names of streams:

Upper Santa Ynez Canyon, Trailer Canyon, Quarry Canyon, Rustic Canyon, Sullivan Canyon, and Temescal Canyon

Watershed location: Headwaters in the Santa Monica Mountains to mainstem creek that eventually flows to the Santa Monica Bay of the Pacific Ocean.

28. Moro Canyon Watershed (Map A-28)

Crystal Cove State Park

Moro Canyon watershed is located in Crystal Cove State Park on the coast between Newport Beach and Laguna Beach. The watershed is most typical of the geomorphology of the Coastal Hills and Coastal Terraces ecological subregion with its relatively narrow beach, steep hills, upland coastal bluffs and terraces and elevations ranging from sea level to approximately 1,000 feet.

Vegetation/habitat types characteristic of the Southern California Coast Ecological Region found within the watershed include coastal sage scrub, coastal oak woodland, annual and perennial grassland, and willow riparian.

Crystal Cove State Park was in the initial group of outstanding areas in California recommended by Frederick Law Olmstead, Jr. in 1929 for creation of the California State Park System.

Moro Canyon watershed is in a core area within the reserve system identified in the Orange County Natural Community Conservation Plan and Habitat Conservation Plan (NCCP/HCP). The Moro Beach marine and shore habitat is classified as the Irvine Coast Marine Life Refuge by the Department of Fish and Game and as an Area of Special Biological Significance by the State Water Resource Control Board. Other protected lands linked to Crystal Cove State Park include Laguna Coast Wilderness Park, Irvine Company Open Space Reserve and Aliso and Wood Canyons Wilderness Park. Together all of these lands provide a relatively large protected area of wildlife habitat and corridor

linkages. The watershed is within one of the 146 Important Bird Areas of California recognized by Audubon California.

Although the lower reaches of the watershed have been impacted by development (trailer park and support infrastructure that are being removed) and plans are underway to convert some of the previously developed area into public use for camping and parking, opportunities exist for watershed restoration and improvement. The stream has been impacted with erosion control structures emplaced by NRCS and Orange County and has been confined and armored where it flows beneath Highway 1. These impacts and physical modifications could be undone, with sufficient commitment and funding.

Biological resources: Salamanders, Pacific tree frogs, California toad, Western spadefoot toad and riparian habitat for least Bell's vireo
Habitat for gnatcatchers

Acres of Watershed: 2,154

Ownership

DPR ~2,154

Caltrans (highway plus 8' either side)

Name of stream: Moro Creek

Watershed location: Headwaters to the Pacific Ocean

Southern California Mountains and Valleys Ecological Region (M 262 B)

This ecological region includes mountains, hills and valleys of the Transverse Ranges and the Peninsular Ranges that are near the Pacific Ocean, but not bordering it. Much of the ecological region is close enough to the Pacific Ocean for the climate to be modified moderately by marine influence.

The land surface is characterized by narrow ranges and broad fault blocks; alluviated lowlands, and dissected westward-lying granitic uplands. The predominant natural plant communities include mixed chaparral shrublands, chamise series, canyon live oak series, coast live oak series, ponderosa pine series, Jeffrey pine series, white fir series and lodgepole pine series. Series restricted to riparian settings include arroyo willow, California sycamore, Fremont cottonwood, mixed willow, mulefat, narrowleaf willow, red willow and white alder.

Characteristic mammals include mule deer, pronghorn, bighorn sheep, bobcat, mountain lion and kangaroo rat. Birds include quail, mourning dove, mockingbird, gulls, herons, crows, finches and sparrows. Species of concern include cactus wren, California gnatcatcher, least Bell's vireo, foothill and mountain yellow-legged frog, orange-throated whiptail and California mountain king snake.

The elevation ranges from 300 to 11,500 feet, and annual average rainfall ranges from 6 to 40 inches. The region represents about 7% of the state, with about

57% of the land in public ownership. Stand-replacing fires of variable frequency, season and intensity are commonplace occurrences.

The region is seismically active area with strong shaking and ground rupture potential. In the steep mountainous areas of the region, due to the steep slopes and the geologic composition of the substrate, coarse soil particles commonly move downslope by gravity (dry ravel).

The composition and successional sequence of some plant communities has changed due to the introduction of exotic plant and animal species between the mid 1800's and early 1900's related to urbanization, grazing, agriculture and recreational activities. Valley portions are densely populated.

29. Aliso Canyon Watershed (Map A-29) Chino Hills SP

Aliso Canyon watershed is within Chino Hills State Park in the Puente/Chino Hills 5 miles northwest of Corona in southern California. The park is the anchor point for the Puente/Chino Hills Wildlife Corridor which extends 31 miles across three ecological subregions; the Los Angeles Plain, the Santa Ana Mountains and the Coastal Hills. The watershed is most typical of the geomorphology of the Santa Ana Mountains and Coastal Hills subregion with its moderately steep to steep hills with narrow to rounded summits and narrow canyons. Elevations in the watershed range from approximately 500 feet to 1,700 feet.

Vegetation/habitat types characteristic of the Southern California Mountains and Valleys Ecological Region found within the watershed include coastal sage scrub, coast live oak woodland, sycamore-willow riparian woodland, annual and perennial grassland, riverine and mixed chaparral.

Aliso Canyon watershed is a part of the Reserve system identified in the Orange County Natural Community Conservation Plan and Habitat Conservation Plan (NCCP/HCP). The purpose of the NCCP/HCP is to provide long-term regional protection and perpetuation of natural vegetation and wildlife diversity. The park is also a member of the Wildlife Corridor Conservation Authority, which provides for the proper planning, conservation, environmental protection and maintenance of the habitat and wildlife corridor between the Puente/Chino Hills and the Santa Ana Mountains and Cleveland National Forest to the south. The unit is within two of the 146 Important Bird Areas of California recognized by Audubon California.

Aliso Creek supports one of the few remaining populations of the arroyo chub in the Santa Ana River, below Prado dam. The Santa Ana sucker and the speckled dace may also use the creek. Aliso Creek provides most of the remaining habitat for native fish in the mostly channelized Santa Ana River. Southwestern pond turtles are found along Aliso Creek.

Acres of Watershed: 5,671

Ownership

DPR ~5,270

Other ~400

Names of streams:

Aliso Canyon and its tributaries: Bane Canyon and Water Canyon

Watershed location: Headwaters in the Puente (Chino) Hills to the flats of the Santa Ana River.

30. North Fork San Jacinto River Watershed (Map A-30)

Mount San Jacinto SP

Dark Canyon, the headwaters for the North Fork San Jacinto River, originates on the western slopes of San Jacinto Peak in the heart of the San Jacinto State Wilderness, in San Jacinto State Park. The State wilderness is contiguous with the federal wilderness of the same name. This nearly 14,000-acre park and wilderness with granitic peaks, sub-alpine forests, and mountain meadows is a rare island of primitive high country south of the Sierra Nevada range. Mount San Jacinto peak, rises almost 11,000 feet above sea level, towering over the lowlands of Palm Springs and the Coachella Valley immediately to the east. It is the highest peak in the San Jacinto Range and the second highest point in southern California.

Similar to the Sierra Nevada, the San Jacinto Mountains rest on a major fault block with a distinct westward tilt. The entire San Jacinto region—bounded on the west by the San Jacinto fault and on the north and east by the San Andreas fault—is seismically active and slowly rising.

The North San Jacinto watershed consists of Fuller Mill Creek and Black Mountain Creek northern portion of the watershed; and Dark Canyon, Stone Creek and Logan Creek in the central portion. The creeks eventually join to form the North Fork of the San Jacinto River which joins with the South Fork San Jacinto River and becomes the San Jacinto River. The San Jacinto River flows to a series of water supply reservoirs (Hemet, Canyon Lake, and eventually to Lake Elsinore). The final lake has very little outflow, but in rare cases it has overflowed into Temescal Creek, a tributary to the Santa Ana River.

The North Fork watershed is home to the southern-most population of mountain yellow legged frog, and old growth forest habitat supports nesting pairs of California spotted owl, the southern-most population of the rubber boa, and the San Bernardino flying squirrel. The streams may support native rainbow trout and brown trout.

The wet meadow areas along some of these streams are potential habitat for the federally listed San Bernardino bluegrass and California dandelion. Species presently known to occur within the watershed based on GIS data include: lemon

lily, Southern skullcap, San Jacinto bedstraw, California bedstraw, Plummer's mariposa lily and Munz's mariposa lily.

Acres of watershed: 16,752

Ownership

USFS ~11,500

DPR: ~4,211

Other ~1,000

Names of streams:

North Fork San Jacinto River and its tributaries: Fuller Mill Creek, Black Mountain Creek, Dark Canyon, Stone Creek, Logan Creek

Location in watershed: Headwaters to confluence with South Fork San Jacinto River

31. Upper Sweetwater River Watershed Complex (Map A-31)

Cuyamaca Rancho SP

Upper Sweetwater River Watershed Complex is within Cuyamaca Rancho State Park approximately 40 miles east of San Diego in the Peninsular Ranges. This 24,614-acre park is representative of the Palomar-Cuyamaca Peak ecological subregion's geomorphology with its steep mountains with rounded summits, broad valleys and rolling plateaus. Elevations in the watershed range from approximately 2,000 feet to the 6,500 foot summit of Cuyamaca Peak.

Vegetation/habitat types characteristic of the Southern California Mountains and Valleys Ecological Region found within the watershed include mixed chaparral, montane hardwood-conifer, Sierran mixed conifer, wet meadow, annual and perennial grassland, montane riparian and chamise-redshank chaparral.

Upper Sweetwater River watershed serves as a keystone preserve in the San Diego County East County Multi-Species Conservation Plan. The watershed links Anza-Borrego Desert State Park with Cleveland National Forest and Bureau of Land Management lands to the south and west. The watershed is within one of the 146 Important Bird Areas of California recognized by Audubon California.

Acres of Watershed: 22,700

Ownership

DPR ~18,000

USFS ~700

Other ~4,000

Names of streams:

Sweetwater River, Descanso Creek

Watershed location: Headwaters in the Peninsular Ranges crest to the mainstem of Sweetwater River which eventually flows to San Diego Bay.

Mojave Desert (high desert plains and hills) Ecological Region (322Ag)

This ecological region is the hot part of the Basin and Ranges from the southern end of the Sierra Nevada and the north-northeastern side of the Transverse Ranges eastward to Nevada and Arizona. The region is characterized by widely separated short ranges in desert plains, isolated mountains, plateaus, extensive alluvial fans, playas, basins and dunes. Predominant natural plant communities include the creosote bush, creosote bush-white bursage, allscale, mixed saltbush, iodine bush, Joshua tree, shadscale, black bush, mesquite, California juniper, single leaf pinyon-Utah juniper and white fir (high peaks).

Plant series restricted to riparian settings include: arrow weed, black willow, Fremont cottonwood, mixed willow, mulefat, narrowleaf willow and red willow.

Mammals include desert bighorn sheep, desert kit fox, spotted skunk, spotted bat, black-tailed jackrabbit, ground squirrel, kangaroo rat and white-footed mouse. Birds include quail, roadrunners, finches, warblers and orioles. Reptiles include desert tortoise, several species of rattlesnakes and chuckwalla lizard.

Elevations in the region range from 280 feet below sea level to 7,900 feet. The climate is extremely dry, with annual average rainfall totals of 3 to 8 inches, occurring mostly as scattered high intensity storms of short duration. Flash floods are commonly associated with the irregular occurrence of precipitation events.

This region occupies 16% of state's land surface; 80% is in public ownership. Fire occurrence in areas receiving more than about 8 inches has been influenced by introduced grasses. Fires are variable in frequency and intensity, due to the relative lack of vegetation to carry sustained fires.

The composition and successional sequence of some communities has changed due to introduction of exotic plant and animal species between the late 1800's and early 1900's related to mining and grazing. Since the early 1900's, significant effects on some plant and animal species have occurred at widely scattered locations associated with military testing, recreational activities and rapidly expanding urbanization.

32. Upper Red Rock Canyon Watershed (Map A-32)

Red Rock Canyon SP

Upper Red Rock Canyon watershed is located approximately 50 miles north of Lancaster on the northwestern edge of the Mojave Desert. It drains the western end of the El Paso Mountains and the desert lands to the northwest. No perennial surface water occupies the stream channels and canyons; however, flash flooding is an important, landscape-altering occurrence following dramatic rainstorms in the higher elevations. Some springs maintain perennial flow, as at the confluence of Tarweed and Red Rock Canyons. This watershed is representative of the geomorphology of both the High Desert Plains and Hills and the Searles Valley-Owlshead Mountains sub-regions with its gently to moderately

sloping pediments, steep to very steep mountains, canyons, sheer cliffs and undulating ridges, alluvial fans and nearly level basin floor. Elevations in the watershed range from approximately 2,000 feet to 4,000 feet.

Vegetation/habitat types characteristic of the Mojave Desert Ecological Region found within the park include desert scrub, desert wash, Joshua tree and desert riparian.

Red Rock Canyon State Park was in the initial group of outstanding areas in California recommended by Frederick Law Olmstead, Jr. in 1929 for creation of the California State Park System. The California Desert Protection Act of 1994 transferred 20,500 acres of federal properties to the State of California as an addition to Red Rock Canyon State Park. The watershed represents a significant core habitat area in the Mojave Desert and serves as an important wildlife corridor and habitat linkage to other protected lands in the vicinity including lands managed by the Bureau of Land Management.

Acres of Watershed: 5,971

Ownership

BLM ~3,200

DPR ~2,970

Watershed location: Headwaters in El Paso Mountains to the desert floor.

Colorado Desert Ecological Region (322C)

The Borrego Valley area subregion of the Colorado Desert is on the southwest side of the Imperial Valley, between it and the Peninsular Ranges. The subregion has an extremely hot, arid climate. Quaternary alluvial, lacustrine, and aeolian deposits predominate in this subregion. Mountains made up of Mesozoic granitic rock protrude through the alluvium on West Mesa.

This subregion consists of very gently to moderately sloping alluvial fans, terraces, and nearly level basin floors and dry lake beds. Clark and Borrego Valleys are aligned toward the northwest, along the San Jacinto and Coyote Creek Faults. Fluvial erosion and deposition and aeolian deflation and deposition are the main geomorphic processes.

33. Coyote Canyon Watershed (Map A-33)

Anza Borrego Desert State Park

Anza Borrego Desert State Park stretches across two ecological sub-regions: (this refers to ecological sub-sections of the USFS classification system) Borrego Valley–West Mesa and Desert Slopes. The park is representative of the geomorphology of both sub-regions with its moderately steep to steep mountains with narrow to rounded summits, narrow canyons, gently to moderately sloping alluvial fans, terraces and nearly level basin floors. Elevations in the park range from approximately sea-level to over 6,100 feet.

Anza-Borrego Desert State Park (ABDSP) in southern California encompasses 640,000 acres, which comprises roughly half the acreage of the entire State Park System and 87% of the State Wilderness System. ABDSP is designated as an International Biosphere Reserve and a National Natural Landmark.

Coyote Creek runs northwest to southeast, bisecting Coyote Canyon with the Santa Rosa Mountains to the north and the San Ysidro Mountains to the south. The Coyote Canyon watershed, located in the northwestern portion of the park, comprises approximately one-sixth of the park or about 80,000 acres.

Vegetation/habitat types characteristic of the Colorado Desert Ecoregion include desert scrub, juniper, mixed chaparral, chamise-redshank chaparral, desert succulent shrub, pinyon-juniper, alkali desert scrub, montane chaparral and palm oasis.

Anza-Borrego Desert State Park was in the initial group of outstanding areas in California recommended by Frederick Law Olmstead, Jr. in 1929 for creation of the California State Park System.

The park has been designated by the U.S. Fish and Wildlife Service as critical habitat for the peninsular bighorn sheep, least Bell's vireo and Quino checkerspot butterfly. The park represents a significant core habitat area in the Colorado Desert and serves as an important wildlife corridor and habitat linkage to other protected lands in the vicinity including Cuyamaca Rancho State Park, Cleveland National Forest and lands managed by the Bureau of Land Management. The unit includes two of the 146 Important Bird Areas of California recognized by Audubon California.

Outstanding features: Anza-Borrego Desert State Park is the largest state park in the United States and, with approximately two-thirds of the park designated as wilderness, contains the largest area of State Wilderness in California. The park's deep canyons with perennial water support native California fan palms while the canyon mouths often give way to large alluvial fans. Over 550 types of fossil plants and animals have been reported in the park, ranging from preserved microscopic plant pollen and algal spores to baleen whale bones and mammoth elephant skeletons. It is estimated that 75% of the total U.S. population of Peninsular bighorn sheep reside in the park.

Coyote Creek, the longest perennial stream in San Diego County, is the largest watershed within ABDSP, encompassing approximately 154 square miles. It serves as the principal source of groundwater recharge for the Borrego Valley aquifer. The creek contains three reaches where bedrock forces groundwater to the surface throughout the year, resulting in perennial surface or near-surface water. These areas, referred to as Lower, Middle, and Upper Willows, form three of the most verdant riparian wetlands of the California desert. Riparian vegetation covers approximately 120 acres at Lower Willows, 54 acres at Middle Willows, and 40 acres at Upper Willows.

Special resources: Big horn sheep, riparian vegetation, southwestern flycatcher, least Bells vireo, amphibians, oases

Five sensitive habitat or vegetation types occur in Coyote Canyon, including: desert fan palm oasis woodland, mesquite bosque, Mojave riparian forest, Sonoran cottonwood willow riparian forest, and Sonoran riparian woodland. Several of these riparian vegetation associations have been recognized for their rarity and sensitivity by the State of California. Lower and Middle Willows are identified as Significant Natural Areas (SNA) in the California Department of Fish and Game's Natural Diversity Data Base because they contain sensitive desert fan palm oasis woodland, Sonoran riparian forest, and nesting habitat for least Bell's vireo. Upper Willows contains the same resources but was not designated as an SNA due simply to an oversight (California Department of Parks and Recreation 1995). All riparian habitats in Coyote Canyon are considered wetlands and are protected under the Keene-Nejedly California Wetlands Preservation Act of 1976.

Acres of Watershed: 78,359

Ownership

DPR ~58,539

Other ~20,000

Names of streams:

Coyote Canyon and its tributaries: Salvador Canyon, Alder Canyon, Horse Canyon, Nance Canyon, Tule Canyon, Parks Canyon, Indian Canyon, White Wash, Medicine Canyon, Yucca Valley

Watershed location: Coyote Creek's headwaters originate in the Santa Rosa Mountains to the north and the San Ysidro Mountains to the south. The mostly ephemeral and intermittent creek drains northwest-southeast to the confined internal basin called the "Borrego Sink."

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Appendix

Maps from this report can be found in the documents named:

- “Representative Keystone Watersheds Appendix Part 1: Maps A-1 through A-15”
- “Representative Keystone Watersheds Appendix Part 2: Maps A-16 through A-33”

**Table 3. Important Natural Parks
Parks Most Representative of Ecological Regions, Located in Key Watershed or Possessing other Outstanding Natural Features**

Park Unit	Park Acres	Recognition			DPR Key Watershed Designation	Watershed Acres	Streams and Tributaries	Ecological Region	Ecological Subregion
		Representative	Outstanding	Key Watershed					
Tolowa Dunes SP	4,399	X				0		Northern California Coast	Crescent City Plain
Jedediah Smith Redwoods SP			X	X	Mill Creek Complex	34,125	Mill Creek and tribs: West Branch Mill Creek, East Fork Mill Creek, and Bummer Lake Creek. Also Rock Creek		Northern Franciscan
Del Norte Coast Redwoods SP				X	Mill Creek Complex	0			Northern Franciscan
Prairie Creek Redwoods SP (grouped w/Humboldt Lagoons SP)	14,187	X	X	X	Prairie Creek Complex	28,853	Prairie Creek and tribs: Hope, Little, Brown, Boyes, May, Lost Man, Godwood Creek, Skunk Cabbage Creek, and Johnson Creeks. Also directly flowing to the ocean: Ossagon, Butler, Boat, Home, Squashan, and Major Creeks		Northern Franciscan
Humboldt Lagoons SP (grouped w/Prairie Creek SP)	1,936	X		X	McDonald Creek	472	McDonald Creek, North Fork McDonald Creek, Stone Lagoon		Wiregrass Ridge Central Franciscan Humboldt Bay Flats & Terraces
Harry A. Merlo SRA				X	McDonald Creek	0	Same as above		Wiregrass Ridge & Central Franciscan
Humboldt Redwoods SP	51,560	X	X	X	Bull Creek Complex	39,816	Bull Creek, Decker Creek, North Fork Bull Creek, Upper Bull Creek & Canoe Creek		Coastal Franciscan
Sinkyone Wilderness SP				X	Whale Gulch-Jackass (Wolf) Creek Complex	11,564	Whale Gulch, Low Gap Creek, Flat Rock Creek, Jackass (Wolf) Creek, Little Jackass Creek, Anderson Gulch Creek, Dark Gulch Creek		Coastal Franciscan
MacKerricher SP	2,520	X	X			0			Fort Bragg Terraces
Mendocino Headlands SP (grouped w/Van Damme SP)	7,694	X		X	Big River Watershed	115,865	Big River, Martin Creek, North Fork Big River, East Branch North Fork Big River, South Fork Big River, Dougherty Creek, Hare Creek		Fort Bragg Terraces and Coastal Franciscan

Park Unit	Park Acres	Recognition			DPR Key Watershed Designation	Watershed Acres	Streams and Tributaries	Ecological Region	Ecological Subregion
		Representative	Outstanding	Key Watershed					
Mendocino Woodlands SP				X	Big River Watershed	0		Fort Bragg Terraces and Coastal Franciscan	
Montgomery Woods SR				X	Big River Watershed	0		Coastal Franciscan	
Van Damme SP (grouped w/Mendocino Headlands SP)	2,337	X				0		Fort Bragg Terraces	
Sonoma Coast SP				X	Willow Creek	5,484	Willow Creek	Coastal Hills-Santa Rosa Plain	
China Camp SP	1,514	X				0		Marin Hills and Valleys	
Sugarloaf Ridge SP	3,783	X				0		Mt. St. Helena Flows & Valleys	
Bothe Napa Valley SP	1,991	X				0		Mt. St. Helena Flows & Valleys	
Mt. Tamalpais SP (grouped w/Samuel P. Taylor SP & Tomales Bay SP)	6,243	X	X	X	Redwood Creek Complex	6,794	Redwood Creek, Fern Creek, Lone Tree Creek	Marin Hills and Valleys	
Samuel P. Taylor SP (grouped w/Mt. Tamalpais SP & Tomales Bay SP)	2,707	X		X	Lagunitas Creek	23,481	Olema Creek, Lagunitas Creek, Papermill Creek, Devil's Gulch	Marin Hills and Valleys	
Tomales Bay SP (grouped w/Mt. Tamalpais SP & Samuel P. Taylor SP)	2,431	X				0		Pt. Reyes	
Angel Island SP	756		X	X	Angel Island	756		Marin Hills and Valleys	
Castle Crags SP	3,905	X	X	X	Castle Creek	22,939	Castle Creek Lower, Upper & North Fork Castle Creeks	Klamath Mountains Lower Scott Mtns. Eastern Klamath Mtns.	
None selected						0		Northwestern Basin and Ranges	
McArthur-Burney Falls Memorial SP	910		X			0		Southern Cascades Hat Creek Rim	
Ahjumawi Lava Springs SP (in 2 Ecological Regions)	6,415	X	X			0		Southern Cascades & Modoc Plateau Medicine Lake Lava Flows & Fall River Valley	

Park Unit	Park Acres	Recognition			DPR Key Watershed Designation	Watershed Acres	Streams and Tributaries	Ecological Region	Ecological Subregion
		Representative	Outstanding	Key Watershed					
Anderson Marsh SHP	1,080	X				0		Northern California Coast Ranges	Clear Lake Hills & Valleys
None selected						0		Northern California Interior Coast Ranges	
Henry W. Coe SP	89,042	X		X	Coyote Creek and tributaries	40,855	East Fork Coyote Creek, Middle Fork Coyote Creek, and Coyote Creek	Central California Coast Ranges	Western Diablo Range Diablo Range
Henry W. Coe SP		X		X	Orestimba Creek and tributaries	85,734	Orestimba Creek, Hartman, Lion, Red, Robinson, and South Fork Orestimba Creeks	Central California Coast Ranges	
Mt. Diablo SP (in 2 Ecological Regions)	20,103	X	X	X	Mitchell Canyon Complex	10,087	Mitchell Canyon, Donner Creek watersheds, and upper Mount Diablo Creek watershed	Central California Coast Ranges & Central California Coast	Fremont -Livermore Hills & East Bay Hills - Mt. Diablo
Big Basin Redwoods SP (grouped w/Año Nuevo SR, Butano SP & Año Nuevo SP)	18,033	X	X			0		Central California Coast	Santa Cruz Mts.
Año Nuevo SP (grouped w/Año Nuevo SR, Big Basin Redwoods SP & Butano SP)	2,896	X		X		0			Santa Cruz Mts.
Año Nuevo SR grouped w/Big Basin Redwoods SP, Butano SP & Año Nuevo SP)	1,319	X	X	X	Waddell Creek watershed	15,437	Waddell Creek, Berry Creek, West Waddell Creek, East Waddell Cree, Opal, Sempervirens, and Union Creeks		Santa Cruz Mts.
Butano SP (grouped w/Año Nuevo SR, Año Nuevo SP & Big Basin Redwoods SP)	4,548	X				0			Santa Cruz Mts.
Wilder Ranch SP				X	Wilder Creek	2,516	Wilder Creek, East Wilder Creek		Santa Cruz Mts.
The Forest of Nisene Marks SP				X	Aptos Creek	7,288	Aptos Creek, Bridge Creek		Santa Cruz Mts. & Watsonville Plain-Salinas Valley
Point Lobos Ranch SP				X	Malpaso Creek-San Jose Creek complex	14,422	Malpaso Creek, San Jose Creek, Soberanes Creek		No. Coastal Santa Lucia Range
Point Lobos SR	1,325		X	X	Malpaso Creek-San Jose Creek complex	0			No. Coastal Santa Lucia Range
Garrapata SP				X	Malpaso Creek-San Jose Creek complex	0			No. Coastal Santa Lucia Range

Park Unit	Park Acres	Recognition			DPR Key Watershed Designation	Watershed Acres	Streams and Tributaries	Ecological Region	Ecological Subregion
		Representative	Outstanding	Key Watershed					
Andrew Molera SP (grouped w/J. P. Burns SP)	4,766	X		X	Big Sur River	37,393	Ventana Creek, Lion, Redwood, Logwood, & Cienega Creeks, N and S Forks Big Sur River		No. Coastal Santa Lucia Range
Pfeiffer Big Sur SP				X	Big Sur River	0			No. Coastal Santa Lucia Range
Julia Pfeiffer Burns SP (grouped w/ Andrew Molera SP)	3,762	X				0			No. Coastal Santa Lucia Range
Montana de Oro SP (grouped w/Morro Bay SP)	8,297	X	X	X	Islay Creek	11,475	Islay Creek, Coon Creek, Ruda Canyon		So. Coastal Santa Lucia Range
Morro Bay SP (grouped w/Montana de Oro SP)	2,770	X	X			0			South Coast Santa Lucia Range
Pismo SB (grouped w/Oceano Dunes SVRA)	1,343	X				0			Santa Maria Valley
Oceano Dunes SVRA (grouped w/Pismo SB)	2,685	X				0			Santa Maria Valley
Woodson Bridge SRA (grouped w/Bidwell-Sacramento River SP)	323	X				0		Great Valley	North Valley Alluvium
Bidwell-Sacramento River SP (grouped w/Woodson Bridge SRA)	284	X				0			North Valley Alluvium
Delta Meadows	472	X				0			Delta Basins
Caswell Memorial SP	258		X			0			Caswell Basin
Great Valley Grasslands SP	2,826	X	X			0			San Joaquin Basin
Plumas Eureka SP	4,424	X		X	Jamison Creek Complex	18,224	Jamison Creek, Eureka Creek	Sierra Nevada	Upper Batholith and Volcanic Flows Greenville - Graeagle
Ed Z'berg-Sugar Pine Point SP	2,324	X		X	General Creek	5,609	General Creek		Upper Batholith and Volcanic Flows
Burton Creek SP				X	Burton Creek	3,331	Burton Creek		Tahoe-Truckee
Emerald Bay SP	1,465		X			0			Tahoe Valley
Calaveras Big Trees SP	6,498	X	X	X	Beaver Creek	20,299	Beaver Creek, Grizzly Creek, Big Trees Creek	Sierra Nevada Foothills	Batholith and Volcanic Flows
Millerton Lake SRA	6,867	X				0			Lower Granitic Foothills

Park Unit	Park Acres	Recognition			DPR Key Watershed Designation	Watershed Acres	Streams and Tributaries	Ecological Region	Ecological Subregion
		Representative	Outstanding	Key Watershed					
Mono Lake Tufa SR (in 2 Ecological Regions)	17,000	X	X			0		Sierra Nevada & Mono	Mono Valley & Eastern Slopes
None selected						0		Southeastern Great Basin	
Red Rock Canyon SP	25,325	X	X	X	Upper Red Rock Canyon	5,971		Mojave Desert	High Desert Plains and Hills Searles Valley - Owshead Mountains
Providence Mountains SRA	5,890	X	X			0			Providence Mountains - Lanfair Valley
Antelope Valley California Poppy Reserve SR	1,781	X				0			High Desert Plains and Hills
Gaviota SP	2,742	X		X	Gaviota Creek	12,921		Southern California Coast	Santa Ynez - Sulphur Mountains
Pt. Mugu SP (grouped w/Leo Carrillo SP)	13,947	X	X	X	Big Sycamore Canyon Complex	16,411	Big Sycamore Canyon, La Jolla Valley		Santa Monica Mountains
Leo Carrillo SP (grouped w/ Pt. Mugu SP)	2,496	X				0			Santa Monica Mountains
Topanga SP				X	Upper Santa Ynez Canyon complex	7,391	Santa Ynez Canyon, Temescal Canyon, Rustic Canyon, Sullivan Canyon		Santa Monica Mountains
Malibu Creek SP (grouped w/Malibu Lagoon SP)	7,915	X	X			0			Santa Monica Mountains
Malibu Lagoon SP (grouped w/Malibu Creek SP)	200	X				0			Santa Monica Mountains
Crystal Cove SP	3,941	X		X	Moro Canyon	2,154	Moro Creek		Coastal Hills Coastal Terraces Los Angeles Plain
San Onofre SB	2,110		X			0			Coastal Terraces Coastal Hills
Torrey Pines SR	1,461		X			0			Coastal Terraces
Border Field SP	1,310	X				0			Coastal Terraces
Chino Hills SP (in 2 Ecological Regions)	12,590	X	X	X	Aliso Canyon	5,671	Aliso Creek, Bane Canyon	Southern California Coast & Southern California Mountains and Valleys	Coastal Hills Los Angeles Plain Santa Ana Mountains

Park Unit	Park Acres	Recognition			DPR Key Watershed Designation	Watershed Acres	Streams and Tributaries		Ecological Region	Ecological Subregion
		Representative	Outstanding	Key Watershed						
Hungry Valley SVRA	18,401	X				0			Northern Transverse Ranges	
Cuyamaca Rancho SP	24,615	X	X	X	Sweetwater River Complex	22,700	Sweetwater River, Descanso Creek		Palomar - Cuyamaca Peak	
Mt. San Jacinto SP	13,718	X	X	X	North Fork San Jacinto River	16,752	North Fork San Jacinto River, Dark Canyon, Black Mountain Creek, Stone Creek, Fuller Mill Creek, Logan Creek		San Jacinto Mountains	
Anza-Borrego Desert SP (in 2 Ecological Regions) (grouped w/Ocotillo Wells SVRA)	577,460	X	X	X	Coyote Canyon	78,359	Coyote Canyon & tribs: Tule Canyon, Parks Canyon, Horse Canyon, Nance Canyon, and Alder Canyon	Southern California Mountains and Valleys and Colorado Desert	Borrego Valley - West Mesa Desert Slopes	
Ocotillo Wells SVRA (grouped w/Anza-Borrego Desert SP)	48,432	X				0		Colorado Desert	Borrego Valley - West Mesa	
Picacho SRA	6,759	X				0		Sonoran Desert	Chocolate Mountains and Valleys	
TOTAL	1,091,091	55	30	33		731,149				