8.0 MSHCP RESERVE SYSTEM MANAGEMENT & MONITORING PROGRAM

This section describes a framework for the implementation of a Management Program to provide for the Conservation of species and natural communities and a Monitoring Program to assess the condition of species and natural communities in the MSHCP Reserve System. The framework Management Program will include ongoing management responsibilities and Adaptive Management. This framework is adaptive and subject to modification as system stressors change and as new information on how better to manage the MSHCP Reserve System to achieve the species and Habitat goals becomes available. The Monitoring Program will be implemented in phases starting with the collection of baseline data that will be used to evaluate conceptual monitoring strategies followed by implementation of long-term species and natural communities monitoring. The Monitoring Program will thereafter be adaptive to incorporate new protocols and techniques as appropriate. The goals in making future modifications to the Monitoring Program will be to improve efficiency and increase the reliability of the data. The Monitoring Program data will be used to both determine if the Plan is meeting its Conservation Objectives and identify the need for and the success of Adaptive Management of the Reserve Lands. This section also includes a program implementation schedule, an estimated annual workload summary, and a cost analysis.

8.1 Introduction and Purpose

The general Conservation approach for the MSHCP Reserve System is to conserve Core Habitat Areas, Other Conserved Habitat, Essential Ecological Processes, and Biological Corridors and Linkages in a size and configuration that will provide for the Conservation of Covered Species and Natural Communities. This Conservation approach requires achieving specific Conservation Goals and Conservation Objectives for Conservation Areas (Section 4), Covered Species (Section 9), and natural communities (Section 10). The CVCC will track the extent to which the Plan is achieving compliance with Conservation Objectives (Section 4) as they relate to acreage goals. Evaluation of Generalized Conservation Objectives that apply to all Covered Species will be evaluated through the Monitoring Program. An example is:

> *Conserve Core Habitat and associated Essential Ecological Processes for "Covered Species A" allowing evolutionary processes and natural population fluctuations to occur. Minimize fragmentation, human-caused disturbance, and edge effects to Core Habitat by conserving contiguous Habitat and effective Linkages between patches of Core Habitat (from Section 4.3).*

In this example, the Monitoring Program would be evaluating population fluctuations, functionality of linkages, impacts of human disturbance (including impacts from edge effects), and if Essential Ecological Processes are being maintained.

The Monitoring Program will provide feedback on the success of achieving the Conservation Objectives by monitoring at multiple levels, including landscape, natural community, and species levels. The landscape level monitoring components are designed to detect large-scale changes and potential threats to the integrity of Essential Ecological Processes and Biological Corridors and Linkages. The natural community level monitoring components are designed to detect changes in key Habitat variables related to the Covered Species in Conservation Areas. The species level monitoring focuses on detecting changes in the distribution and abundance of the Covered Species. Each monitoring level is designed to be adaptive so that when better technologies, protocols, or metrics are identified the process allows and encourages their adoption. The levels are also designed to be contextually interactive, so that each level can be meaningfully compared with the others in both space and time.

The Monitoring and Management Programs are designed to: (1) determine if the Plan is achieving its Conservation Goals for the Covered Species and conserved natural communities; (2) specify the primary components of MSHCP Reserve System management; and (3) determine how Adaptive Management strategies will be used and how effective they are to address changes in Habitat condition, natural communities, and/or species status. These changes may be the result of anthropogenic and/or natural forces. The Management and Monitoring Programs focus on identifying changes in identified natural communities and Covered Species condition (numbers, distribution, etc.) and what factors may be causing the identified changes. The data gathered will help identify the thresholds that would trigger when Adaptive Management actions are appropriate and test their efficacy.

8.1.1 Goals and Objectives: Monitoring Program

The Monitoring Program will provide scientifically reliable data on: (1) the status of Covered Species; (2) spatial and temporal dynamics (amplitude and magnitude) of ecosystem components for the Covered plant and animal Species and natural communities; (3) the threats to these species and natural communities; and (4) the results of research on the management of Covered Species. The Monitoring Program will:

1. Establish baseline information on the status of Covered Species and natural communities. Review of the data, literature, historical records, and other data sources may be used to develop hypotheses and models about factors affecting distribution and population size.

    - Use a tiered approach incorporating monitoring questions at different levels, including individual species (populations and metapopulations), natural communities (including Habitat quality for Covered Species), and landscapes (including multiple natural communities) as models indicate there is a biological relationship.
    - Describe the spatial and temporal variation (amplitude and magnitude) in populations of Covered Species.
    - Identify likely threats to each species or natural community. Threats may be identified according to species assemblages and/or based on Habitat affinities (e.g. aeolian sand Habitat assemblage).
    - Gather data on various measurable environmental factors identified in the conceptual models as having a measurable effect on Covered Species.

- Develop and refine models describing species distributions relative to Habitat quality and other parameters with data. Model refinement may include analysis of causal factors related to temporal and spatial annual population fluctuations and the amplitude of those fluctuations.
- Evaluate the extent to which integration of individual species/population and landscape/Habitat quality monitoring can occur.
- Develop monitoring protocols to stay current with accepted methodology as technologies and analytic tools improve. The Plan includes an analysis of monitoring data and a process for changing protocols to address changing needs.
- Identify, develop, and evaluate the extent to which, management practices and policies are sustaining the plant and animal species and natural communities covered under the Plan. This includes the collection and analysis of scientifically reliable data to enable Conservation Area managers to identify threats and to assess the effectiveness of management actions.
- Establish thresholds for changing or modifying management and identify appropriate responses or management practices for statistically and biologically significant changes in populations, communities, and ecological processes.
- Identify, as part of ongoing monitoring efforts, any diseases that may be adversely affecting Covered Species. This information will be shared with the Wildlife Agencies to assist the Wildlife Agencies in developing appropriate responses to disease issues and for identifying appropriate Adaptive Management responses.

2. To ensure all data are collected and stored in a manner that provides open access, authorized release, and communication and transfer to members of the public, local jurisdictions, and state and federal agencies. Transfer of information and data is necessary for policy making, communicating, and implementing all aspects of the Monitoring and Management Programs.

    - Utilize a system for the input, management, storage, accessibility, release, and transfer or communication of monitoring data. Identify who is responsible for data management tasks, including storage, analysis, and transfer. Identify the process for access to and communication of data.

The detailed monitoring protocols will be developed during the first two years of implementation and will be modified based on the baseline data collected during the first baseline phase of monitoring and thereafter as appropriate. Specific descriptions of the potential Monitoring Program for each natural community assemblage and the integration of monitoring and management are presented in Section 8.4.

8.1.2 Goals and Objectives: Management Program

The Management Program will incorporate Adaptive Management, which includes an integrated multidisciplinary approach to addressing management practices, evaluating

management actions, and assessing threats using appropriate experimental approaches at species, community, and landscape levels. The Management Program will:

- Develop a reserve management plan within 3 years of permit issuance and evaluate existing management activities. This plan will delineate cost estimates, staffing needs, and schedules for implementation.
- Use available data to structure a range of alternative response models to address a given threat or stressor affecting a Covered Species or natural community and evaluate these models.
- Incorporate a research component that will be funded and implemented by this Plan. Research needs will evolve over time. Research needs will be revealed by the same process used to evaluate monitoring and management protocols and results, incorporating empirical data and recognition of knowledge gaps.
- Provide a process for implementing Adaptive Management actions, and a means to evaluate the efficacy of these actions.
- Establish an evaluation subcommittee composed at least in part of managers and scientists.

8.2 Management of the MSHCP Reserve System

8.2.1 General Overview

The management of the Reserve Lands will integrate management of Existing and Additional Conservation Lands. The goal of the Management Program is to implement management actions and prescriptions that ensure Conservation of the Covered Species and Natural Communities within the Plan Area. The Management Program will include ongoing Management and Adaptive Management. This section describes the current management of Existing Conservation Lands, new or changed management actions for both Existing and Additional Conservation Lands and the Adaptive Management framework for these lands. The design of Adaptive Management strategies will include the use of conceptual models. Additional discussion of management for Covered Species and Natural Communities is included in Section 8.4.

8.2.2 Organizational Structure

Section 6.0 describes the organizational structure for Plan implementation, including the implementation of the Management Program. Responsibilities for specific activities associated with reserve management are divided amongst the Reserve Management Oversight Committee (Section 6.1.3), the Land Manager (Section 6.1.5), and the Reserve Management Unit Committees (Section 6.1.4). The specific responsibilities of each of these entities are detailed in the identified sections. Their responsibilities include facilitating consistent and continuing exchange of

information among all individuals and committees involved in reserve management and monitoring.

The Monitoring Program Administrator (MPA) (Section 6.1.6) is responsible for coordinating with reserve managers to facilitate the exchange of Monitoring Program data. Likewise, the Land Manager has the responsibility to facilitate the exchange of information regarding all completed and proposed management and Adaptive Management actions. Annual reports are prepared by the Land Manager and MPA and require review by the CVCC, RMOC, and appropriate RMUCs. Section 8.7 describes the elements of the annual reports and the process for review and evaluation of these reports. The organizational structure also provides for input and recommendations from Independent Science Advisors on specific issues concerning scientific aspects of the Plan. Figure 8-1 illustrates the Management Program Implementation process.

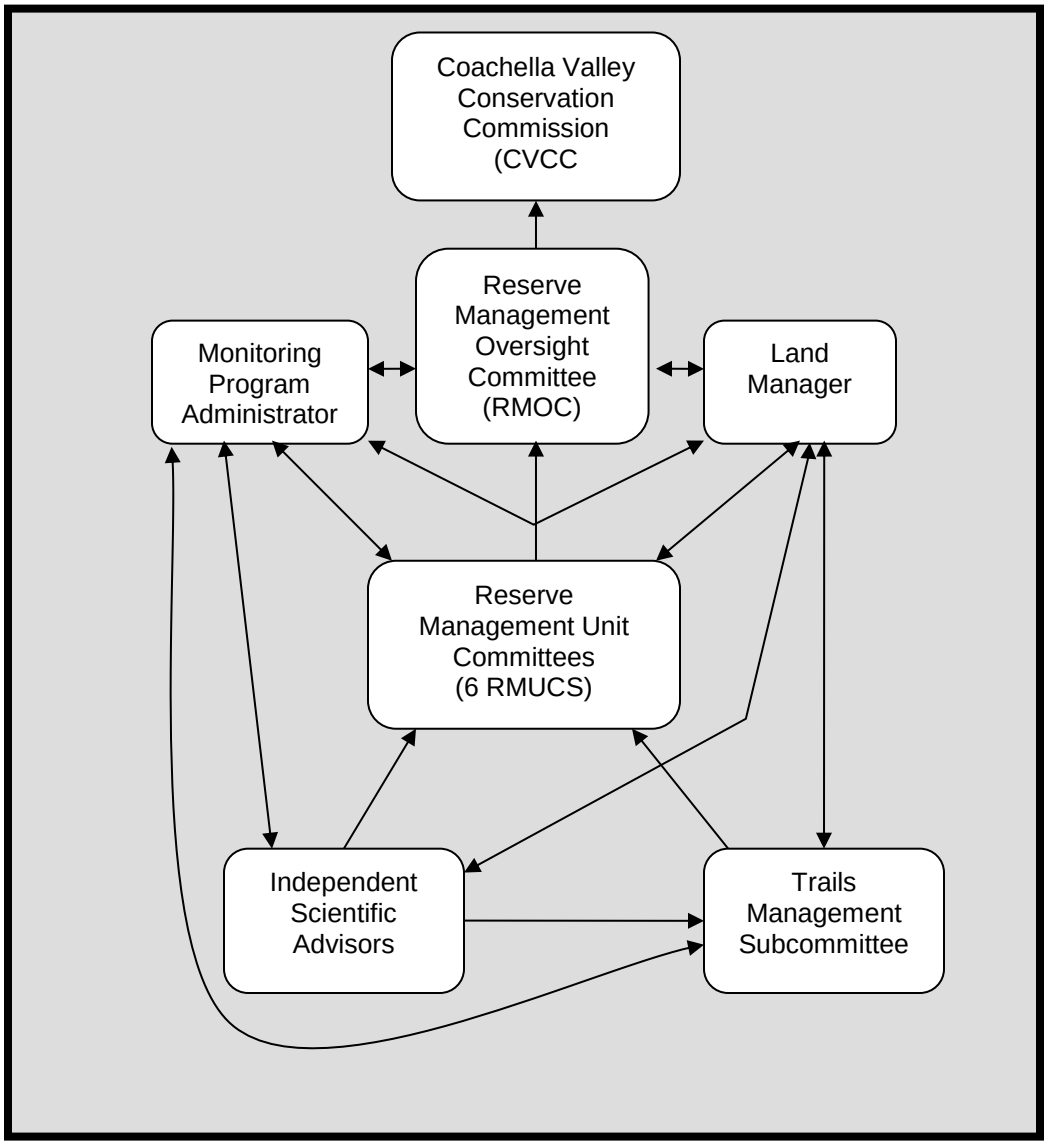
The Plan establishes Reserve Management Units (RMUs) to ensure the coordinated management necessary to achieve the Conservation Goals and Objectives. RMUs encompass one or more Conservation Areas, based on Habitat/natural community patterns, land ownership, and similar management needs. Within the RMUs, management obligations under the Plan may vary depending on land ownership or administrating agency. Either a single agency (e.g., the National Park Service for Joshua Tree National Park Conservation Area) or a group of agencies will oversee these RMUs, working together as a Reserve Management Unit Committee (RMUC).

Within three years of Permit issuance the Reserve Management Unit Committees, Reserve Managers, and the Land Manager will develop Reserve Management Unit Plans (RMUPs). The elements of the RMUP are described in Section 6.2. The RMUPs will include ongoing management measures and Adaptive Management actions, schedules, and responsibilities for implementation. The RMUP will include recommendations for public access and uses based on assessment of compatibility with resource protection objectives.

Pursuant to the Monitoring, Management, and Adaptive Management measures to be implemented under the Plan, the Land Manager and RMUCs, in coordination with the Monitoring Program Administrator (MPA), will prepare annual work plans for management and adaptive management priorities, actions, and funding to be conducted on an annual basis (see Sections 6.1.4 and 6.1.5). The MPA, in coordination with the Land Manager, RMUCs, and RMOC, will prepare a three- to five-year projected work plan and budget, as described in Section 6.1.6. The first annual work plans will be prepared within six months of Permit issuance. The RMOC, which includes the Wildlife Agencies, will provide review and oversight of these plans and then submit the plans to the CVCC for budget approval. The Reserve Management Unit plans will provide specific on-the-ground guidance for the Reserve Manager, MPA, and cooperating agencies. The first Reserve Management Unit plans shall be prepared, reviewed, and approved within three years of Permit issuance. The elements of this plan are described in Section 6.2. As needed, or every 5 years, the RMOC may empanel a group of Independent Science Advisors (ISAs), which will, in coordination with the MPA, provide scientific expertise and recommendations on specific reserve management and monitoring issues.

Figure 8-1: Organizational Structure and Decision Process

for Monitoring and Management Programs



This framework follows the adaptive resource management approach (Holling 1978, Walters 1986, Kendall 2001) which involves development of objectives, conceptual models of system dynamics, a Monitoring Program, and changes to management based on monitoring results. This approach emphasizes a collaborative decision-making effort bringing together biologists, biometricians and modelers, resource land managers, and research scientists (Walters 1986, Kendall 2001). In practice, monitoring, ongoing management, and Adaptive Management are interrelated and therefore integrated in this Plan. All management actions have impacts and will be modified, based on monitoring results and regular evaluation. The essence of Adaptive Management is the integration of design, management, and monitoring (Salafsy et al. 2001, Salafsy et al. 2002) to test assumptions systematically in order to adapt and learn.

8.2.3 Current Management of Existing Conservation Lands

Management plans already in place on Existing Conservation Lands will serve as the basis for the management programs for Reserve Lands; these plans will be reviewed for their appropriateness. Current management programs and plans on lands administered by state and federal agencies, Local Permittees, and various non-profit Conservation entities are described below in the context of the six Reserve Management Units designated (See Section 6.1.4) by the Plan. Figure 8-2 depicts the Reserve Management Units and illustrates the extent of Existing Conservation Lands within these units. Figure 8-3 shows the location and boundaries of individual Existing Conservation Lands that occur within these Reserve Management Units, as listed in Tables 8-1 through 8-6. As part of the Plan implementation, land management agencies will coordinate to bring their management programs into conformance with the goals of the Plan for Covered Species and Natural Communities.

Reserve Management Unit 1

This unit consists of Conservation Areas from Cabazon to the East Indio Hills and includes all the aeolian sand natural communities. Table 8-1 identifies the Existing Conservation Lands to be managed as part of this unit and the current organization responsible for its management. The RMUC will consist of the Land Manager, BLM, CDFG, USFWS, USFS, and State Parks, TNC, and CNLM. The USFWS shall be included in the membership of all RMUCs with responsibility over the Conservation Areas in Reserve Management Unit 1 if the boundaries of Unit 1 are changed in the future. The following Conservation Areas are included:

- Cabazon
- Stubbe and Cottonwood Canyons
- Whitewater Canyon
- Snow Creek/Windy Point
- Highway 111/I-10

- Whitewater Floodplain
- Upper Mission Creek - Big Morongo Canyon
- Mission Creek / Morongo Wash
- Willow Hole
- Long Canyon
- Edom Hill
- Thousand Palms
- West Deception Canyon
- Indio Hills/Joshua Tree National Park Linkage
- Indio Hills Palms
- East Indio Hills

The Existing Conservation Lands within this Reserve Management Unit are described below:

Big Morongo Canyon Preserve/Area of Critical Environmental Concern (ACEC). The Big Morongo Canyon Preserve/ACEC is located in the mountains north of the City of Desert Hot Springs. It is situated about equally in the Plan area and in adjacent San Bernardino County. The portion in the Plan area is within the Upper Mission Creek/Big Morongo Canyon Conservation Area. In 1998, the California Desert Conservation Area (CDCA) Plan was amended to expand the ACEC boundary to encompass 29,000 acres to minimize Habitat fragmentation and maintain wildlife corridor links between the San Gorgonio Wilderness to the west and Joshua Tree National Park to the east. The portion of this ACEC in the Plan area includes 13,797 acres, including 9,975 acres federal and 3,822 acres private. Biological resource values in the portion of the ACEC within the Plan area include riparian woodlands, desert dry wash woodland, Habitat for the triple-ribbed milkvetch, Little San Bernardino Mountains linanthus, riparian birds, and possibly desert tortoise. Management objectives and prescriptions include Habitat enhancement, including tamarisk removal, and resource protection through controlling access to appropriate areas. In the BLM CDCA Plan, these lands are classified as Class "L", Limited. The existing Management Plan focuses on riparian bird species and the desert bighorn sheep, and does not include specific management prescriptions for desert tortoise and triple-ribbed milkvetch. The Habitat for these species is protected within the ACEC by the overall management regime.

Table 8-1: Management Entities for Existing Conservation Lands in Reserve Management Unit 1

EXISTING CONSERVATION LANDS	MSHCP CONSERVATION AREAS	MANAGEMENT ENTITY
Oasis de Los Osos Reserve	Snow Creek/Windy Point	❖ University of California Natural Reserve System
Big Morongo Canyon Preserve/ACEC	Upper Mission Creek/Big Morongo Canyon	❖ Bureau of Land Management
Coachella Valley Preserve System ❖ Whitewater Floodplain Preserve	Whitewater Floodplain	❖ Bureau of Land Management ❖ Coachella Valley Water District
❖ Willow Hole/Edom Hill Preserve/ACEC	Willow Hole Edom Hill	❖ Bureau of Land Management ❖ Center for Natural Lands Management ❖ Coachella Valley Mountains Conservancy
❖ Thousand Palms Preserve ❖ Coachella Valley Ecological Reserve	Thousand Palms	❖ Bureau of Land Management ❖ California Dept. of Fish and Game ❖ California State Parks ❖ Center for Natural Lands Management ❖ The Nature Conservancy ❖ US Fish and Wildlife Service
Indio Hills Palms State Park (managed as part of Thousand Palms Preserve)	Indio Hills Palms	❖ California State Parks
Mission Creek Preserve	Upper Mission Creek/Big Morongo Canyon	❖ Wildlands Conservancy
San Gorgonio Wilderness	Cabazon Stubbe and Cottonwood Canyons Whitewater Canyon Upper Mission Creek/Big Morongo Canyon	❖ Bureau of Land Management ❖ US Forest Service
Sky Valley Ecological Reserve	Indio Hills/Joshua Tree National Park Linkage	❖ California Dept. of Fish And Game
Whitewater Canyon ACEC	Whitewater Canyon	❖ Bureau of Land Management

Coachella Valley Preserve System. The 1985 Coachella Valley Fringe-toed Lizard Habitat Conservation Plan established the Coachella Valley Preserve System. The preserve

system consists of the Thousand Palms Preserve (within the Thousand Palms Conservation Area), the Willow Hole-Edom Hill Preserve/ACEC, described separately below (within the Willow Hole and the Edom Hill Conservation Areas), and the Whitewater Floodplain Preserve (within the Whitewater Floodplain Conservation Area). The Thousand Palms Preserve is situated in and immediately south of the central portion of the Indio Hills. It consists of 17,651 acres of BLM, USFWS, CDFG, State Parks, and Center for Natural Lands Management lands. This includes the Coachella Valley Ecological Reserve lands owned by CDFG. A small amount of private land is slated for acquisition pursuant to the HCP. The Willow Hole-Edom Hill Preserve (a large portion of which is a BLM ACEC of the same name) is located at the west end of the Indio Hills and is 2,027 acres in size. Ownership is approximately 1,869 acres BLM, 117 acres Coachella Valley Mountains Conservancy, and 41 acres private land. The Whitewater Floodplain Preserve is located south of Interstate 10 and east of Indian Avenue, and is 1,316 acres of BLM and Coachella Valley Water District land. The preserves are managed to protect and enhance the Habitat of the endangered Coachella Valley fringe-toed lizard. Other species that also occur on the preserves include the Palm Springs ground squirrel, Palm Springs pocket mouse, flat-tailed horned lizard, burrowing owl, Crissal thrasher, least Bell's vireo, southwestern willow flycatcher, yellow warbler, yellow-breasted chat, giant sand-treader cricket, and Coachella Valley milkvetch. Primary management actions range from control of exotic species and limiting public access to compatible scientific, educational, and recreational uses. An extensive and successful tamarisk eradication program has been completed.

Indio Hills Palms (State Parks). This is a 5,758-acre unit of the State Park System in the Indio Hills. The State Park property includes 3,467 acres acquired in the Fan Hill area in 2004. It is managed as part of the Coachella Valley Fringe-toed Lizard Preserve by the Preserve Management Committee, of which State Parks is a member agency. There are several desert fan palm oases within the State Parks property; control of tamarisk shall be undertaken.

Mission Creek Preserve. The Wildlands Conservancy owns a portion of the Mission Creek watershed, adjacent to BLM lands, in the Upper Mission Creek/Big Morongo Canyon Conservation Area. The Wildlands Conservancy manages these lands as the Mission Creek Preserve. Coordination shall occur with the Wildlands Conservancy to achieve Covered Species Conservation Objectives. The Preserve is available for recreational trail use, environmental education, and access to the BLM lands in the San Gorgonio Wilderness Area. The lands within this Preserve are shown generally as Existing Conservation Lands in Figure 8-2; the Preserve boundary is not shown in Figure 8-3.

San Gorgonio Wilderness (BLM). This Wilderness Area includes portions of the Cabazon, Stubbe and Cottonwood Canyon, Whitewater Canyon, and Upper Mission Creek/Big Morongo Canyon Conservation Areas. The BLM portion of the San Gorgonio Wilderness is located in the mountains north of the San Gorgonio Pass area. Much of wilderness is outside the Plan area boundaries. The portion within the Plan area includes approximately 17,232 acres. Ownership is approximately 16,935 acres federal and approximately 297 acres private. Biological resource values include a high level of biodiversity due to the confluence of Mojave Desert, Sonoran Desert, montane, and coastal influences. This wilderness area includes riparian woodlands and Habitat for least Bell's vireo, southwestern willow flycatcher, and arroyo toad. The terrain is rugged and steeply dissected, with the ecotone providing Habitat for Nelson's

bighorn sheep, black bear, golden eagle, prairie falcon, red-tailed hawk, numerous songbirds, and desert tortoise in outlying areas. Visitor use includes day hiking, hunting, and backpacking along the Pacific Crest Trail. The area is managed as Class "C" in the California Desert Conservation Area Plan. The area is managed under the provisions of the 1964 Wilderness Act, the 1994 California Desert Protection Act, and all applicable laws, regulations, and policy.

Whitewater Canyon ACEC. The Whitewater Canyon ACEC is located in the San Bernardino Mountains north of the San Gorgonio Pass, including the Whitewater River canyon. About 29% of the ACEC is situated in San Bernardino County. The portion in the Plan area encompasses approximately 12,448 acres of which approximately 11,622 acres are federal and approximately 826 acres are private. Approximately 75% of the ACEC is within the San Gorgonio Wilderness. The ACEC lands are classified as Class "L," Limited, in the CDCA Plan. Biological resource values in the portion of the ACEC within the Plan area include riparian woodlands, mesquite thickets, a desert fan palm oasis, and Habitat for arroyo toad, and, at least in migration, least Bell's vireo, southwestern willow flycatcher, and other riparian species. Management objectives and prescriptions include Habitat enhancement and protection through controlling access to appropriate areas and monitoring the effectiveness of the Management Program.

Willow Hole - Edom Hill Preserve/ACEC. The Willow Hole-Edom Hill Preserve/ACEC is located in the western Coachella Valley at the west end of the Indio Hills. It consists of two disjunct areas: Willow Hole and Edom Hill, which are two to three miles apart. The ACEC is 2,027 acres in size. Ownership is approximately 1,869 acres federal, 41 acres private, and 117 acres of state lands. The Willow Hole-Edom Hill Preserve/ACEC is also a preserve unit under the Coachella Valley Fringe-toed Lizard Habitat Conservation Plan. The BLM ACEC lands are classified as Class "L," Limited, in the CDCA Plan. Biological resource values include mesquite hummocks, desert fan palm oasis woodland, and Habitat for the Coachella Valley fringe-toed lizard, Coachella Valley milkvetch, Coachella Valley round-tailed ground squirrel, Palm Springs pocket mouse, burrowing owl, Crissal thrasher, and the Coachella Valley giant sand treader cricket. Migrating birds such as the least Bell's vireo, southwestern willow flycatcher, yellow-breasted chat, and the yellow warbler occur at Willow Hole as well. Management objectives and prescriptions include Habitat protection through land acquisition and control of deleterious activities such as off-highway vehicle use. Perimeter fencing limits OHV access.

Sky Valley Ecological Reserve. This reserve is located in the Indio Hills/Joshua Tree National Park Linkage Conservation Area. This reserve consists of approximately 1,763 acres and is managed by CDFG. Biological resource value includes a critical wildlife linkage between Joshua Tree National Park and the existing Coachella Valley Fringe-toed Lizard Preserve, habitat for the desert tortoise, and a movement corridor for species such as coyote, bobcat, and gray fox. Coordination shall occur with CDFG to achieve Covered Species Conservation Objectives.

Reserve Management Unit 2

This unit consists of the Joshua Tree National Park Conservation Area. The RMUC consists of the National Park Service and the Land Manager. Table 8-2 identifies the Existing Conservation Lands to be managed as part of this unit.

Table 8-2: Management Entities for Existing Conservation Lands in Reserve Management Unit 2

EXISTING CONSERVATION AREA	PLAN CONSERVATION AREAS	MANAGEMENT ENTITY
Joshua Tree National Park	Joshua Tree National Park	❖ National Park Service ❖ Wildlands Conservancy (for transfer to NPS)

Joshua Tree National Park. The National Park Service manages Joshua Tree National Park. The Plan area boundary runs along the ridgeline of the Little San Bernardino Mountains to include the southern portion of the National Park. The entire Park comprises approximately 795,000 acres, of which approximately 180,541 acres are in the Plan area. Approximately 11,300 of these acres are, however, private inholdings, leaving 161,300 acres owned and managed by the National Park Service. This portion of the Park includes the transition zone between the Sonoran and Mojave deserts and contains diverse natural communities such as Mojave mixed woody scrub, blackbrush scrub, Mojavean pinyon and juniper woodland, desert dry wash woodland, and desert fan palm oasis woodland. The area provides Habitat for desert tortoise, Le Conte's thrasher, and, at least in migration, such riparian species as least Bell's vireo and yellow warbler. More than ninety-five percent of the lands in the pre-1994 California Desert Protection Act (CDPA) boundaries of the national park are designated wilderness and managed in accordance with the 1964 Wilderness Act to protect and maintain the area in its natural state. The approximately 64,350 acres within the Plan area that the 1994 CDPA added to the park are not wilderness; they are managed for backcountry, non-motorized recreation except on a few designated routes of travel on dirt roads. Approximately 27,000 roadless acres of the addition are recommended for study to determine suitability for wilderness designation. Approximately 33,141 acres of the addition area were privately owned in 1994; the other lands were owned by BLM or the State of California. Acquisition of the private lands from willing sellers has begun, principally by the nonprofit Wildlands Conservancy. To date, approximately 9,300 acres have been acquired. Title to these lands has been, or likely will be, conveyed to the federal government. The National Park lands are adequately managed and protected for the Conservation of the species and natural communities included in the Plan. Three plans have been adopted that are relevant to the portion of the Park within the Plan area. The Land Protection Plan, approved in November 1996, recommends that the National Park Service acquire all lands within the Park boundaries except for certain tracts of land owned by Metropolitan Water District. As mentioned above, the Land Protection Plan proposes acquisition of over 30,000 acres of private lands within the MSHCP/NCCP Plan area. Management related plans include:

1. Joshua Tree National Park General Management Plan. The management goals for the Park are to "manage land and wilderness to preserve them unimpaired for future generations, participate cooperatively in the preservation of ecological units that extend beyond the park boundary, and facilitate cooperative planning throughout the California Desert ecosystem with other public agencies and communities."

2. Backcountry and Wilderness Management Plan. The General Management Plan did not address the land added to the Park by the California Desert Protection Act in 1994. The added land is primarily adjacent to backcountry and wilderness areas and largely undeveloped. The Backcountry and Wilderness Management Plan, which amends the General Management Plan, minimizes disturbance to resources and ensures their preservation unimpaired while affording the public a broad spectrum of recreational enjoyment. The Backcountry and Wilderness Management Plan proposes 2,980 acres of additions to existing wilderness areas within the Plan area and establishes a Wilderness Study Area on approximately 27,000 acres in the Cottonwood Mountains, which is also within the Plan area. These areas will be managed as wilderness until Congress determines whether to designate them wilderness. Small scattered tracts along the Park boundary, totaling less than 500 acres, are designated Special Use Zone to reflect ownership by Metropolitan Water District and rights granted it by Congress in conjunction with the Colorado River Aqueduct. The remainder of the area added to the Park is designated as a Backcountry Transition Subzone, which is zoned for the Conservation of natural resources and processes, even though it is not designated as wilderness. Three dirt roads with a connecting link between two of them, totaling 24.5 miles are open to registered motor vehicles that are legal to operate on public roads in California. The roads are not open to off-highway vehicles. A bicycle trail is also designated. The Plan also implements the Desert Tortoise Recovery Plan, adopting all the management recommendations in the recovery plan for this area, except for fencing Park roads.

Reserve Management Unit 3

This unit consists of the following Conservation Areas in the eastern portion of the Plan area:

- Desert Tortoise and Linkage
- Mecca Hills/Orocopia Mountains Wilderness.

The RMUC for this unit will consist of the Land Manager and BLM.

Table 8-3: Management Entities for Existing Conservation Lands in Reserve Management Unit 3

EXISTING CONSERVATION LANDS	MSHCP CONSERVATION AREAS	MANAGEMENT ENTITY
Mecca Hills Wilderness	Mecca Hills/Orocopia Mountains	❖ Bureau of Land Management
Orocopia Mountains Wilderness	Mecca Hills/Orocopia Mountains	❖ Bureau of Land Management
Chuckwalla Bench ACEC	Mecca Hills/Orocopia Mountains	❖ Bureau of Land Management
BLM Multiple Use Lands (CDCA)	Desert Tortoise and Linkage	❖ Bureau of Land Management

BLM Lands Managed within the California Desert Conservation Area. There are many sections of BLM land in the Desert Tortoise and Linkage Conservation Area. These are multiple use lands. However, these lands are also part of a Desert Wildlife Management Area (DWMA) as designated by the Northern and Eastern Colorado Desert Coordinated Management Plan, approved on December 19, 2002. The DWMA was established in this area to ensure Conservation of desert tortoise Habitat. In addition to desert tortoise Habitat, this area provides extensive areas of desert dry wash woodland, Le Conte's thrasher Habitat, and important Biological Corridor and Linkage areas associated with numerous culverts and under crossings under the I-10 freeway. These Biological Corridors provide an important link from Joshua Tree National Park to the Mecca Hills and Orocopia Mountains to the south. With implementation of the MSHCP, these BLM lands will be managed as part of the Conservation Area.

Mecca Hills Wilderness. The Mecca Hills are located in the northeast portion of the Plan area and encompass 28,544 acres. Ownership is approximately 24,755 federal acres, approximately 2,952 privately owned acres, and approximately 837 acres of state lands. Biological resource values include creosote bush scrub and desert dry wash woodland, two desert fan palm oases, and Habitat supporting Mecca aster and Orocopia sage. Desert tortoises have been observed within the wilderness and surrounding area. This wilderness is known for its striking and colorful faulted and folded geologic formations, resulting from mineralization and activity along the San Andreas Fault. Mazes of small, narrow, steep-walled canyons attract local as well as international visitors. Day hiking is the most popular activity, with commercial jeep touring to the wilderness boundary contributing additional visitor days. The area is managed as Class "C" in the California Desert Conservation Area Plan. The area is managed under the provisions of the 1964 Wilderness Act, the 1994 California Desert Protection Act, and all applicable laws, regulation, and policy. Wilderness management plans have not yet been initiated for wilderness areas designated in the 1994 California Desert Protection Act. The Mecca Hills Wilderness is also addressed in the Northern and Eastern Colorado Desert Coordinated Management Plan (NECO Plan). The Plan is coordinating with the NECO Plan, and the two plans will be consistent.

Orocopia Mountains Wilderness. The Orocopia Mountains are located in the northeast portion of the Plan area, east of and contiguous with the Mecca Hills wilderness. This wilderness encompasses approximately 53,503 acres. Ownership is approximately 42,214 acres federal, approximately 10,014 acres private, and approximately 1,275 acres state lands. Biological resource values include the creosote bush scrub and desert dry wash woodland natural communities and Habitat supporting the Mecca aster and Orocopia sage. Desert tortoises have been observed within the wilderness and surrounding area. This wilderness is comprised of a diverse and varied mountain landform, with open valleys cut by steep and dissected ridges. Visitor use includes hiking, backpacking, and hunting. The area is managed under the provisions of the 1964 Wilderness Act, the 1994 California Desert Protection Act, and all applicable laws, regulations, and policy. Wilderness management plans have not yet been initiated for wilderness areas designated in the 1994 California Desert Protection Act. The Orocopia Mountains wilderness is also addressed in the Northern and Eastern Colorado Desert Coordinated Management Plan (NECO Plan). The Plan is coordinating with the NECO Plan and the two plans will be consistent.

Chuckwalla Bench ACEC. The Chuckwalla Bench was nominated as an Area of Critical Environmental Concern (ACEC) in the California Desert Conservation Plan (CDCA) in 1980. The Chuckwalla Bench Management Plan and Environmental Assessment were signed in September of 1984. The Chuckwalla Bench ACEC includes 12,067 acres. Ownership is approximately 6,745 acres federal, 5,320 acres private, and 2 acres owned by the State Lands Commission. The area was designated as an ACEC for its exceptional desert tortoise densities, the highest in the Sonoran Desert; it is also notable as a rich representative of Sonoran Desert vegetation with a full compliment of wildlife and plant species including several rare plants. Extensive stands of desert dry wash woodland occur within this ACEC. These values could not be adequately managed in small parcels. The ACEC boundary was drawn to include the entire Chuckwalla Bench area so that it could be managed as a system. Management objectives and prescriptions include tamarisk eradication, provision of wildlife water sources, and removal of abandoned mine shafts, after surveys for use of these shafts by bats. Habitat protection would be accomplished through control of vehicle and public access in the ACEC, additional land acquisition and land exchanges, cooperative agreements with private landowners and adjacent military lands, monitoring of species and vegetation, and educating visitors about avoiding impacts to desert tortoise and other sensitive resources.

Reserve Management Unit 4

This unit consists of the Dos Palmas Conservation Area. The following table shows Existing Conservation Lands within this RMU and the management entities involved in current management. The RMUC will consist of the Land Manager, BLM, CDFG, State Parks, and CNLM.

Table 8-4: Management Entities for Existing Conservation Lands in Reserve Management Unit 4

EXISTING CONSERVATION LANDS	MSHCP CONSERVATION AREA	MANAGEMENT ENTITY
Dos Palmas ACEC	Dos Palmas	❖ Bureau of Land Management ❖ Center for Natural Lands Management
Oasis Springs Ecological Reserve	Dos Palmas	❖ California Department of Fish and Game
Salton Sea State Recreation Area	Dos Palmas	❖ California State Parks

Dos Palmas Preserve/ACEC. In 1980, the California Desert Conservation Area Plan designated 2,503 non-contiguous acres as the Salt Creek Desert Pupfish/Rail Habitat ACEC to protect washes, seeps, and springs, which provide Habitat for the federally listed desert pupfish, Yuma clapper rail, and other species. This ACEC was expanded to 4,288 acres in 1984. In 1998, the CDCA Plan was amended again to expand the ACEC to 14,419 acres and to rename the ACEC as the Dos Palmas ACEC. These lands are classified as Class "L," Limited in the CDCA Plan. The Dos Palmas Preserve/ACEC is located in the extreme eastern portion of the Coachella Valley, just south of the Orocopia Mountains. Ownership is approximately 7,078 acres federal, 5,606 acres private, 1,027 acres state and approximately 800 acres belong to the Center for Natural Lands Management. Biological resource values include desert fan palm oasis woodland, desert dry wash woodland, mesquite bosque, stabilized desert sand fields, desert saltbush scrub, desert sink scrub, and freshwater marsh. The area provides Habitat for the desert pupfish, Yuma clapper rail, California black rail, flat-tailed horned lizard, southern yellow bat, and the Palm Springs pocket mouse. Management objectives and prescriptions include Habitat enhancement, including tamarisk removal and creation of additional pupfish Habitat, and Habitat protection through additional land acquisition, cooperative agreements with private landowners, species monitoring, and controlling access to appropriate areas. The existing Management Plan focuses on protecting the entire Dos Palmas ecosystem, thereby providing generally for the Conservation of the species and natural communities included in the Plan that occur at Dos Palmas.

Oasis Springs Ecological Reserve (CDFG). This 494-acre ecological reserve, all in state ownership, is located east of the Salton Sea near Salt Creek. It was designated in 1984 to protect desert pupfish Habitat in three ponds fed by artesian wells. The reserve is within the boundaries of the Dos Palmas Preserve/ACEC. A Management Plan was prepared in 1992. Management recommendations include protecting and enhancing the existing aquatic Habitat and enhancing other Habitats to increase biological diversity.

Salton Sea State Recreation Area. The State Recreation Area is a unit of the State park system and as such, its primary purpose is the protection and enhancement of the natural resources, including Habitat for the Yuma clapper rail and desert pupfish. There is also the potential for flat-tailed horned lizard, several bat species, and Orocopia sage to occur on these

state lands. A great variety of waterfowl, shorebirds, raptors, and other water related birds use the area. Consistent with the protection of these resources, the State Recreation Area also provides recreation and interpretive/ education opportunities, including camping and fishing facilities. Management activities include a non-native species eradication program.

Reserve Management Unit 5

This unit consists of the Coachella Valley Stormwater Channel and Delta Conservation Area. The only existing Conservation lands within this Conservation Area are BLM lands without a specific management designation. The remaining lands are either Coachella Valley Water District or private. The RMUC consists of the Land Manager and BLM.

Table 8-5: Management Entities for Existing Conservation Lands in Reserve Management Unit 5

EXISTING CONSERVATION LANDS	MSHCP CONSERVATION AREA	MANAGEMENT ENTITY
BLM Multiple Use Lands (CDCA)	Coachella Valley Stormwater Channel and Delta	❖ Bureau of Land Management

BLM Lands Managed within the California Desert Conservation Area. There are scattered parcels of BLM land in the Coachella Valley Stormwater Channel and Delta Conservation Area totaling approximately 389 acres. These are multiple use lands. With implementation of the MSHCP, these lands will be managed as part of the Conservation Area.

Reserve Management Unit 6

This unit consists of the Santa Rosa and San Jacinto Mountains Conservation Area. The RMUC consists of the Land Manager, BLM, CDFG, State Parks, CVMC, UCNRS, USFS, and the Chair of Trails Advisory Subcommittee to the Monument Advisory Committee.

Carrizo Canyon Ecological Reserve (CDFG). This ecological reserve is located in the Santa Rosa Mountains, adjacent to Highway 74, and is within the Santa Rosa Mountains Wildlife Management Plan area. It consists of approximately 1,040 acres, all in state ownership. The California Fish and Game Commission designated this reserve following the listing of the Peninsular bighorn sheep as a rare species in 1972. The primary purpose of the reserve is to protect vital bighorn water sources and a lambing area. A draft Wildlife Management Plan was prepared in 1977. The draft plan emphasized controlling vehicular access and regulating human use of the reserve to ensure compatibility with bighorn sheep use. This plan was adopted jointly by CDFG and BLM in 1980.

Garner Management Area (USFS). The Garner Management Area encompasses 22,350 acres south of the San Jacinto Wilderness. Less than 1,000 acres are within the Plan area, the remainder is on the side of the ridgeline outside the Plan area. The portion within the Plan area is exceptionally rugged and is all publicly owned. The Pacific Crest Trail is located on the ridgeline, which forms the boundary of the Plan area. The lands within this management

area are shown generally as Existing Conservation Lands in Figure 8-2; the boundary of this area is not included in Figure 8-3.

Hidden Palms Ecological Reserve (CDFG). This ecological reserve is located in the Santa Rosa Mountains adjacent to Highway 74, and is within the Santa Rosa Mountains Wildlife Management Plan area. It consists of approximately 156 acres, all in state ownership. The California Fish and Game Commission designated the reserve in 1974 to protect the only confirmed Habitat of the desert slender salamander, a state and federally listed endangered species. Secondarily, the reserve provides Habitat for the Peninsular bighorn sheep. An Operations and Maintenance Schedule/Plan was developed in 1988. The management objectives articulated in the plan include ensuring the long-term stability of water supply and water quality to Hidden Palms Canyon; protecting the reserve from intrusion by hikers, campers, vandals, or collectors; and ensuring the survival of the sensitive plants and palm oasis woodland Habitats in the reserve and its watershed. This plan was adopted by CDFG and BLM in 1980.

Magnesia Spring Ecological Reserve (CDFG). This ecological reserve is located in the Santa Rosa Mountains immediately south of Rancho Mirage. It consists of approximately 1,167 acres, all in state ownership. The California Fish and Game Commission designated the reserve following the listing of the Peninsular bighorn sheep as a rare species in 1972. The primary purpose of the reserve is to protect and rehabilitate Habitat and a vital water source for bighorn sheep. The reserve also provides potential Habitat for seven bat species. An Interim Management Plan was prepared in 1989. Recreational use of the area is to be regulated to avoid impacts to the bighorn sheep.

Mount San Jacinto State Park (State Parks). This state park lies in the high elevations of the San Jacinto Mountains. The federal San Jacinto Wilderness area managed by the U.S. Forest Service is located both north and south of the State Park. Approximately 9,700 acres of the State Park are within the Plan area. Of this acreage, approximately 7,006 acres are designated as wilderness. The remainder is not classified as wilderness because of the presence of the Palm Springs Aerial Tramway facilities. The portion of the wilderness in the Plan area includes the high peaks of the San Jacinto Mountains, including 10,802-foot San Jacinto Peak, and some of the steepest, most rugged terrain in the continental United States. The northern escarpment plunges nearly two miles in steep cliffs and ridges to the San Gorgonio Pass below. Snowmelt infiltrating into the permeable soils at the higher elevations is an important source of water for springs at lower elevations. Runoff is also an important source of water for Snow Creek, Falls Creek, Willow Creek, and Tamarack Creek within the Plan area. Natural communities found within the State Park include Westside ponderosa pine forest, Southern California subalpine forest, Sierran mixed coniferous forest, black oak forest, interior live oak chaparral, and southern sycamore-alder riparian woodland. The Peninsular bighorn sheep may occasionally utilize the lower portions of the State Park. Only the lower portions of the State Park are included in the Santa Rosa and San Jacinto Mountains Conservation Area. There is potential for the California red-legged frog and the mountain yellow-legged frog to occur in the Park. The wilderness is among the most frequently visited wilderness areas in the nation because of its accessibility by the tram and via hiking trails from the Idyllwild area.

In 1985, the Resources Agency approved the Mount San Jacinto Wilderness Management Plan. Its focal point is maintaining opportunities for wilderness solitude and protecting natural resources. A wilderness permit system is enforced to manage the number of visitors to maintain a use rate within the carrying capacity of the area's natural resources. Camping is allowed only in designated zones or campgrounds. No open wood fires are permitted. Resources are monitored for impacts and overuse, and facilities are relocated and use areas closed as needed to alleviate impacts. Restoration activities are also undertaken as feasible. A new general management plan for the park is currently being prepared.

Oasis de los Osos (UCNRS). This is a 160-acre site at the base of the San Jacinto Mountains west of Palm Springs. It contains southern sycamore-alder riparian woodlands, interior live oak chaparral, semi-desert chaparral, and Sonoran creosote bush scrub. A year round stream and waterfall attract some unauthorized trespass but the area receives relatively little use. University Natural Reserve system staff occasionally monitor the reserve but there is no on-site management presence.

Table 8-6: Management Entities for Existing Conservation Lands in Reserve Management Unit 6

EXISTING CONSERVATION LANDS	MSHCP CONSERVATION AREAS	MANAGEMENT ENTITY
BLM Wilderness Areas ❖ Santa Rosa Mountains Wilderness Area	Santa Rosa and San Jacinto Mountains	❖ Bureau of Land Management
USFS Wilderness Areas ❖ San Jacinto Wilderness Area ❖ Santa Rosa Wilderness Area	Santa Rosa and San Jacinto Mountains	❖ US Forest Service
USFS Special Management Areas ❖ Garner Management Area ❖ Pyramid Peak Planning Area ❖ Pinyon Management Area	Santa Rosa and San Jacinto Mountains	❖ US Forest Service
Santa Rosa and San Jacinto Mountains National Monument	Santa Rosa and San Jacinto Mountains	❖ Bureau of Land Management ❖ US Forest Service ❖ Cooperative Management involves Agua Caliente Band of Cahuilla Indians, CDFG, California State Parks, local cities, CVMC
State Ecological Reserves ❖ Carrizo Canyon Ecological Reserve ❖ Hidden Palms Ecological Reserve ❖ Magnesia Spring Ecological Reserve	Santa Rosa and San Jacinto Mountains	❖ California Department of Fish and Game
Santa Rosa Mountains Wildlife Area	Santa Rosa and San Jacinto Mountains	❖ California Department of Fish and Game
Fish and Game District 4D (Game Refuge)	Santa Rosa and San Jacinto Mountains	❖ California Department of Fish and Game
Mount San Jacinto State Park/State Park Wilderness	Santa Rosa and San Jacinto Mountains	❖ California State Parks
University of California (UC) Philip Boyd Deep Canyon Desert Research Center	Santa Rosa and San Jacinto Mountains	❖ University of California Natural Reserve System
Rancho Mirage Conservation Easement	Santa Rosa and San Jacinto Mountains	❖ City of Rancho Mirage ❖ Coachella Valley Mountains Conservancy

Philip L. Boyd Deep Canyon Desert Research Center (UCNRS). Deep Canyon, as the Research Center is known locally, is located in the Santa Rosa Mountains, south of Palm Desert and east of Highway 74. It consists of 6,175 acres, all state owned. Cooperative use agreements on adjacent federal land cover an additional 10,400 acres. Biological resources include riparian woodland, desert dry wash woodland, Sonoran mixed woody and succulent scrub, and peninsular juniper woodland and scrub, and Habitat for Peninsular bighorn sheep and various bat species. Deep Canyon is open only to qualified users for teaching and research purposes.

Pyramid Peak Planning Area (USFS). The Pyramid Peak Management Area is located east of the Garner Management Area and northwest of the Pinyon Management Area. It covers 18,450 acres; the U.S. Forest Service manages approximately 15,390 acres, and approximately 3,060 acres are private. The entire Pyramid Peak Planning Area is within the Plan area, and forms part of the watershed of Palm Canyon. Biological resources include semi-desert chaparral, redshank chaparral, scrub oak chaparral, interior live oak chaparral, peninsular juniper woodland and scrub, and a small area of Habitat for the peninsular bighorn sheep. The Pacific Crest Trail traverses the western edge of the planning area. One grazing allotment occurs within the management area. Management systems and techniques, including fencing and water developments, are applied as needed to obtain relatively uniform livestock distribution and plant use and to maintain plant vigor. No attempt is made to maximize livestock forage production. Much of the area is highly rugged terrain and relatively inaccessible. The area was previously proposed for wilderness designation, but it was not so designated. Management emphasizes non-motorized recreation, range, and wildlife. Pursuant to a settlement agreement, the Forest Service has already agreed to eliminate cattle grazing in bighorn sheep Habitat. The lands within this planning area are shown generally as Existing Conservation Lands in Figure 8-2; the boundary of this area is not included in Figure 8-3.

Pinyon Management Area (USFS). The Pinyon Management Area is located west of the Santa Rosa Wilderness. It covers 24,870 acres, of which the U.S. Forest Service manages approximately 12,850 acres, and approximately 12,020 acres are private. All of it is within the Plan area. Biological resources include semi-desert chaparral, redshank chaparral, peninsular juniper woodland and scrub, and Habitat for the gray vireo and, in part, for the peninsular bighorn sheep. Rural residential communities, including Pinyon Flats, occupy a portion of the area. There are some mining claims in the area and a Forest Service campground. Highway 74 traverses the management area. Primary public use of Forest Service lands is for dispersed recreation. There are four management emphasis zones in this planning area: "watershed" applies to 6 0% of the area, "wildlife" to 15%, "custodial" (managed to protect existing facilities and resources, including wildlife) to 15%, and "recreation" to 10%. Prescribed burning and other treatments will be used on approximately 20% of the chaparral to enhance wildlife Habitat and range conditions. Under the Plan, the Forest Service will need to adopt management prescriptions to address the Conservation of the gray vireo and its Habitat. Pursuant to a settlement agreement, the Forest Service has already agreed to eliminate cattle grazing in bighorn sheep Habitat. The lands within this management area are shown generally as Existing Conservation Lands in Figure 8-2; the boundary of this area is not included in Figure 8-3.

Rancho Mirage Conservation Easement. These existing Conservation lands include approximately 1,200 acres owned by the City of Rancho Mirage with a Conservation easement

held by the Coachella Valley Mountains Conservancy. The lands within this Conservation easement are shown generally as Existing Conservation Lands in Figure 8-2; the boundary of this area is not included in Figure 8-3.

San Jacinto Wilderness (USFS). The San Jacinto Wilderness is in the San Jacinto Mountains southwest of the Coachella Valley and comprises 32,850 acres, of which approximately 28,558 acres are estimated to be in the Plan area. This wilderness is split into two units, one north, and one south of the Mt. San Jacinto Wilderness State Park. Ownership is approximately 27,078 acres federal, 637 acres water district (Desert Water Agency), and 843 acres of private lands. The northern unit is made up largely of the escarpment of San Jacinto Peak, some of the steepest and most rugged terrain in the nation. The southern unit includes the rugged headwaters of Andreas and Murray canyons and other desert canyons emanating from the ridgeline of the San Jacinto Mountains. The ridgeline is also known as the "Desert Divide" and forms the boundary of the Plan in this area. The Pacific Crest Trail follows the ridgeline through much of the wilderness, eventually descending in the Snow Creek area to cross under Interstate 10 to the San Bernardino Mountains. With the exception of a small amount of potential Habitat for the riparian birds, the San Jacinto Wilderness does not provide Habitat for the Covered Species. Biological resources include diverse natural communities. Management direction is to maintain long-term health and vigor, species diversity, and watershed stability, based on the regenerative potential of vegetation. Wilderness status provides access only for equestrians and pedestrians. There are no adopted fire management objectives for this area, nor is there a separate wilderness management plan. Under the San Bernardino National Forest Land and Resource Management Plan, wilderness is managed to provide for recreation opportunities, while maintaining wilderness resource values at a near pristine level.

Santa Rosa Mountains Wildlife Area (CDFG). In addition to the three ecological reserves in the Santa Rosa Mountains described above, the Department of Fish and Game also owns and manages approximately 24,880 acres of lands in the Santa Rosa Mountains as part of the Santa Rosa Mountains Wildlife Area. The Fish and Game Commission can establish regulations for the management of these lands.

Fish and Game District 4D. Lands from Palm Canyon east to La Quinta are designated as Fish and Game District 4D (Game Refuge). This includes all lands, public and private, within a described area from approximately the corner of Highway 111 and Highway 74 west to Palm Canyon, south along Palm Canyon to Omstott Creek, then southeast to Highway 74, south to include much of Horsethief Canyon, then north to Washington Avenue (old Marshall Street) in La Quinta, continuing north to Highway 111 and west to Highway 74. The game refuge was designated by the state legislature. It is illegal to take or possess any bird or mammal, or to be in possession of weaponry, such as firearms and bow and arrows, within the refuge, except under a permit or specific authorization. Thus, functionally, the refuge provides Habitat protection for all wildlife species on state lands within the game refuge.

Santa Rosa Wilderness (BLM). The BLM managed Santa Rosa Wilderness is located in the mountains south of the Coachella Valley. A portion of the wilderness is outside the Plan area. The portion within the Plan area encompasses approximately 68,216 acres, ownership of which is approximately 44,427 acres federal, approximately 8,886 acres private, and

approximately 14,903 acres state lands. Resource values include Habitat for peninsular bighorn sheep, possibly for the desert slender salamander, and for many bat species. The steep, rugged wilderness contains diverse Habitats that range from creosote bush scrub to desert fan palm oasis woodland to pinyon-juniper woodland and mixed conifer forest; these Habitats support mountain lion, bobcat, gray fox, coyote, ringtail, great horned owl, prairie falcon, and golden eagle. Visitor use includes day hiking on the Boo Hoff Trail and backpacking on the Cactus Springs Trail, which enters the adjacent U.S. Forest Service's Santa Rosa wilderness (See management discussion under San Gorgonio Wilderness, above). The area is managed under the provisions of the 1964 Wilderness Act, the 1994 California Desert Protection Act, and all applicable laws, regulations, and policy. Wilderness management plans have not yet been initiated for wilderness areas designated in the 1994 California Desert Protection Act. The wilderness is also included in the Santa Rosa and San Jacinto Mountains National Monument designated in October 2000. The area will continue to be managed as wilderness under the national monument designation.

Santa Rosa Wilderness (USFS). The Santa Rosa Wilderness lies in the Santa Rosa Mountains south of the Coachella Valley. The wilderness is 20,160 acres in extent, all but a few hundred acres of which are in the Plan area. Ownership is 19,313 acres federal and approximately 237 acres private lands. Biological resource values include diverse natural communities such as Sonoran mixed woody and succulent scrub, peninsular juniper woodland and scrub, and Jeffrey pine forest. They also include Habitat for the peninsular bighorn sheep and gray vireo. The wilderness also includes the upper portion of the Deep Canyon watershed (see Section 2.5.7). To the north, east, and south, this wilderness is contiguous with the BLM Santa Rosa Mountains Wilderness. Public use is generally centered on the Cactus Springs Trail. Management direction is generally the same as for the San Jacinto Wilderness except that appropriate areas of the Santa Rosa Wilderness are to be managed for protection of the peninsular bighorn sheep in coordination with CDFG and BLM. There are no adopted fire management objectives for this area, nor is there a separate wilderness management plan. Under the San Bernardino National Forest Land and Resource Management Plan, wilderness is managed to provide for recreation opportunities, while maintaining wilderness resource values at a near pristine level. Under the Plan, the Forest Service will need to adopt management prescriptions to address the Conservation of the gray vireo and its Habitat. Pursuant to a settlement agreement, the Forest Service has already agreed to eliminate cattle grazing in bighorn sheep Habitat.

Santa Rosa and San Jacinto Mountains National Monument (BLM/USFS). This new national monument includes BLM and U.S. Forest Service lands in the Santa Rosa and San Jacinto Mountains. Much of the area south of Highway 74 is also within the Santa Rosa Mountains Wilderness. The Santa Rosa and San Jacinto Mountains National Monument includes a total of 150,800 acres of federal land, including 86,400 acres of BLM land and 64,400 acres of National Forest land. Also included within the boundary, but not affected by the federal designation, are 31,400 acres of Agua Caliente Band of Cahuilla Indians land, 43,000 acres of state lands (California State Parks, University of California, California Department of Fish and Game, Coachella Valley Mountains Conservancy), and 55,200 acres of private land. The U.S. Forest Service and the BLM are partners in the management of this national monument, including the preparation of a management plan within three years, to ensure protection of the resource values that the Monument was created to protect. The draft Monument Plan was

released in March 2003 and a final plan was issued in October 2003. The BLM lands are classified as Class "L," Limited, in the CDCA Plan. A citizen's advisory committee, the Monument Advisory Committee (MAC) is involved to help guide management of the monument. As part of their implementation responsibilities under the Plan, BLM and the U.S. Forest Service would ensure consistency between the national monument management plan and the Coachella Valley Multiple Species Habitat Conservation Plan/Natural Communities Conservation Plan.

8.2.4 Proposed Management

The implementation of management actions for Reserve Lands will integrate management of Existing Conservation Lands with Additional Conservation Lands. This section describes a framework for development of proposed management prescriptions, a process for their evaluation, and implementation of Adaptive Management actions on Reserve Lands. Management actions are subject to the Adaptive Management approach in that they will be evaluated and modified based on feedback from the Monitoring Program. However, some general management actions, or ongoing management actions, have already been identified as necessary for the integrity of the ecosystems, and the Covered Species and natural communities they protect and will be included in the Reserve Management Unit Plans. These ongoing management actions are described below. Section 8.4 includes specific discussion of management of natural communities.

The Reserve Land Manager, the public or private land management agency, and/or the Reserve Management Unit Committees with input from the Reserve Management Oversight Committee, will initiate proposed management actions that are identified on the Reserve Lands. While each agency with land ownership within the Conservation Areas will have ultimate responsibility for managing its land, implementation of the Plan will reinforce the existing close coordination and cooperation in management of reserve areas. This coordinated management approach also incorporates feedback from the Monitoring Program.

8.2.4.1 General Ongoing Management

Within the Reserve Lands, ongoing management actions will include:

1. Control of Habitat disturbance from unauthorized OHV use or vehicle trespass by installation of signage, fencing, and gates; patrolling; law enforcement; installation of barriers.
2. Prevention of Habitat disturbance from unauthorized dumping, including removal of non-organic debris and installation of barriers, gates, and fences.
3. Control of disturbance from sand and gravel mining, road widening, illegal berming, and drainage diversions that may in the future, affect the structure and function of wash and canyon Habitats.
4. Control of non-native or invasive species.

a. Control of tamarisk. Tamarisk is an exotic pest plant that competes with native species and reduces the Habitat value for Covered Species including Peninsular bighorn sheep, least Bell's vireo, and other riparian birds. A program to control tamarisk has already been implemented in many areas on Existing Conservation Lands (Thousand Palms Preserve, Dos Palmas Preserve/ACEC, Carrizo Canyon Ecological Reserve, and Deep Canyon Desert Research Center in the Santa Rosa and San Jacinto Mountains Conservation Area). This invasive species control project is considered ongoing management because the need for tamarisk eradication and the techniques to accomplish it have already been determined.

b. Control of cowbirds in riparian areas. Surveys done for the Monitoring Program in spring 2003 determined that cowbirds are present in all areas where riparian birds nest. Methodologies for cowbird control are well established and will be implemented in riparian Habitat areas when needed.

c. Control of bullfrogs, crayfish, and exotic fish species that may adversely impact rail, arroyo toad, and pupfish.

(1) For the pupfish, measures identified in Section 9.4.1.2 shall be implemented to control exotic fish species.

(2) If control of crayfish in Yuma clapper rail habitat within Conservation Areas is necessary for any reason, the establishment of other suitable prey for the Yuma clapper rail shall be evaluated by the CVCC, CDFG, and the USFWS consistent with Section 9.7.1.2.

d. Control of other species that may adversely impact Covered Species or natural communities.

5. Ensure the compatibility of activities, and any restrictions on those activities, allowed within Conservation Areas with the Conservation of species, Habitats, natural communities, and their associated ecological functions.

6. Maintain active and intact hydrological regimes in Conservation Areas to retain sand transport systems, other Essential Ecological Processes, and Habitat features for Covered Species and natural communities.

7. Maintain and manage wetland Habitats, which provide Habitat for riparian birds and other Covered Species on Reserve Lands, to ensure no net loss, including for the remaining acreage of the natural communities where disturbance is authorized by the Plan. This applies to mesquite hummocks, marsh, and riparian natural communities.

8. Only utilize pesticides or other toxic chemicals when absolutely necessary to carryout management actions identified in the Management Plans or as part of an Adaptive Management action.

9. Restrict human access to unoccupied Habitat during the emergence period for Covered insect Species and during the breeding and nesting season for other species.

10. Grazing should only be used as a response to an Adaptive Management plan.

11. Prevent poaching or illegal collection of Covered Species and other desert organisms including reptile and cactus species.

12. To the extent activities are under Plan authority, maintain water levels, water quality, and proper functioning condition of seeps, springs, marshes, and wetlands.

13. Conserved populations of Covered Species shall be protected from edge effects, from OHV impacts, and from any activities that may result in disturbance to them.

14. If the USFWS or CDFG provides written notice to the CVCC or Local Permittee that Peninsular bighorn sheep are using artificial sources of food or water in unfenced areas of existing urban Development within or near a Conservation Area, the CVCC (unless otherwise agreed to by the applicable Local Permittee) shall cause to be constructed a barrier to sheep access to cure the problem within 2 years of such notice. The location of this barrier (i.e., an 8-foot fence or functional equivalent) shall be determined by CVCC based on its ability to obtain permission/access to the necessary lands. If placement of a barrier must occur on other public lands (e.g., BLM, CDFG), CVCC will coordinate with these other agencies as appropriate.

15. Should a bighorn sheep subgroup population (as determined by the recovery team) drop below five or fewer ewes due to unknown cause-specific mortality, a temporary moratorium on all non-emergency discretionary Covered Activities will be instituted in the subgroup area. The RMOC will review data and determine appropriate follow-up management action.

These management activities will be implemented on Reserve Lands and the RMOC will work with the federal land managers in the Plan Area to implement similar measures on their lands. These management actions will be evaluated to determine their efficacy for helping meet the Conservation goals for Covered Species. Ongoing management activities such as Habitat perimeter fencing and signing may need to be evaluated through the Monitoring Program.

An initial baseline assessment of newly acquired lands will be undertaken within the first three years of their addition to the MSHCP Reserve System. The baseline assessment will include a general characterization of existing Habitat conditions, species presence and diversity, presence of threats, and general identification of management issues. The assessment will be included in the Monitoring Program database and provided to the RMOC. Existing baseline data will be used for the Existing Conservation Lands and will be augmented by new data collected in the Monitoring Program.

8.2.4.2 Management Contingency Fund

The CVCC will establish a $5 million dollar management contingency fund as a subset of the Monitoring and Management Program budgets. The purpose of this fund is to provide the ability to address immediate and/or large-scale Monitoring and Management Program needs on Permittee lands. As described in Section 6.6.3, state and federal agencies are responsible for addressing these contingencies on their lands. The management contingency fund will be established within the first ten years. This fund shall be used when monitoring results and/or other information indicate that corrective actions to address these management priorities are needed to achieve the goals and objectives for Covered Species. The process for determining specific expenditures from this fund will involve identification of needs, a work

plan with actions necessary to address them, and a budget by the Land Manager and the appropriate RMUC(s). These recommendations will be reviewed by the RMOC. The RMOC will make recommendations to the CVCC; a decision will by made by the CVCC with concurrence from the Wildlife Agencies. These actions will be designed, implemented, monitored, and revised based on the best available science and an Adaptive Management approach. Management needs to be addressed by use of this Fund are those that are impacting the sand dependent Covered Species, in particular Coachella Valley fringe-toed lizard, Coachella Valley milkvetch, flat-tailed horned lizard, and Coachella Valley round-tailed ground squirrel.

8.2.4.3 Adaptive Management

Adaptive management was pioneered by Holling (1978) and has since become both a popular and controversial (Johnson 1999) component of Conservation strategies. In its simplest form, Adaptive Management is "learning by doing" (Walters and Holling 1990). More specifically, Adaptive Management is the application of the scientific method to management strategies. It requires the development of management objectives and a formal recognition of uncertainties surrounding management decisions. A key element of Adaptive Management is the establishment of testable hypotheses linked to the conservation strategies and their biological objectives (USFWS, HCP Handbook 1996). The hypotheses are tested with the commencement of the management options, results are quantified and analyzed, and uncertainty reduced. Hypotheses are restated, and the process repeated until goals are met or uncertainty reduced sufficiently. The Plan will utilize Adaptive Management strategies as applicable throughout the Reserve System.

Adaptive Management can range from an experimental approach which involves monitoring response of identified factors to a treatment where a control area is also evaluated to a broader view where monitoring is conducted within the context of hypothesis testing (Walters and Holling 1990, Holling 1999, Johnson 1999) to determine the effect of management. Hypotheses are proposed based on insights derived from conceptual models.

The Management Program will address management uncertainty, including the following issues:

1. Management action as indicated by the results of the Monitoring Program in regard to unanticipated changes in the needs of individual species or groups of species, or natural communities, or processes including fluvial and aeolian transport and sorting of sand.
2. Reserve and species management techniques and actions.
3. Enhancement of the Conservation values of lands in the MSHCP Reserve System.
4. Management actions to address Changed Circumstances as described in Section 6.8.3.

Figure 8-4 illustrates the integration of the Monitoring and Management Programs, including Adaptive Management. Linking the Monitoring Program with Adaptive Management actions will inform reserve managers of the status of Covered Species, natural communities, and Essential Ecological Processes, as well as the effectiveness of management actions, in a

manner that provides data to allow informed management actions and decisions. Existing information about Covered Species life history and natural community and ecosystem function, together with current understanding of likely responses to management actions and pressures (i.e. stressors, causes of change) will be used extensively in designing the initial Management Program for each Conservation Area. For example, the impacts of unrestricted off-highway vehicles have been sufficiently identified (Lukenbach and Bury 1983) and the means for restricting vehicle trespass have been identified and evaluated. Identified off-highway vehicle control measures will be incorporated into the Reserve Management Unit Plans. These measures will still be evaluated to determine the response of Covered Species and natural communities from their implementation.

In this example, the need for additional knowledge is relatively low compared to the known severity of impacts and therefore management actions would be initiated without delay. This end of the Adaptive Management spectrum is sometimes referred to as "passive adaptive management" (Walters and Holling 1990). Other ongoing management actions might also fit under this description.

Where "new" information is required or desired about the nature of a threat, "active adaptive management" (Walters and Holling 1990) may be appropriate. Management activities about which there is uncertainty regarding application or outcomes should be designed as experiments to increase understanding of the system and the effectiveness of management (Atkinson et al. 2004). In this scenario, clear hypotheses are developed and tested to determine if the null hypothesis should be rejected. When the viability of natural communities and Covered Species are threatened, Adaptive Management actions must be implemented to eliminate or control those perturbations. For previously untested active management strategies, an experimental approach will be used. Control of an invasive species, or other management actions, may have non-target impacts and so need to be developed carefully with a rigorous experimental design. For instance, not all exotic organisms have a negative impact on natural systems. Alternatively, exotic ant infestations appear to have negative impacts that cross several trophic levels (Suarez et al. 1998).

Figure 8-5 depicts the Adaptive Management process. The first step in the development of an Adaptive Management approach is to explicitly state the Conservation Goals and Objective to be achieved. Next, uncertainty in ecological system function is captured as hypotheses, which may be stated as either mathematical or conceptual models, using best available information and Monitoring Program results. Conceptual models can help identify and develop hypotheses about potential stressors, knowledge gaps, or other sources of uncertainty. Using models, predictions can be made about how each stressor or management option will impact the Covered Species, natural communities, and associated ecological processes. Each model is evaluated to identify a conservation strategy, followed by an implementation approach involving management actions and monitoring. Monitoring measures change in response to management actions. Once data are collected, and the findings are analyzed, the model can be updated incorporating the new data. If the Conservation Objectives were not obtained by the Adaptive Management action(s) the process becomes iterative. Models with little empirical support may be excluded from future consideration, and new models may be added as ecological learning occurs.

An active Adaptive Management strategy utilizes an experimental approach to address the need for new knowledge about the nature of a threat, or the affect of a variable, or a new active management strategy or to reduce uncertainty about an ecological question. Active Adaptive Management strategies need to be considered carefully. Within a multiple species Conservation strategy, Habitat manipulations that are designed to enhance a particular species could easily have detrimental impacts to other species; these impacts may include direct interactions among species. For example, there is substantial overlap between the various aeolian sand species, and in a natural, dynamic site, species will select the areas most favorable for meeting their ecological requirements. However, if reserve managers (or natural stochastic processes) manage for a static system which does not provide for variability in the aeolian Habitat certain species may thrive while others do not. Adaptive Management objectives will be carefully crafted such that the individual species objectives for sympatric species are jointly considered.

Another caution about the use of a manipulative, experimental approach is that these results may not represent the cause and response in natural complex habitat conditions. Altering an arguably natural habitat to one that requires anthropogenic input and control could include the loss of the "natural" character of that habitat and be costly to maintain. When the viability of Habitats and species are threatened, Adaptive Management actions must be implemented to eliminate or control those perturbations.

Ultimately, the acquisition of sufficient ecological knowledge to understand critical pathways and processes and the implementation of actions based on that information are necessary to ensure the Conservation of the Covered Species and natural communities in the Plan Area. This knowledge will be gained through passive or active Adaptive Management and the Monitoring Program. Adaptive Management treats management actions as experiments and utilizes a monitoring strategy to evaluate the actions thereby allowing a Management Program to proceed without complete knowledge of the species or processes. In this way, management actions will increase the knowledge base and result in providing for the Conservation of the Covered Species. A conceptual model of the Adaptive Management approach is shown in Figure 8-5. Specific Adaptive Management issues are described in Section 8.4.

8.2.5 Ecosystem Models

Conceptual models state what is currently believed about the components and natural functioning of a system, beneficial variables, and how it responds to perturbations (Woodward et al. 1999, Hardesty et al. 2000). Here the use of a conceptual model approach is applied to the ecosystems within the MSHCP Reserve System. A model will always be imperfect, although it will improve as additional information on how the system works becomes available. Even without further refinements, models provide a basis for discussion and critique by other ecologists familiar with a system (Salafsy et al. 2002, Kendall 2001). Conceptual models provide a basis to develop hypotheses about the assumptions regarding the relative importance of various processes, and/or threats which may affect Covered Species and their Conservation. In this manner, the conceptual models evolve and help inform the Monitoring and Management Programs.

By monitoring multiple species simultaneously, a better understanding of how individual species react to the same management actions is obtained. Models that will be utilized will strike a balance between being sufficiently complex to capture the hypothesized dynamics of a community while not being too complex to understand what factors are important to understanding the system. The models in the Plan (preliminary conceptual models are presented in the discussions of community level monitoring and management in Section 8.4.) are stress-response models except for the two process models (e.g. sand processes). In the stress-response scenario, stressors, or threats, are generally aligned along the left tier of the model. The central tier generally represents Habitat responses, while the right side tier contains responses of the Covered Species. Models will ultimately incorporate beneficial variables.

The Adaptive Management approach requires a close linkage between the Monitoring and Management Programs. Linking changes in species and Habitat metrics with potential causative agents is essential in helping managers formulate management options for their implementation. These data will also stimulate research, which will feed back into improving the accuracy of the conceptual ecosystem models and improving the efficacy of the Monitoring and Management Programs.

Figure 8-4: Integration of the Monitoring Program and the Management Program

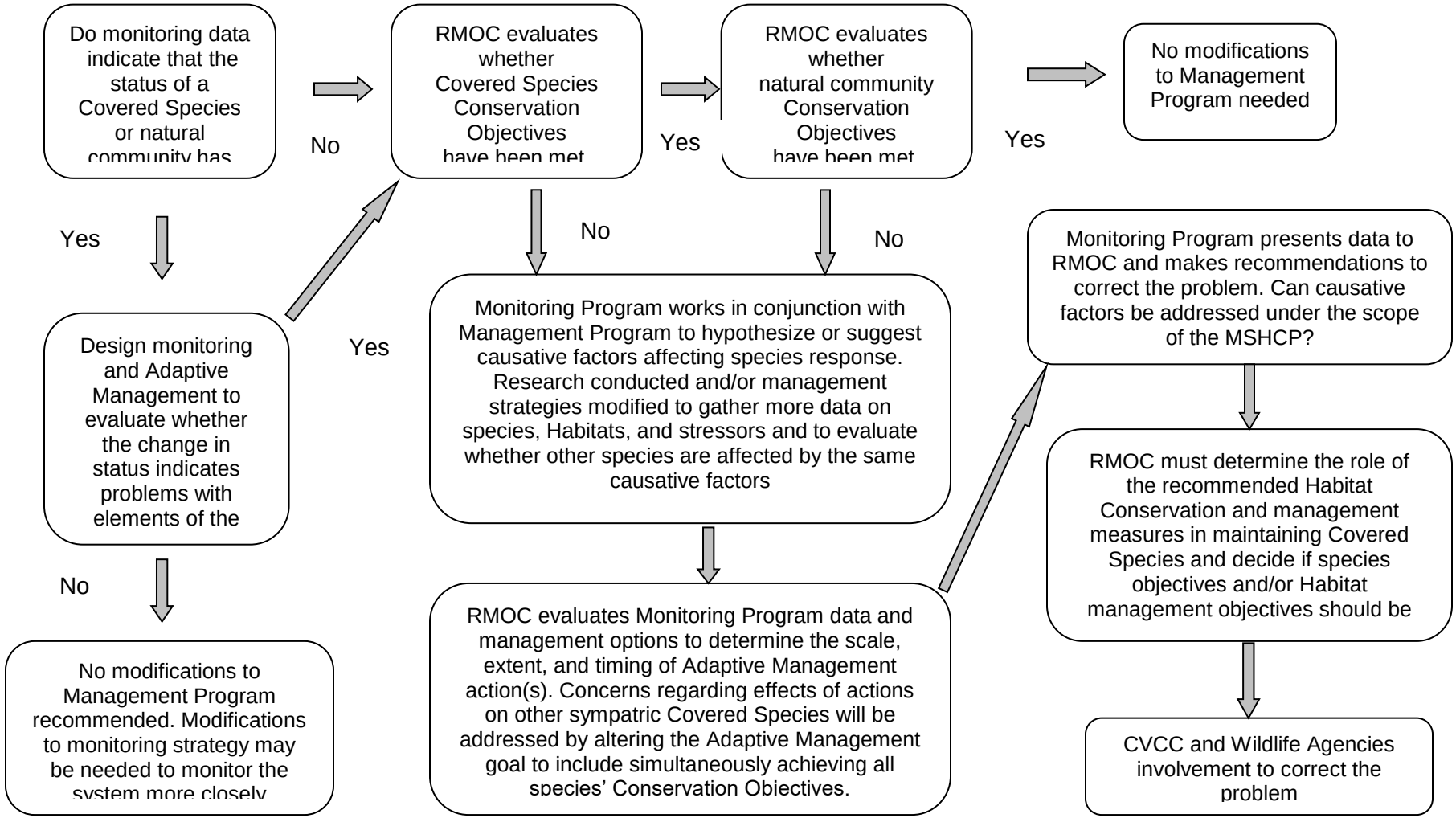
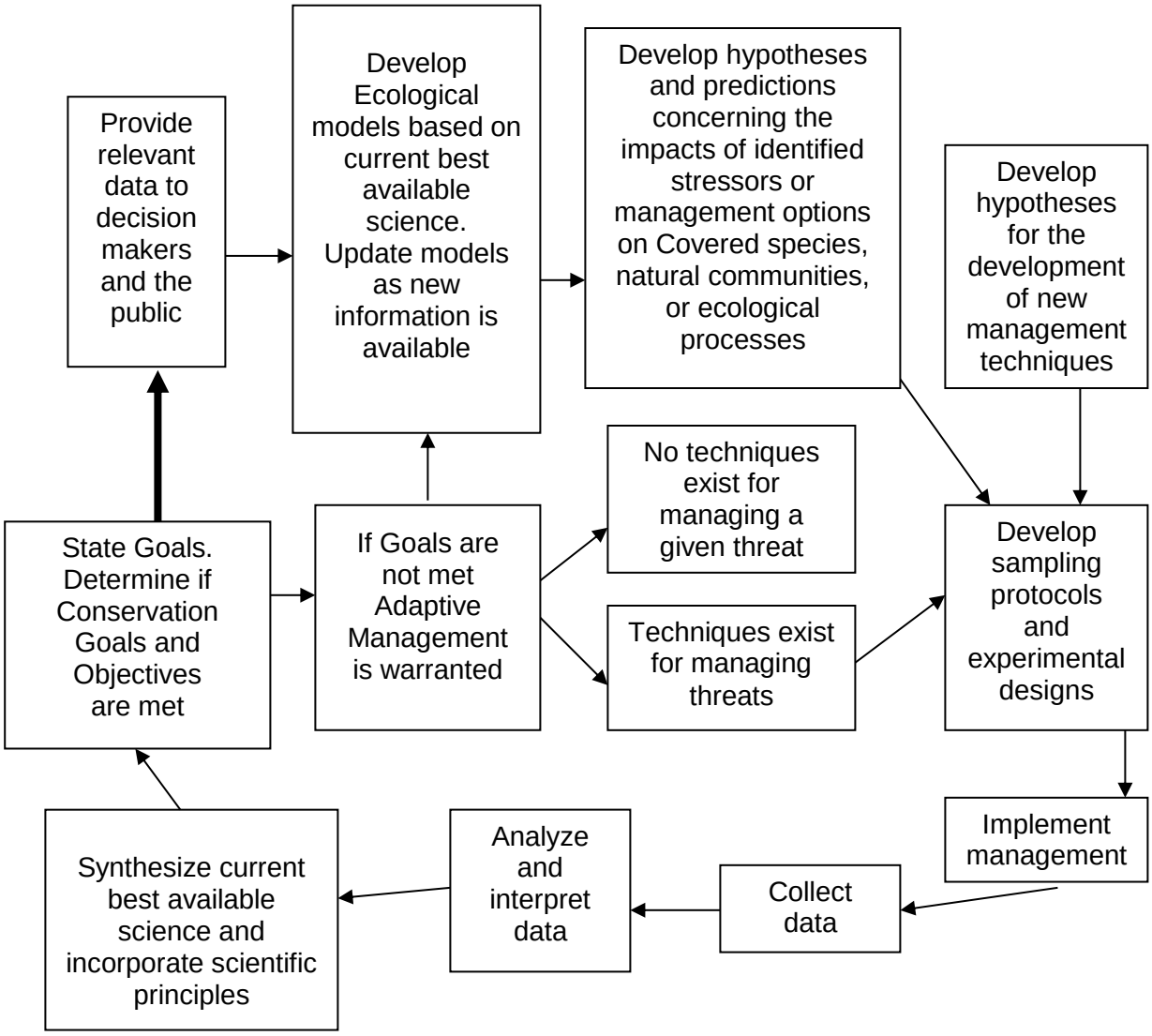


Figure 8-5: Adaptive Management Conceptual Model

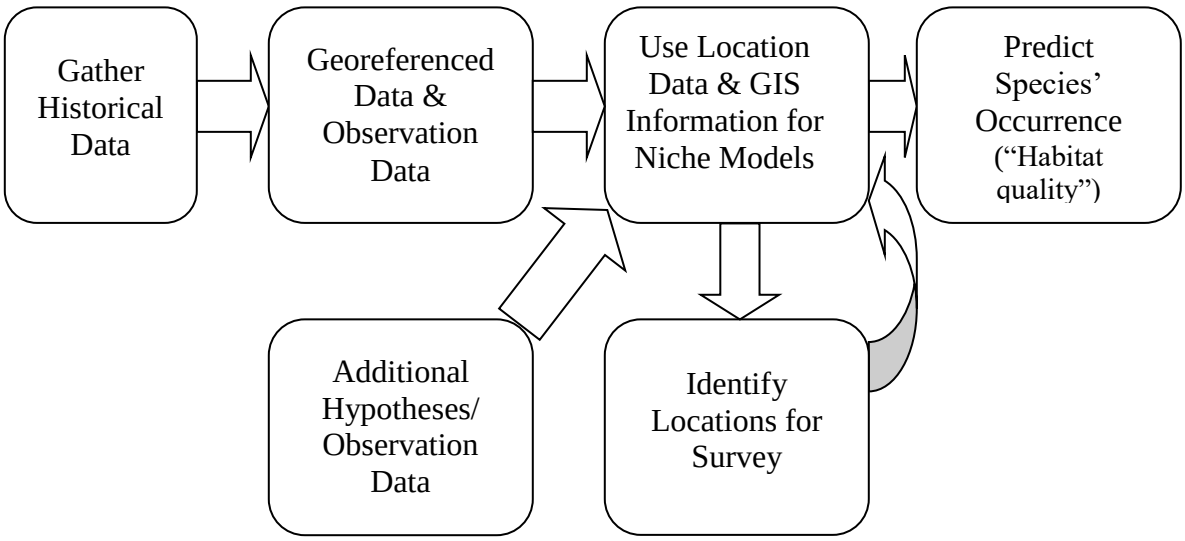


8.2.5.1 Habitat/Niche Models

Niche modeling will involve the development of models to predict species' population distributions and occupancy, and assess trends. This process involves developing GIS-based models based on Habitat associations of the Covered Species (see papers in Scott et al. 2002). These models will be used to predict the likelihood of a species' occurrence (i.e., estimate "Habitat quality") for any point within the Plan area. Models will be developed that are based on *a priori* hypotheses about causal relationships between the organism and variables in the landscape. For GIS-based models, the variables that can be used are those that can be supported by biological theory and are generally those that can be generated directly or calculated from

GIS layers, which may include vegetation/natural communities, soils, elevation, and other Habitat or niche elements. The intent is also to be able to integrate a wider variety of threats to species or communities of interest. The general process for development of niche models is illustrated in Figure 8-6. More detail on the methodologies being tested for niche models is provided in Section 8.0 of Appendix I.

Figure 8-6: Development of Niche Models from Baseline Survey Data and GIS Habitat Parameters



8.3 Monitoring for the MSHCP Reserve System

The Monitoring Program details will be added as additional baseline information is collected and will occur utilizing the organizational structure for Plan implementation, which is summarized here and described in detail in Section 6.0. The Monitoring Program Administrator, selected by the CVCC, shall be responsible for implementation of the Monitoring Program with oversight from the CVCC and the Reserve Management Oversight Committee (RMOC) (See Section 6.1.3 and 6.1.6). The Monitoring Program Administrator will coordinate with the Land Manager (See Section 6.1.5), and the Reserve Management Unit Committees (RMUC) in evaluation and interpretation of the monitoring data and identification of future monitoring needs. Coordination between the Monitoring Program and land managers will occur through both direct contacts between the individuals of the programs and through the RMUCs and RMOC. The elements of the annual reports prepared by the Monitoring Program Administrator are described in Section 8.7. The involvement of Independent Science Advisors will also be available to provide input relevant to scientific issues for the Monitoring Program.

8.3.1 Current Monitoring on Existing Conservation Lands

Monitoring efforts have been ongoing on some of the existing Conservation lands, in some cases for many years. These monitoring efforts contribute to the base of knowledge used to develop this Monitoring Program. Table 8-7 summarizes the monitoring efforts that were initiated prior to the development of this Plan by various land management entities and their cooperative partners. Table 8-8 describes monitoring efforts initiated in spring 2002, to evaluate protocols to be used in the implementation of this Monitoring Program. The 2002-2005 effort involved University of California Riverside, Center for Conservation Biology, and CVAG, and was funded by an NCCP Local Assistance grant from CDFG.

Table 8-7: Current Monitoring on Existing Conservation Lands

COVERED SPECIES **CONSERVATION AREA**	**CURRENT MONITORING**	**PARTICIPATING ENTITIES**
CV Fringe-toed Lizard [1] ❖ Whitewater Floodplain	Annual Monitoring since 1985 of marked individuals on 2.5 ha plot; 2 x per week, March – Oct.	❖ University of California Natural Reserve System
CV Fringe-toed Lizard *CV Milkvetch* *CV Round-tailed ground squirrel* ❖ Whitewater Floodplain ❖ Willow Hole ❖ Thousand Palms ❖ Snow Creek	Annual Monitoring since 1986 of 3 species along 1000 m x 10 m belt transects; 6 visits to each site from May to June, again from September to October. Two transects at Thousand Palms, 1 each at Whitewater Floodplain and Willow Hole 2002 Estimation of proportion of modeled Habitat in Thousand Palms, Whitewater Floodplain, Willow Hole, and Snow Creek occupied by CV ground squirrel	❖ Center for Natural Lands Management (Nature Conservancy prior to 1997) with assistance from: ❖ Bureau of Land Management ❖ Calif. Dept. of Fish & Game ❖ Calif. State Parks ❖ USFWS ❖ Volunteers
Desert Pupfish ❖ Coachella Valley Stormwater Channel & Delta ❖ Dos Palmas	Annual monitoring of pupfish in CVWD drains Annual monitoring of pupfish in Dos Palmas ponds	❖ California Dept. of Fish and Game
California Black Rail *Yuma Clapper Rail* ❖ Coachella Valley Stormwater Channel & Delta ❖ Dos Palmas	Monitoring of presence and distribution	❖ California Dept. of Fish and Game
Peninsular Bighorn Sheep ❖ Santa Rosa & San Jacinto Mountains	Helicopter surveys (abundance, distribution, lamb/ewe ratios) Monitor water sources, presence of water sources, guzzlers 30% of Northern Santa Rosa ewe group is radio collared. CDFG does monthly telemetry flights plus 2 times weekly relocation on ground – survivorship, reproduction If mortality occurs, retrieval to determine cause of death	❖ California Dept. of Fish and Game (approx. every other year) ❖ Bighorn Institute [1]

[1] This monitoring activity will continue independently of and at no cost to the Plan.

Table 8-8: Initial Monitoring on Existing Conservation Lands to Evaluate Protocols for MSHCP Monitoring Program

COVERED SPECIES **CONSERVATION AREA**	**CURRENT MONITORING**	**PARTICIPATING ENTITIES**
TRANSECT SAMPLING		
CV Fringe-toed Lizard *CV Giant Sand-treader Cricket* *CV Jerusalem Cricket* *CV Milkvetch* *CV Round-tailed ground squirrel* *Flat-tailed Horned Lizard* ❖ Snow Creek/Windy Point ❖ Whitewater Floodplain ❖ Willow Hole ❖ Thousand Palms	Test monitoring in 2003 of 6 species along 100 m x 10 m belt transects; 6 visits to each site from May to June, again from September to October. Ongoing monitoring of these transects for all species (2003 – 2007)	❖ Center for Natural Lands Management (field surveys) ❖ California Dept. of Fish and Game (funding) ❖ University of California Riverside, Center for Conservation Biology (design and field surveys) ❖ Volunteers (field surveys)
Palm Springs Pocket Mouse ❖ Snow Creek/Windy Point ❖ Whitewater Floodplain ❖ Willow Hole ❖ Thousand Palms	Trapping along transects in appropriate Habitat during summer 2003, 2006/2007	❖ University of California Riverside, Center for Conservation Biology ❖ California Dept. of Fish and Game (funding)
Riparian Birds ❖ Upper Mission Creek ❖ Whitewater Canyon ❖ Willow Hole ❖ Santa Rosa & San Jacinto Mountains (Chino Cyn) ❖ Thousand Palms (incl. Pushawalla Cyn) ❖ Dos Palmas ❖ Coachella Valley Stormwater Channel	April to July 2003 Point counts in appropriate Habitat (presence/absence) to refine distribution models, Habitat parameters Quantify threats as potential correlates of distribution (brown-headed cowbirds)	❖ University of California Riverside, Center for Conservation Biology ❖ California Dept. of Fish and Game (funding) ❖ Center for Natural Lands Management (field surveys)
INDIVIDUAL SPECIES SAMPLING (2002-2007)		
Coachella Valley Milkvetch ❖ Snow Creek/Windy Point ❖ Whitewater Floodplain ❖ Willow Hole ❖ Thousand Palms	March to September 2003-2007 Revisit known occurrences to determine if species is extant at site, if suitable Habitat remains.	❖ University of California Riverside, Center for Conservation Biology ❖ California Dept. of Fish and Game (funding)
Triple-ribbed Milkvetch *Little San Bernardino Mountains Linanthus* ❖ Whitewater Canyon ❖ Upper Mission Creek/Big Morongo Canyon ❖ Mission Creek/Morongo	Characterize plant community for distribution modeling and invasive species impacts	❖ University of California Riverside, Center for Conservation Biology ❖ California Dept. of Fish and Game(funding)
Crissal Thrasher *Le Conte's Thrasher* ❖ Willow Hole ❖ Thousand Palms ❖ Desert Tortoise & Linkage ❖ Dos Palmas	April to June 2003-2007. Baseline surveys to refine distribution models, determine Habitat correlates, revisit known occurrences	❖ University of California Riverside, Center for Conservation Biology ❖ California Dept. of Fish and Game (funding)

COVERED SPECIES **CONSERVATION AREA**	**CURRENT MONITORING**	**PARTICIPATING ENTITIES**
❖ Coachella Valley Stormwater Ch.	Test different sampling strategies for detection of Le Conte's thrasher	

TABLE 8-8 (CONT.)

COVERED SPECIES **CONSERVATION AREA**	**CURRENT MONITORING**	**PARTICIPATING ENTITIES**
CV Jerusalem Cricket ❖ Cabazon ❖ Snow Creek/Windy Point ❖ Hwy 111/I-10 ❖ Whitewater Canyon ❖ Whitewater Floodplain ❖ Willow Hole	December to April 2002-2007. Live trapping to extend and refine knowledge of species range and biology, test different sampling designs.	❖ University of California Riverside, Center for Conservation Biology ❖ California Dept. of Fish and Game (funding)

8.3.2 Scientific Principles

The "Five Point Policy Guidance" (FR 65, 106, page 35242, June 1, 2000) states: "In order to obtain meaningful information, the applicant and the Services should structure the monitoring and standards so that we can compare the results from one reporting period to another period or compare different areas, and the monitoring protocol responds to the question(s) asked." In addition, it states that, "The monitoring program will be based on sound science."

The Monitoring Program will employ a set of scientific principles that will establish the standard for collection, analysis, and interpretation of data generated in this program. These principles will ensure a program that is scientifically rigorous, question-based, and with the strongest inference possible. These principles will also ensure that monitoring efforts efficiently provide data that are relevant and enable valid comparisons between populations separated by distance and time.

1. Define the question. Monitoring strategies will be designed to address specific hypotheses. Conceptual, statistical, and spatially explicit models will define those hypotheses.
2. Define the area, also known as the target population, and create a sampling frame to which the statistical inference will be made.
3. Develop and state the assumptions in the hypotheses and models *a priori* to collecting monitoring data or conducting manipulations such as experiments and adaptive management.
4. When designing an experiment or using adaptive management, randomly select the units, randomize the allocation of treatments to the units, and use controls.
5. Use probability-based sampling to allocate sampling effort and incorporate spatial variation in the data. Using probability-based sampling allows unbiased inferences to the larger area (Morrison et al. 2001, Atkinson et al. 2004).
6. Replicate in space and time the number of sites surveyed during monitoring (e.g. survey sampling) and those receiving a treatment/management action.

7. Adjust the sensitivity of the data to reflect true changes in the resource being sampled. Adjust counts, measures of species richness, and patch occupancy (i.e., presence/absence) with an estimate of detection probability, such as those described by Lancia et al. (1994), Yoccoz et al. (2001), and Pollock et al. (2002)
8. Describe the methods and the assumptions of the methods used to collect and analyze data.

Useful insight and recommendations for the development of sampling designs are provided in Atkinson et al. (2004).

8.3.3 Baseline Phase of Monitoring Program

Initially the Monitoring Program will gather baseline data for all Covered Species. This task is large and complex, given the ecology of the Covered Species and the complexity of their Habitats. Sampling designs and implementation will be consistent with the Scientific Principles. With few exceptions, additional knowledge about effective sampling methods, site-specific distributions, and species' natural history parameters is needed to design proven monitoring protocols for the Covered Species. The Plan area has highly variable climates, large fluctuations in plant productivity, and subsequently large fluctuations in animal species' populations. The primary objective of the baseline phase will be to conduct baseline surveys and to develop and test methods and protocols. *A priori* hypotheses about the factors affecting the distribution of species can be tested during the surveys. The baseline phase will test methods to aggregate these species in a manner that increases monitoring efficiency. The baseline phase will also be used to assess the potential for integration of monitoring for species, natural communities, and ecological processes. Even after the baseline phase is completed, protocols will undoubtedly evolve with improved technologies. Some of the initial hypotheses utilized in the development of the Monitoring Program are included in Section 8.4 for each of the natural community assemblages. The baseline phase will be conducted during the first five years.

Baseline monitoring will also attempt to distinguish between natural fluctuations in population size and those with anthropogenic causes. Identifying thresholds for management actions without the ability to separate the effects of natural fluctuations from anthropogenic threats can be problematic.

An additional objective during this first phase will be to determine if certain Covered Species, Habitat level variables, or landscape metrics can serve as effective surrogates, umbrella species, or other indicators, for species groups or associations within natural community assemblages. This would be determined by analyzing data that test the assumption that there is a predictable mathematical relationship between the indicator and the variables of interest (i.e., Covered Species). Partially or completely meeting this objective could significantly reduce monitoring costs without losing critical information necessary to manage and protect the species and communities included in the MSHCP Reserve System.

8.3.4 Monitoring at Multiple Scales

The body of scientific literature on ecological monitoring is largely focused on individual species. More recently, several authors have addressed the challenges of monitoring multiple species (Atkinson 2004, Barrows et al. 2005). Williams et al. (2002) provided several examples of how to estimate species richness and manage for competing species requirements. The intent here is to create a system that is flexible enough to adjust to each species situation, but is formal enough to allow evaluations of entire preserves -- an ecosystem approach. The following sections describe the general parameters of a hierarchical approach involving landscape, natural community, and species-level monitoring.

Threat monitoring is woven into the framework at all levels of monitoring. Threats operate at different and often multiple scales concurrently, including landscapes, natural communities, and in the case of diseases, at the level of individual species. Known threats are identified in the conceptual models; potential new threats will be identified as scientists evaluate monitoring data, recent literature, and report their field observations from the Plan area. During field surveys, biologists will identify opportunities for enhancement of variables that benefit species, for example availability of food or roost sites.

8.3.4.1 Species Level Monitoring

Species-level monitoring will provide data on the extent to which Conservation Goals for species are being met. Species monitoring will involve tracking Covered Species and invasive species that may pose a threat to Covered Species. It will also involve collecting information on the ecology of species to better manage them and increase the probability of Conservation. This monitoring needs to sample in both space and time, to address both distribution and trends in Covered Species. It also tracks species responses to resource fluctuations and the level at which threats are affecting species.

Monitoring will serve to test hypotheses regarding mechanisms controlling the distribution of species, groups of species, and as a means to track the response of resources to management actions and experiments. Monitoring needs to provide scientifically defensible estimates of status and trends in Covered Species and Natural Communities and determine whether they are being sustained by management practices. This integration of monitoring results and management actions is an essential element of Adaptive Management. In addition to species monitoring, this Monitoring Program will select and test Habitat metrics based on models that predict how specific variables will affect the system. By focusing on variables that concomitantly affect species, species assemblages, and natural communities, monitoring data can be placed within an environmental context. That context then allows the identification and testing of hypotheses explaining population trends, and so can direct management actions if necessary.

Specific protocols and sampling design to monitor Covered Species will be developed during the baseline phase and will conform to the scientific principles. Feedback from the evaluation of the general sampling approaches described herein will be incorporated in this process. While all aspects of the eventual protocols have yet to be determined, the following

descriptions outline general methodologies to track species. Section 8.4 provides more information on species-level monitoring for a given natural community or species assemblage.

The precise methodology for assessing the status of a Covered Species (or species group) at a sampling point will be tailored to that species. Some potential techniques have been developed during spring 2003 with input from specialists for each taxon (ornithologists, herpetologists, mammalogists, botanists). Sample units ("points") involve for example, auditory or visual counts, small grids of traps, short transects, and will differ in size. Monitoring surveys for any Covered Species or species group will consist of a network of sample units distributed throughout the Plan Area. These sample units will be distributed using probability based sampling and stratified by Habitat or vegetation type where appropriate. For some species of very limited distribution, such as narrow endemics, a stratified random approach may not adequately sample the individuals present so another probability-based sampling distributions scheme will be used.

One part of the evaluation process to be carried out in the baseline phase of monitoring will focus on the appropriate metric to use in describing species occurrence and distribution. Initial efforts will focus on the potential to use presence or absence, which can be expressed as the proportion of Habitats occupied. The potential for use of presence absence is further described below in the discussion of the occupancy approach. Other metrics, including estimates of abundance and measures of demographic characteristics may be used for individual species and will be evaluated.

Detection Probability. For a variety of well-documented reasons, the number of individuals observed or captured at points in a survey area invariably underestimates the number of individuals actually present. Thus, it is necessary to also estimate "detectability," the probability that the Covered Species will be observed at a point if it is, in fact, present. Multiple protocols will be evaluated for detectability of the target species during the baseline phase. Explorations of these techniques may suggest that different approaches may be more appropriate for different taxa. The sampling design will provide for comparison of two or more protocols so that detection probability of a given species can be compared.

One major concern will be sufficiency of observations. Some of the Covered Species may be so uncommon as to generate an insufficient number of observations to apply some of these techniques successfully. Sample sizes and survey effort may have to be rather large for some species or confidence intervals will be very wide. Further discussion of detection probability is provided in Section 8.0 of Appendix I.

Several sampling approaches will be evaluated during the baseline phase for their applicability to the Monitoring Program. These approaches may include an occupancy approach, based on determination of presence or absence, a population estimation approach, methods for trend detection, and appropriate statistical analysis techniques. Additional discussion of these approaches is provided in Section 8.0 of Appendix I. These are not the only approaches that might ultimately be assessed in this process. The focus of the assessment process is to identify indicators that are measurable, precise, consistent, and sensitive to the phenomena being tracked (Margoluis and Salafsky 1998). The evaluation process will also

identify methods that are feasible, efficient, cost-effective, and provide the appropriate information.

8.3.4.2 Landscape Level Monitoring

Landscape-level monitoring focuses on geographically large areas with Essential Ecological Processes and coarse-scale Conservation targets. Landscapes are defined at a scale that includes multiple ecosystems, natural communities, and/or where there is a transfer of energy, or movement of nutrients or materials between those units. Landscape monitoring includes regional weather, Essential Ecological Processes, and groundwater levels. This monitoring focuses on processes that affect the condition and dynamics of landscapes that models predict will affect Covered Species and natural communities.

Landscape level monitoring may explore large-scale changes, such as the relationship between areas occupied by exotic grasses and historical fire sites. Desert ecosystems have only recently been subject to perturbations that were virtually unknown in the past. As an example, they are subject to increasing exotic plant invasion, which then facilitates the spread of fire, an ecological perturbation not previously typical of deserts. Because of indirect effects on the environment of carbon dioxide precipitation and nitrogen oxide deposition from air pollution, urban development can have impacts hundreds of miles away (E. Allen, pers. comm.). Some possible approaches to landscape level monitoring are discussed briefly below.

Remote Sensing. Landscape level monitoring calls for assessing Habitat conditions over larger areas than can be surveyed with regularity. Remote sensing may provide a means of distinguishing native vegetation from exotic grasses in remotely sensed images of the Plan area. One remote sensing technique that bears further investigation for this program is to assess leaf area index (LAI) using satellite imagery. Satellite imagery data is improving in resolution and quality rapidly. Specific features, such as sand dune edges, can be resolved at sample intervals limited only by the numbers of images acquired.

The occurrence of species and species associations may be illuminated by linking satellite imagery to site-specific field data and creating polygons with particular attributes. These include particular vegetation associations, vegetation density, soil types, and sand compaction values, among others. The Habitat polygons can be analyzed in terms of size, spatial distribution, and temporal dynamics. When combined with site-specific field data on the occurrence and abundance of species, analyses at multiple scales can be conducted. Through such analyses the scale that provides the greatest sensitivity and predictive power for identifying when and where species are likely to occur and how the dynamics of changing Habitat characteristics affect species occurrences and abundance (Li, 2002) can be determined.

Climatic Processes. Variation through both time and space due to large-scale climatic processes and climate change is the dominant feature of the biota in the ecosystems of the Coachella Valley. Variation in space will be addressed through sampling across the area of inference, described under species-level monitoring, and perhaps stratifying sampling across community or substrate type(s). However, variation through time is just as crucial. Although temperature is relatively predictable, precipitation can vary by almost an order of magnitude.

Variation at this scale exists in the desert and comprises the El Nino-Southern Oscillation (ENSO) phenomena and the Pacific Decadal Oscillation (PDO).

Tracking of these large-scale processes will be integrated into the Monitoring Program. The effect of climate on Covered Species over time can be tested. For example, the effect of weather on patch occupancy can be estimated. Populations of both plants and animals are probably synchronized with these large-scale climate drivers (Post and Forchhammer 2002). Plant responses are direct and indirect. Direct, in that many of the sensitive species are water-limited annuals requiring average or above average precipitation to germinate and set seed. However, with high precipitation, exotic annual grasses also are highly productive, often out-competing native species (Eliason and Allen 1997) and providing fuel for fires in lowland areas (Fenn et al. 2003). Drought has some advantages in that grass competition can be curtailed, but seed production and annual plant germination can also be reduced.

8.3.4.3 Natural Community Level Monitoring

Natural community-level monitoring focuses on the local-scale threats to natural communities and Habitats, such as non-native invasive species. It also addresses quantification of variables that are or may be important to the distribution and abundance of individual Covered Species.

Natural Community level monitoring will involve two primary elements. The first of these is refinement and update of the natural communities map and the species distribution models originally developed in the reserve design process for the Plan. The refinement of the current natural communities (vegetation) map will better describe the occurrence and distribution of both natural communities and the Covered Species that depend on them. It is discussed below in Section 8.3.4.3.1. The provision to update and remap Natural Communities or Covered Species models shall not be implemented in any way that would increase the amount of Take or reduce the amount of Conservation specified by the Plan for Covered Species or Natural Communities. The refinement of species distribution and Habitat models is described separately in Section 8.2.5.1. The second element for natural communities monitoring is the evaluation and development of a "Rapid Assessment" of several natural community-level characteristics and trends (e.g. CNPS 2003). The following sections describe the framework for these elements of the overall program.

8.3.4.3.1 Natural Community Map and Description

The natural community (vegetation) map created for the Plan will be used as the initial baseline for a revised and updated map. The natural communities map will be updated to bring it into conformance with the classification system of the Manual of California Vegetation (MCV) (Sawyer and Keeler-Wolf 1995) and unpublished updates. This system has replaced the Holland (1986) vegetation classification system that was in use when the natural communities map was originally developed. This effort will use the Vegetation Rapid Assessment Protocol developed by the California Native Plant Society (CNPS 2003) and a releve protocol which has already been used to describe over 200 vegetation "plots" (Mueller-Dombois and Ellenberg 1974, CNPS 2003).

Stands of vegetation will be identified and delineated with high-resolution aerial photographs and satellite imagery. On-site ground-truthing will be completed to determine vegetation composition of the delineated stands. Vegetation types can then be classified using ordination, multivariate analyses, and associated data analysis methods (Sawyer and Keeler-Wolf 1995) for assessing and classifying vegetation to create a more detailed natural communities map. All locations are georeferenced for follow-up vegetation and Habitat description. Standard techniques for sampling percent cover and biomass of herbs, and percent cover along line transects for shrubs can be used (Mueller-Dombois & Ellenberg 1974) to assess vegetation change, coupled with vegetation mapping activities. Power analyses are used to determine adequate sample size. The releve approach can be used to detect infrequent species. Biomass of herbaceous vegetation will also be sampled to detect yearly variation and fuel load that might promote fire.

8.3.4.3.2 Assessing Natural Community Changes and Trends

One objective of the natural community monitoring is to develop and test models that propose a causal relationship between characteristics of natural communities and Covered Species. Quantitative characterizations of communities will be obtained that can be used to detect both natural and anthropogenic changes in community structure in time and space. Several approaches to natural community change detection will be tested in the baseline phase. This may include a rapid assessment approach. One element of this effort will be a quantitative means of assessing invasion by exotic species. Baseline descriptions of presence and relative cover of invasive species can be used to track changes in their status. Re-sampling and gathering more data on the same sites used in the vegetation mapping effort will enable greater accuracy in determining how communities change over time, and will establish confidence intervals for the vegetation mapping data.

Trend Detection. Once data are gathered from field surveys for a given species, they can be used to describe and analyze trends. Data collected during the baseline phase will be used to test the various hypotheses and models for trend analyses. Clearly, surveys cannot be undertaken on an arbitrary 5, 7, 8, or 10-year periodicity if trends are to be determined. Understanding the relationships between climate and biota and between sensitive plants, exotic invaders, and animals of concern is going to be crucial for developing accurate monitoring protocols. One goal is to begin to understand relationships between climactic variables and metapopulation dynamics to generate an appropriate sampling periodicity. Further discussion of the formulation of trend analysis is included in Section 8.0 of Appendix I.

8.4 Integration of the Management and Monitoring Programs

The Monitoring Program and the Adaptive Management component of the Management Program must be integrally linked. The analyses of species and natural community monitoring data (and information regarding on-going preserve management issues) will be used to identify if and where Adaptive Management actions should be considered. When Adaptive Management actions are implemented, the Monitoring Program will need to evaluate the species and/or natural community's response.

Linking the Monitoring Program with the implementation of Adaptive Management actions will require:

- The use of data from the Monitoring Program to update Adaptive Management models and the implementation of actions suggested by the monitoring data. Use available data to structure a range of alternative response models to address a given threat or stressor affecting a Covered Species or natural community and evaluation of the models.
- The implementation of actions suggested by the Monitoring Program data and Adaptive Management models.
- Development of cost estimates and schedules for implementation of Adaptive Management actions and monitoring results.
- A program implementation structure, that includes both Monitoring Program Administrator and staff and Land Managers, which helps identify potential Adaptive Management options and associated monitoring to determine their effectiveness, and evaluates the Adaptive Management action for further use or modification.

The following sections describe an integrated approach to monitoring and management for the Covered Species and Natural Communities that addresses threats and concerns identified to date. This integrated approach will ultimately depend on the results during the baseline phase and so is subject to change. The intent is that information on species and natural community distributions and factors that influence distribution from the early baseline sampling will be the basis for exploring other questions including scale and relationships. Each section presents an initial conceptual model that has been developed for these ecosystems.

These sections describe how under this monitoring and management framework species covered under the Plan will be treated as affiliated with six natural community/Habitat assemblages that are grouped due to similar natural processes and threat regimes. The broad Habitat associations include aeolian sand, alluvial fan and wash, riparian, marsh, alkali flat and playa, and mountain, each of which includes one or more of the 27 natural communities included in the Plan area. Within each of these Habitat associations, monitoring and management protocols are provided at several scales: (1) landscape, (2) natural community/Habitat, and (3) species. In many cases, these protocols involve measurements at

multiple trophic levels. A process is proposed for evaluating monitoring results, for modifying monitoring protocols to provide more insightful data, and for recommending management actions. A variety of approaches will be evaluated to monitor landscapes, natural communities, and species, during the baseline phase and on an ongoing basis.

The multiple scales designed into the framework should provide biologists and managers sufficient information to identify:

1. Natural patterns and fluctuations within the typical dynamics of this Habitat assemblage.
2. The occurrence and extent of perceived threats within a time frame to enable managers to respond with appropriate management tools.
3. The range of impacts that ecological variables, including stressors or threats, have on site-specific Habitat characteristics and species assemblages, across trophic levels.
4. The scope of impacts that variables, including threats, have on the distribution of Covered Species across a landscape that includes multiple Conservation sites, each with different physical attributes (climate, sand delivery sources and conduits, vegetation patterns).
5. Success or failures in the implementation of management action aimed at controlling threats.

8.4.1 Aeolian Sand Communities: Sand Dunes and Sand Fields

Sand Dunes and Sand Fields: Natural Communities

- Active Desert Dunes
- Stabilized and Partially Stabilized Desert Dunes
- Active Desert Sand Fields
- Ephemeral Desert Sand Fields
- Stabilized and Partially Stabilized Desert Sand Fields
- Stabilized Shielded Desert Sand Fields
- Mesquite Hummocks

Associated Covered Species:

- Coachella Valley fringe-toed lizard *(Uma inornata)*
- Coachella Valley giant sand treader cricket *(Macrobaenetes valgum)*
- Coachella Valley Jerusalem cricket *(Stenopelmatus cahuilaensis)*
- Coachella Valley milkvetch *(Astragalus lentiginosus* var. *coachellae)*

- Coachella Valley round-tailed ground squirrel *(Spermophilus tereticaudus chlorus)*
- Flat-tailed horned lizard *(Phrynosoma mcallii*)
- Palm Springs pocket mouse *(Perognathus longimembris bangsi)*

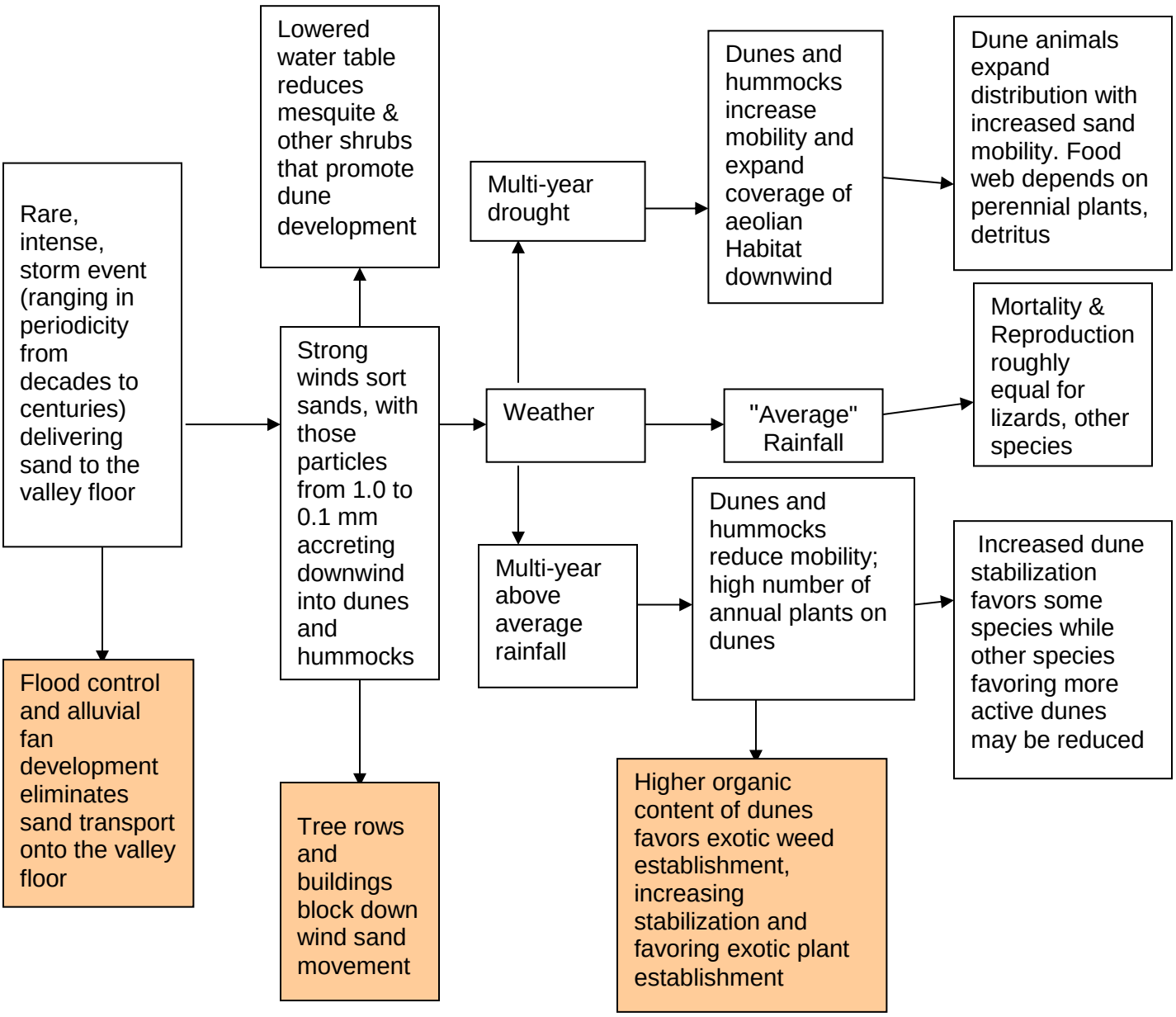
8.4.1.1 Background and Models

Covered Species associated with the aeolian (wind-blown) sand community are listed above. Le Conte's thrasher (*Toxostoma leconti*) occasionally inhabits this community as well, but it is discussed in the alluvial fan and wash community section.

These sandy substrate natural communities are extremely dynamic in terms of spatial mobility and tendency to change from active to stabilized and back (Lancaster 1995). These changes can be caused by local and regional weather patterns, as well as anthropogenic modifications. A general model of the processes that create and maintain these Habitats is depicted in Figure 8-7. Each of the Covered Species utilizes the Habitat in unique ways, thus local Habitat shifts that favor one of these species do not necessarily favor another. Rather, the temporal and spatial dynamics create a matrix of microhabitats that supports each of the Covered Species simultaneously. Any process which favors Habitat homogeneity over heterogeneity, will have a skewed effect on the community. Notwithstanding these differences, the constituent species can still be subject to a common set of threats that can have an impact on most community members, although the degree of sensitivity and response can vary between them. Figure 8-7 also depicts known threats and the resultant impacts.

The threats model in Figure 8-8 reveals that natural stochasticity (randomness) of weather events, long-term climatic trends, and anthropogenic stresses can have similar impacts. For instance, a prolonged period without an intense storm resulting in no new sand erosion and deposition can produce impacts to the fringe-toed lizard populations that are similar in appearance to those caused by an up-wind or up-stream barrier to sediment transport. The difference, however, is in the permanence of the condition. A storm will eventually occur and bring new sands, creating new Habitat on the valley floor if the sand transport corridors are not blocked (e.g., a flood control dam or golf course). Another example could be that a dense bloom of native desert annual plants, or a dense growth of Saharan grass (*Schismus barbatus),* Saharan mustard (*Brassica tournefortii),* and tumbleweed (*Salsola tragus)* tend to enhance the stabilization of sand dunes already moving toward a stabilized state. However, the stabilizing effect of the native annuals lasts only for a season or two, whereas the exotics, especially the grasses, produce impacts that can last much longer. Monitoring efforts need to be able to: (1) assess the impacts of stressors on the Covered Species; (2) determine if the impacts and effects are likely to be short-term or permanent; and (3) evaluate methods for reversing or ameliorating the impacts.

Figure 8-7: Aeolian Community Sand Process Model



1. Figure 8-8 indicates that the primary threats to the aeolian community are: (1) OHV trespass and (2) various factors (including exotic plant infestation, loss of mesquite to anchor dunes in some areas) which contribute to the loss or stabilization of active aeolian sands. The shaded boxes along the left side of Figure 8-8 include causative factors or threats. They are sources of perturbation at which management actions will be directed.

   Among management actions are:

   - The elimination of OHV trespass
   - The protection of wind and sand deposition corridors
   - The control of invasive species
   - To maintain or increase groundwater levels so that mesquite hummocks can be maintained in extent and can regenerate.

Of these threats, exotic plant impacts are the least understood, and the tools for their control are not yet widely developed. Thus, the relationships of exotic species to Covered Species' abundances, to stabilization rates, and to changes in native vegetation merit an Adaptive Management approach and research prior to implementation of large-scale control efforts.

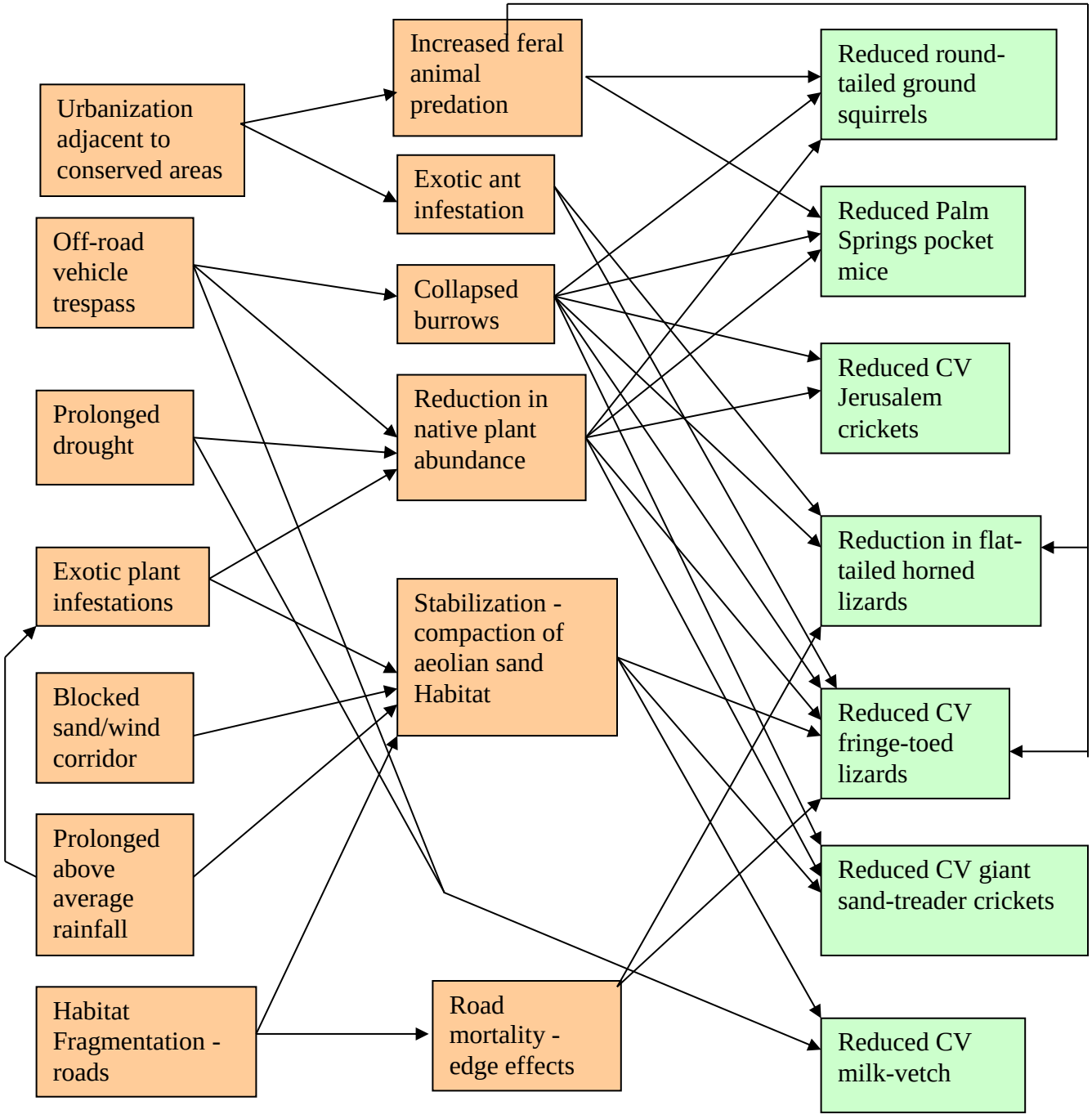
8.4.1.2 Management: Aeolian Sand Communities

Ongoing Management. Based on conceptual threats model and past research, OHV trespass should be eliminated from all areas designated to protect the Covered Species associated with sandy Habitats. This can be accomplished through both fencing and signing property boundaries, and by active and frequent patrolling by law enforcement officers. Protecting sand transport corridors through acquisition is an important Conservation objective for the Plan. Once acquired, removal of any anthropogenic structures that could block sand movement such as exotic tree rows will be a management priority.

Ongoing management will ensure that continuous Habitat is protected to provide for other Essential Ecological Processes, including but not limited to dispersal mechanisms, movement of pollinators, seed dispersal, and mycorrhizal relationships for plant species and soil characteristics for insects.

Current management of the Coachella Valley Preserve system sites includes very restricted human access to the most sensitive Habitat areas, including the active sand dunes. Opportunities for the public to visit and learn about the ecology of the preserve sand dunes are provided on an annual basis at the Thousand Palms Preserve with scheduled tours accompanied by a preserve manager.

Figure 8-8: Aeolian Sand Habitat Threats Model



Adaptive Management. The Habitat Threats Model presented in Figure 8-8 identifies known threats in the aeolian sand Habitats. The impacts of these threats on Covered Species and natural communities and the potential management responses will be addressed through monitoring and Adaptive Management.

Stabilization and sand depletion of the aeolian sand Habitats are clearly important stressors to the viability of the associated Covered Species (Figure 8-8). Stabilization and sand depletion can be caused by both natural process stochasticity, and by anthropogenic perturbation. Dissecting out causal factors for stabilization and sand depletion will be accomplished through landscape-level and Habitat-level monitoring.

In a non-fragmented landscape, local population declines may be less critical because if overall Habitat diversity has been maintained causes for local declines are unlikely to be of equal strength across the entire species range. Once favorable habitat conditions return the species would likely re-invade those habitats from refugia in nearby habitat areas.

In a fragmented landscape such as the Coachella Valley, local extirpations can increase the risk of overall extinction by reducing the number of protected populations. The evolutionary forces at work during a natural population decline are processes that are desirable to maintain. These benefits may be lost either if managers react too quickly and natural selection has not had an opportunity to operate, or if they react too late and the species becomes extirpated. Determining the time to act will be a challenge. Atkinson et al. (2004) address the challenges of determining the thresholds for management action (See page 38-39) but emphasize the opportunity to take advantage of extreme circumstances (e.g., extreme drought, 500-year flood events) to learn more about system function.

Additional tools for reducing sand depletion and stabilization could include hauling sand lost from the downwind side of the preserves back into the upwind sand corridor. Sand fencing to reduce the rate of sand loss on the downwind side of the preserves may also be effective. Prior to implementing such a management tool, careful evaluation and consultation with the Wildlife Agencies is necessary. Initially, a determination of the effectiveness of experimental drift fences in creating expanded blowsand hummocks, particularly in the Whitewater Floodplain Conservation Area, would have to be made. This analysis will include determination of a trigger for when installation of drift fences to create blowsand hummocks is necessary. Then monitoring should determine the use of the created Habitat by blowsand-dependent species, especially the Coachella Valley fringe-toed lizard. In areas where there is a deep layer of stabilized sand at the upwind portion of a preserve, it may be destabilized and activated by physically removing vegetation and surface crusts. This should only be employed experimentally, on a relatively small scale since the impacts to other aeolian species, such as the flat-tailed horned lizard and the Palm Springs pocket mouse, are not known, and might be negative.

Maintenance of the natural sand transport processes is the preferred means of securing aeolian sand Habitats. When a natural sand deposition event occurs (e.g. after a large storm), active sand fields (sand hummocks) will likely be the primary natural community that is created. Historically, mesquite clusters occurred in the Thousand Palms Preserve and appeared to serve

as structures for larger sand dune development. Those mesquite clusters have largely disappeared or are highly degraded, perhaps due in part to lowered water tables. Data gathered by USFWS (Ball et al. *in Press*) and UCR (UCR 2005) indicate Coachella Valley round-tailed ground squirrels occur at higher densities in mesquite hummocks. Mesquite hummocks could be restored in this area (see below). The fringe-toed lizard does not require large dunes, nor do any of the sand-associated Covered Species; active sand fields and hummocks are of at least equal Habitat value. The structural diversity provided by larger dunes may have value to other, non-covered, aeolian sand obligate species.

Invasive Species. Invasive species infestations are an additional potential cause for stabilization of aeolian sand. Where invasive annual vegetation is identified as a possible stressor, then a focused research effort will need to be undertaken to determine control methods, as no methods beyond hand removal exist today. The cause and effect dynamics, duration of effects, and control methodologies all need further research before management actions can or should occur. A couple of consecutive wet years can result in profusion of exotic invasive annual plants and cause increased stabilization, especially along the margins of the active dunes and in the hummock areas. A couple years of drought can apparently erase that stabilization trajectory and activate previously stabilized areas. The seed production of the exotics may actually enhance harvester ant populations, which are food for both the fringe-toed and flat-tailed horned lizards. If exotic vegetation is implicated in long-term stabilization, research will be initiated to develop effective control methods.

Feral Animals. Feral dogs currently occur on all preserve sites, but the impact, if any, they have on the Covered Species is unknown. They could be detrimental to Palm Springs pocket mice. If dogs are suspected as a threat to any species' population viability, experimental dog proof fencing, much like that used in Australia to control dingoes, could be employed in targeted areas to determine if it results in a positive response by the pocket mice. Such fencing would also limit coyote access, and if used widely could disrupt natural predator-prey relationships. For this reason, such fencing should only be used with extreme caution, and other alternatives would have to be considered.

Road Mortality. Several of the aeolian sand species, in particular the flat-tailed horned lizards, are probably impacted negatively by road mortality. The Thousand Palms Preserve is likely large enough to be self buffered from this stressor to the extent that it could contribute to reduced population viability. If, however, monitoring shows mortality of Covered Species on Washington Street, Ramon Road, and Thousand Palms Road, low, relatively fine (one-cm^2 holes) mesh wire could be attached to the lower portions of the preserve's perimeter fence to prevent lizard movement onto roads. This fencing would likely accumulate sand and if installed, would need to be maintained (cleaned) regularly.

Habitat Enhancement and Restoration. The potential for mesquite hummock restoration and enhancement will be evaluated through monitoring and Adaptive Management. The potential for creation or enhancement of mesquite hummock Habitat will be considered in the context of Conservation Objectives for all Covered Species and natural communities. This evaluation will consider results from other areas where mesquite restoration has been attempted in terms of the potential for success. Water requirements, the source of water to support

mesquite restoration or enhancement, and the relationship with groundwater levels will be addressed in this evaluation. Adding supplemental water at the surface would create the potential for invasive weeds and non-native ants to become established. These invasive plants and non-native ants are threats to the aeolian sand communities. Subsurface supplemental water will be evaluated. The impacts to other natural communities and species will also be evaluated.

Restoration by CVWD**.** In conjunction with its WRP recharge facility, CVWD will remove tamarisk from the site in the East Indio Hills Conservation Area. In addition, if a study undertaken by the CVCC demonstrates the feasibility of mesquite restoration, CVWD will restore and enhance mesquite and Coachella Valley round-tailed ground squirrel Habitat on site in the East Indio Hills Conservation Area, pursuant to Required Measure 2 in Section 4.3.20. Within two years of Plan approval, a plan detailing the location, water requirements, and monitoring and management responsibilities, including funding, for this restoration effort shall be provided to the Wildlife Agencies for review and approval. If deemed appropriate in the context of Conservation Objectives, the Habitat will be established within three years of approval of this restoration plan by the Wildlife Agencies.

CVWD will enhance and manage Coachella Valley round-tailed ground squirrel Habitat on land it owns in the East Indio Hills Conservation Area to mitigate and provide for the Conservation of impacts to this species from CVWD's operation and management activities in the Coachella Valley Stormwater Channel and Delta Conservation Area. (See Section 4.3.16 for additional details).

Restoration by CVCC. CVCC will undertake additional mesquite hummocks restoration in the East Indio Hills Conservation Area, pursuant to Required Measure 3 in Section 4.3.20, to ensure a total of 40 acres of mesquite Habitat is created. If 80% of the mesquite hummocks natural community in the south half of Section 17, T5S, R8E, is not conserved under the Plan, CVCC shall ensure the establishment of an additional 40 acres (80 acres total) of mesquite hummocks in this Conservation Area if Feasible. To the extent Feasible, the acreage to be established by CVCC will be sited on the CVWD land where CVWD establishes its required mesquite habitat. To the extent that the CVWD site does not accommodate the CVCC-required acres of mesquite hummocks restoration, CVCC will seek to establish the remaining requirement elsewhere in this Conservation Area. If establishment of the full acreage is not Feasible in this Conservation Area, establishment of acreage needed to reach the required total may occur in other appropriate Conservation Areas, proximate to Coachella Valley round-tailed ground squirrel habitat.

Restoration by MSWD**.** To improve the water available to mesquite hummocks, MSWD will provide funds to CVCC to be used for the removal of non-native tamarisk from the Willow Hole Conservation Area in the amount of $100,000 to cover the costs of tamarisk removal from approximately_30 acres of conservation lands. CVCC will ensure that removal of tamarisk occurs on lands controlled by CVCC or other public or private conservation lands. MSWD will also contribute $20,000 to the cost of a study being conducted by CVCC of the feasibility of mesquite restoration and development of a mesquite restoration plan. MSWD will contribute to and participate in CVCC's research evaluating the relationship between mesquite hummocks and groundwater for the mesquite hummock areas within their district boundary. If the study

undertaken by the CVCC demonstrates the decline of mesquite hummock areas in the Willow Hole Conservation Area, MSWD will work with CVCC, the Wildlife Agencies, and other relevant Permittees to identify and implement a plan to enhance, restore, and maintain the mesquite hummocks natural community and to address changed circumstances, identified in the CVMSHCP, that affect this natural community as a part of their CVMSHCP implementation activities.

8.4.1.3 Monitoring: Aeolian Sand Communities

The monitoring programs already in place for species associated with the aeolian sand communities are described in Table 8-7. The following sections describe general monitoring approaches for landscape, natural community, and species level monitoring on existing and newly acquired lands under Plan implementation.

8.4.1.3.1 Landscape Level Monitoring

Key Monitoring Objectives:

- Collect data on environmental variables (e.g., local, regional, and global weather patterns) identified in the conceptual models
- Develop and test conceptual models about how changes to the landscape impact Covered Species
- Determine and quantify changes in Habitat that may affect Covered Species
- Determine the annual or periodic rate of sand deposition or depletion within sand transport areas
- Assess landscape connectivity between preserves through hypothesis testing
- Identify distribution and cover of aeolian sand natural communities
- Relate changes in Habitat to changes in annual weather patterns

Weather. As a first step in the Monitoring Program, the apparent sensitivity of the aeolian sand community to rainfall argues strongly for gathering detailed weather records at sites characterizing the wide range of conditions found in the Coachella Valley. Only after development of a sufficient baseline data set showing how the various Covered Species and their Habitats respond to natural resource levels induced by weather patterns, is it possible to identify population trajectories that are outside of natural patterns, and are thus cause for concern. For instance, Barrows (2000) found significant east-west differences in the dune beetle communities of the Coachella Valley. The differences correlated, in part, with a substantial gradient in rainfall between the eastern and western extremes of the valley (i.e. double rainfall amounts in the west). This gradient is strongest between the Windy Point area and the Thousand Palms Preserve, and was reflected in dramatic differences in the dune arthropod community in the respective extremes. Between the Thousand Palms Preserve and lands further east within

the Coachella Valley, there appears to be little or no difference in either rainfall or dune arthropod species composition.

Rainfall appears related to fringe-toed lizard reproductive patterns as well. Even though fringe-toed lizard numbers have at times over the past 15 years dropped to nearly non-detectable levels in drought years, lizard numbers have always rebounded during average to above average rainfall years. Only through a thorough understanding of regional weather conditions and patterns can large spatial scale conclusions be drawn regarding the relative importance of either anthropogenic or natural causes of changes in abundance of Covered Species.

In addition to existing weather monitoring stations, an additional two stations will be established within or adjacent to core Habitat areas to record precipitation, wind, and temperature.

Areal Extent of Habitat: Information on the distribution and extent of natural communities may be used to: (1) determine and quantify the ebb and flow of the extent of this dynamic sand dune Habitat and use as a covariate when testing hypotheses about the effects on Covered Species; (2) assess future changes in landscape connectivity; and (3) evaluate the edge effects of changing proximity to human activities. Digital satellite imagery is extremely useful in distinguishing and quantifying different levels of stabilization within the dune and hummock Habitat matrix.

As an example of the application of this approach, using satellite imagery of the Coachella Valley Preserve area, Habitat was divided into 10 categories based on reflectance values. Four of the created categories dealt specifically with aeolian Habitat and appeared to make separations consistent with both particle size and compaction (C. Barrows, pers. comm.); the other six were upland Habitats or areas of dense vegetation. Both of these variables have bearing on the relative abundances of the dune-associated species. Additionally, by having the GIS program "choose" the categories, the choices are without observer biases and are more likely to be repeatable and comparable to future images. This process is further described in Section 8.0 of Appendix I.

Due to the dynamics of this Habitat, new digital images will be acquired and analyzed every five years. In this way, the extent of Habitat gains and losses through time can be analyzed. Of highest priority is the quantity and distribution of the active aeolian Habitat, a type clearly and accurately discerned by this kind of analysis. When active aeolian Habitat is in decline, the images can be used to help develop a hypothesis about the cause of that decline, and to evaluate the success of remedial management actions that may be taken.

Groundwater: It has long been recognized that the honey mesquite that form mesquite hummocks grow in distinctive hydrologic environments where the water table is near the surface. However, hydrologic conditions and the health of the mesquite hummocks are subject to change from both natural and human-induced processes. If natural and human-induced impacts on this resource are to be mitigated, the relationship between hydrologic conditions and the health and reproduction of the native mesquite hummocks need to be quantified. CVWD monitors groundwater and has data at well sites including the Conservation Areas. Monitoring

will involve evaluating the health of the mesquite (plant characteristics) in the Willow Hole, Thousand Palms, East Indio Hills, and Dos Palmas Conservation Areas, and its relationship to hydrologic/groundwater conditions in the Coachella Valley. As described in Section 6.6.1, MSWD will provide data as available on water levels in the Willow Hole Conservation Area, specifically for the "fault dunes" and associated mesquite hummocks west of Palm Drive, and funds to be used for water monitoring wells or other means of gathering data on groundwater levels related to mesquite hummocks.

8.4.1.3.2 Natural Community Level Monitoring

Key Monitoring Objectives:

- Estimate distribution and abundance of exotic invasive plants
- Estimate live perennial shrub abundance and distribution
- Ground-truth the spatial extent of Habitats as shown in the satellite imagery and aerial photography
- Develop and evaluate models about relationships between changes in vegetation, landscape level variables, and responses by covered species
- Confirm variables or characteristics the GIS analysis used to separate the categories of reflectance types within the aeolian system
- Evaluate relationships between groundwater and mesquite hummocks

This monitoring level focuses on measurable variables that describe the sand associated natural communities and identified threats to them. Habitat variables (and threats) that appear, based on the conceptual model in Figure 8-8, to have relevance to the dune species include sand compaction, native ant numbers, live perennial shrub abundance, and exotic weed abundance.

Monitoring will address the following issues:

1. Describe the characteristics of each Habitat category as defined by the GIS analysis.
2. Provide direct measurement of Habitat dynamics and trends over time. The transects are to be placed in areas likely to (1) capture the range of microhabitats within a Habitat type and (2) capture the characteristics of Habitats in areas where they are relevant to protection issues or concerns.
3. Provide data that are directly comparable to species-specific monitoring locations.

One example of a protocol to monitor Habitat variables is a series of transects/plots within each of the Conservation units. In the baseline phase, transects will be established according to the Scientific Principles.

Transects will be sampled yearly to obtain quantitative information on perennial plant communities, annual plant communities, ground dwelling arthropods and vertebrates, and to

characterize sand compaction. Some of the sampling effort is directed at non-Covered Species and communities in order to track changes likely to affect Covered Species. For example, pitfall trapping of arthropods may be a simple and efficient technique to track change. The most common captures in these pitfalls are tenebrionid beetles and ants. Monitoring ant species as indicators of environmental conditions is becoming increasingly common worldwide (Bisevac and Majer 1999, Read and Anderson 2000). In California, exotic ants such as Argentine ants *(Linepithema humile*), (Suarez et al. 1998) and fire ants (*Solenopsis invicta*) are potentially serious threats to native ants and the wildlife species that depend on them for food. Here in the Coachella Valley, native harvester ants of the genera *Pogonomymex* and *Messor* are important granivores and detritivores. They are also critical foods for both the Coachella Valley fringe-toed lizard (Barrows and Fisher in prep) and the flat-tailed horned lizard. The ants' trophic relationships as well as ease in sampling make them good candidates to be bioindicators of ecosystem conditions including changes in soil characteristics and seed abundance. In addition, the influence of exotic plant species infestations on harvester ants, and other dune arthropods, is unknown and deserves further analysis. Monitoring ant species should illuminate this relationship.

The focus of arthropod sampling is to enumerate temporal changes in ant abundance; however, many of the other arthropods captured in the pitfalls can be valuable indicators of aeolian Habitat quality (Barrows 2000). For instance, tenebrionid beetles such as *Asidina confluens, Batulius setosus, Cheriodes californica, Cryptoglossa laevis,* and *Triorophus laevis* (in the eastern portions of the valley), and *Batulius setosus*, *Edrotes barrowsi*, and *Chilometopon brachystomum* (in the western valley) are all sensitive to levels of aeolian sand activity (all preferring active dunes and hummocks). Members of other coleopteran families such as Ptinidae (*Niptus ventriculus)* and Dermestidae (*Novelis picta*) can also be useful indicators of aeolian sand Habitat in this region (Andrews et al. 1979). These arthropods, being largely detritivores, as well as many being prey for fringe-toed lizards (Barrows and Fisher, in prep.) form a potentially important trophic level/species assemblage monitoring target. These species can accentuate the level of monitoring above that obtained strictly from only ant data. Adding the sand treader cricket, and perhaps the Jerusalem cricket (see below), provides an efficient and information rich database. The abundance of each of these arthropod species, across the east-west moisture cline within the Coachella Valley, could result in statistical problems when each species is compared individually. However, when examined as a biologically defensible species assemblage, or community, sample sizes will be ample to meet statistical requirements.

The relationship between mesquite hummocks and groundwater will be evaluated through the Monitoring Program. The objectives of this research will include, (1) to monitor the plant characteristics and hydrologic conditions of mesquite hummocks in the Coachella Valley; (2) to determine the source(s) of water utilized by the mesquite; and (3) to relate vegetation health and reproduction to varying hydrologic conditions in the Coachella Valley. The study will involve compiling existing vegetation and hydrologic data as GIS layers, coordination with CVWD on ground-water level data they collect from existing wells, and monitoring plant characteristics and hydrologic conditions at the sites including Willow Hole, Thousand Palms, East Indio Hills, Indio Hills Palms, and Dos Palmas Conservation Areas. Additional support and information in the Willow Hole Conservation Area will be provided by

MSWD. The water-level trends from these sites can be compared to precipitation and pumping trends to help determine the natural and/or human-induced impacts on the groundwater system. The GIS will be updated on an annual basis with the data collected by other agencies during this study. These data will be used in conjunction with the hydrologic data to determine if there is a correlation between the health of the mesquite and the hydrologic properties at the site (depth to water and soil moisture). Persistence of the mesquite trees will be monitored to determine if there is a relationship between water-table depth, soil moisture, and reproduction.

8.4.1.3.3 Species Level Monitoring

Key Monitoring Objectives:

- Estimate the distribution or population size of Covered Species to describe status
- Estimate adult survivorship, age structure for some Covered Species
- Develop and evaluate ecological models that propose relationships between biotic and abiotic variables and Covered Species
- Learn more about the ecology of Covered Species
- Identify and evaluate potential threats to Covered Species
- Develop effective and efficient non-lethal sampling protocols

The proposed Monitoring Program provides the ingredients to develop and test hypotheses relating to changes in the abundances of the Covered Species and then to direct appropriate management actions and evaluate the results. These data also provide context for observed species fluctuations so that appropriate management actions can be taken. Species-level monitoring will address when changes in Habitat variables approach critical levels, and identify whether species respond to the management of the Habitat variables in the predicted fashion.

Initially baseline data will be collected on species, including the Coachella Valley fringe-toed lizard, flat-tailed horned lizard, Palm Springs pocket mouse, Coachella Valley round-tailed ground squirrel, Coachella Valley giant sand treader cricket, Coachella Valley Jerusalem cricket, and Coachella Valley milkvetch. The precise protocols to be used for these species will be developed during this baseline phase. Replicated sampling will be used. In addition to presence or absence, relative abundance and other metrics will be recorded, depending on the species (e.g. percentage in flower/fruit for plants). The survey interval and frequency will initially be determined based on feedback from the spring 2003 and 2004 results. Based on the information gathered during the baseline phase, the level of ongoing monitoring appropriate for each of the Covered Species will be determined. However, ongoing monitoring may change over time in response to Adaptive Management needs, changes in technology, or other circumstances.

Within 5 years of Permit issuance, the CVCC shall use a methodology consistent with Section 8.3.2 to estimate the size of the Coachella Valley fringe-toed lizard population within the four designated Core Habitat areas. Sampling shall be designed and implemented according

to the Scientific Principles identified in Section 8.3.2. Likewise, within 5 years of Permit issuance, CVCC shall also use a methodology to estimate the size of the flat-tailed horned lizard population within the Thousand Palms Conservation Area. The methodology shall be the mark-recapture protocol adopted by the Flat-tailed Horned Lizard Interagency Coordinating Committee or another methodology consistent with Section 8.3.2 of the Plan. The frequency of population size estimation for both species in the Coachella Valley Preserve shall be based on information needs to establish the status of the species over a variety of environmental conditions. Population estimates as part of the monitoring program shall be linked to the question-based, hypothesis testing approach described in Section 8.2.4.3 and illustrated in Figure 8-4. Thresholds for management action will be identified through this hypothesis-based adaptive management approach. Demographic responses to stressors will be identified and assessed, and management actions will be taken to eliminate potential threats and stressors that are amenable to management action.

Within the Desert Tortoise and Linkage Conservation Area, the CVCC and Caltrans shall coordinate with the USFWS, CDFG, and BLM to identify appropriate areas within the Reserve System to install desert tortoise fencing. This coordination does not obligate CVCC to install fencing.

The sensitivity of the Covered Species to invasive weeds is not well understood. As shown in Figure 8-8, the impact of weeds could be identified as either a reduction in native ant abundance or an increase in the stabilization of the aeolian sands. Since both stabilization and ant abundance are to be measured directly and simultaneously with exotic species abundance, monitoring should provide an adequate indication if management actions are necessary to control the weeds.

Monitoring will be subject to regular evaluation and adaptive changes. These evaluations need to examine appropriate sampling efforts required for adequate accuracy and precision of monitoring as defined by management needs (e.g. Covered Species), as well as defining their efficacy in providing insights for the development and testing of hypotheses regarding changes in the conceptual model.

8.4.2 Alluvial Fan and Wash Communities

Desert Scrub Natural Communities:

- Sonoran Creosote Bush Scrub
- Sonoran Mixed Woody and Succulent Scrub
- Mojave Mixed Woody Scrub

Desert Dry Wash Woodland and Mesquite Natural Communities

- Desert Dry Wash Woodland
- Mesquite Bosque

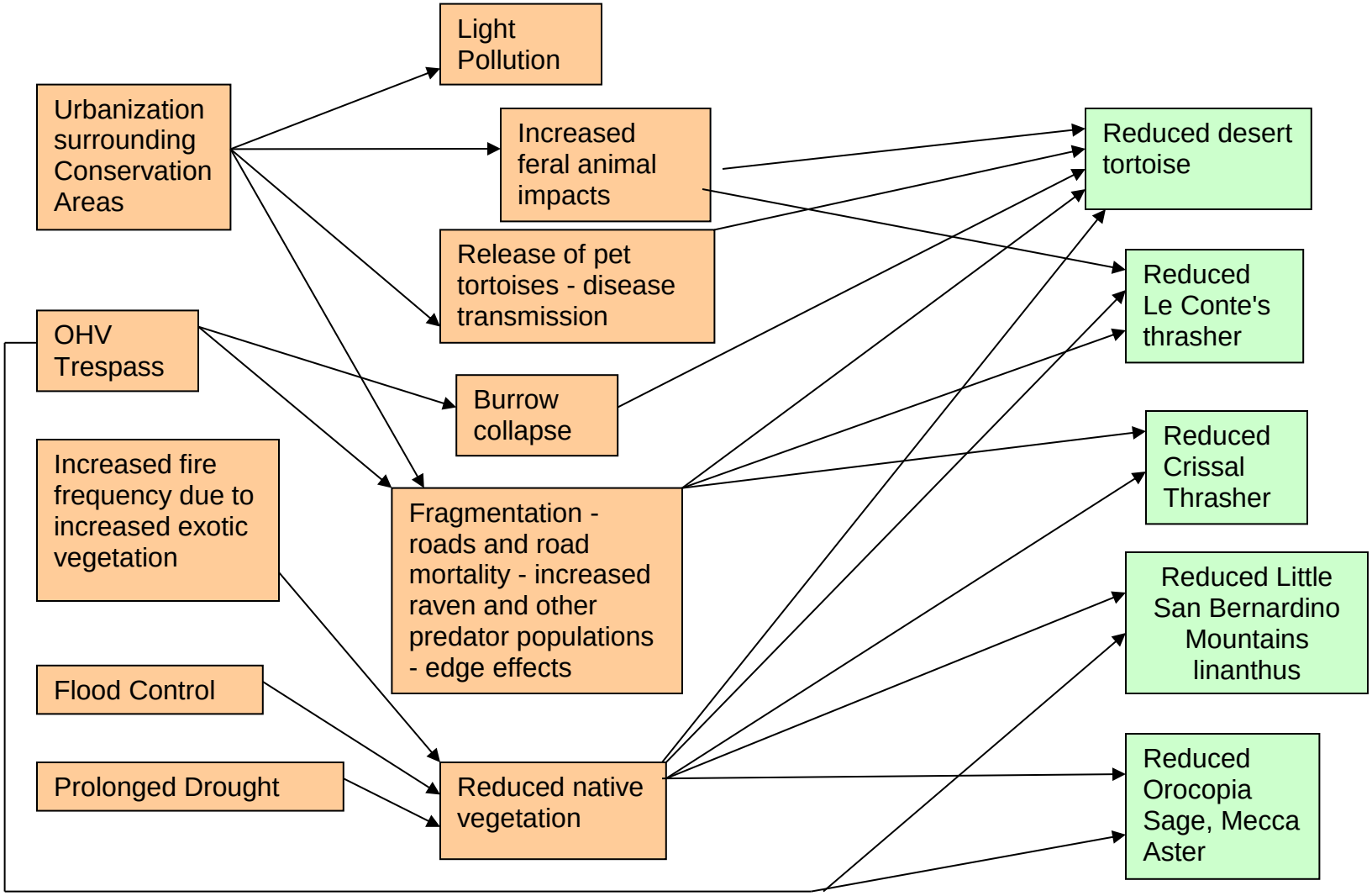
Associated Covered Species

- Burrowing owl (*Athene cunicularia*)
- Crissal thrasher (*Toxostoma crissale)*
- Desert tortoise *(Gopherus agassizii)*
- Le Conte's thrasher (*Toxostoma lecontei)*
- Little San Bernardino Mountains linanthus (*Linanthus maculatus*)
- Mecca aster *(Xylorhiza cognata)*
- Orocopia sage (*Salvia greatae*)

8.4.2.1 Background and Models

Species associated with alluvial fans and washes that are covered by the Plan are listed above. It is somewhat misleading to assume that these species are an assemblage or community, because they rarely occur sympatrically. However, they all do occur on the alluvial fans and associated washes, and are susceptible to many of the same threats or stressors. Figure 8-9 is a conceptual model of the threats in alluvial fan and wash Habitats.

Figure 8-9: Alluvial Fan and Wash Habitat Threats Model



Generally, alluvial fans are less dynamic than aeolian Habitats, but the associated washes are subject to periodic flooding events. Flooding events are not only important to the species living there, but also serve as critical transport for sediment for the aeolian sand Habitats. The apparent higher level of stability has made alluvial fans the preferred area for urban development, the source of many threats to the species living there.

Threats on the alluvial fans and within washes include OHV damage to plants and animal burrows and increased fire frequency due to weed proliferation. For instance, repeated fires on the lower alluvial fan, north of Interstate 10 and near Highway 62, appear to have altered the dominant plant cover, removing much of the creosote bush and replacing it with the native brittlebush (*Encelia farinosa),* non-native filaree (*Erodium sp.),* mustard (*Brassica sp.),* and non-native invasive grasses. The impacts of these changes on the Covered Species of plants and animals have not been quantified.

Another stress comes from the urban interface where rodents, reptiles, and ground (or near ground) nesting birds suffer increased predation and harassment from feral pets. Common raven populations have increased dramatically primarily because of supplemental food resources at landfills and road kills. Ravens have been implicated in reduced survivorship of hatchling tortoises throughout the California deserts. Desert tortoises are also vulnerable to an upper respiratory virus (URDS), as well as a fungus that causes shell necrosis. Both of these diseases can eventually be fatal. The original cause of the disease outbreak is not fully understood, but it is believed that URDS was spread between wild populations by the release of infected captive tortoises.

8.4.2.2 Management: Alluvial Fan and Wash Communities

Ongoing Management. Based on conceptual threats model and past research, OHV trespass should be eliminated from all areas designated to protect the desert tortoise and other Covered Species associated with alluvial fans and washes. This can be accomplished through both fencing and signing property boundaries, and by active and frequent patrolling. These areas probably do not attract significant pedestrian or equestrian traffic, but if such access is desired it will be restricted to a specific trail system and carefully controlled. Other threats that could pose a problem for Covered Species and natural communities include illegal vehicle travel within washes, sand and gravel mining, illegal berming and drainage diversion. The potential impacts of these threats will be controlled and managed.

Ongoing management will ensure that continuous Habitat is protected to provide for Essential Ecological Processes including but not limited to dispersal mechanisms; movement of pollinators, seed dispersal, and mycorrhizal relationships for plant species, and soil characteristics for insect species.

Management of lands within the Mission Creek drainage will require coordination with the Wildlands Conservancy with respect to their lands in the Mission Creek Preserve.

Adaptive Management. If weeds are identified as a limiting factor in any species' distribution, Adaptive Management research will be initiated to examine causal relationships and control mechanisms. Successful control strategies will then be implemented.

In desert dry wash woodland communities, hydrological regimes are an important component of the maintenance of these areas. To ensure maintenance of the Habitat for Covered Species including Little San Bernardino Mountains linanthus, the potential for periodic and unpredictable flooding to rework stream channels and channel sediments, and create shallow terraces along the wash bottom must be maintained. More data are needed to evaluate the significance of these processes.

An evaluation of the impacts of road mortality and the need for tortoise-proof fencing along roads, including Dillon Road if this road is widened, will be completed.

8.4.2.3 Monitoring: Alluvial Fan and Wash Communities

The following objectives will guide the development of monitoring protocols for landscapes, natural communities, and species in the various alluvial fan and wash associated Habitats.

8.4.2.3.1 Landscape Level Monitoring

Key Monitoring Objectives:

- Collect data on environmental variables (e.g., local, regional, and global weather patterns) identified in the conceptual models
- Develop and test conceptual models about how changes to the landscape impact Covered Species
- Determine and quantify changes in Habitat that may affect Covered Species
- Assess landscape connectivity between preserves through hypothesis testing
- Relate changes in Habitat to changes in annual weather patterns

Since the alluvial fans are less dynamic than aeolian Habitats, a less frequent landscape monitoring regime may be possible. By identifying the areal extent of exotic species invasions and/or natural ground cover loss, and identifying OHV trouble spots, satellite imagery should prove useful in defining where management actions are needed, and could help refine individual species models. After an initial satellite image is purchased, new images would be obtained about every five years.

Annual weather fluctuations will have an overriding affect on the annual distribution, abundance, and reproduction of alluvial fan and wash species. Understanding weather effects are essential to understanding background variation in the system, which eventually could lead to distinguishing anthropogenic stressors from this natural variation. The two permanent, continuously recording weather stations established for the aeolian community monitoring,

supplemented by additional weather data from airports and existing stations, should be sufficient for describing the weather variation across the Coachella Valley's alluvial fans and washes.

8.4.2.3.2 Natural Community Level Monitoring

Key Monitoring Objectives:

- Estimate distribution and abundance of exotic invasive plants
- Estimate live perennial shrub abundance and distribution
- Ground-truth the spatial extent of Habitats as shown in the satellite imagery and aerial photography
- Develop and evaluate models about relationships between changes in vegetation, landscape level variables, and responses by covered species

The increased abundance of non-native invasive annual plants (with one result being an increased fire frequency) appears to be the most important stressor affecting the species living on the alluvial fans and in associated washes (See Figure 8-9). These causes tend to decrease native shrub cover, and potentially decrease native annual production through various types of competition (e.g. moisture depletion, interference competition, etc.). Analysis of the multi-band satellite images will be used to evaluate these variables.

More precise data on the abundance and species composition of exotic invasive weeds will be obtained by collecting information along transects much the same way as was described within the Habitat and Natural Community Level Monitoring section for the aeolian sand Habitat. These transects will be distributed on alluvial Habitats within the preserve areas established by the Plan where sensitive species or species associations are known to occur, according to the scientific principles and accepted sampling design guidelines. In this Habitat, sand compaction is not believed to be an informative metric, and so will not be measured. There are no data to indicate that ants or other ground invertebrates in this community are indicators of the condition of the overall Habitat or serve as direct links to the Covered Species. Until those links are established, invertebrates will be sampled as a pilot investigation only, and then continued or discontinued based on the utility of those data.

8.4.2.3.3 Species Level Monitoring

Key Monitoring Objectives:

- Estimate the distribution or population size of Covered Species to describe status
- Estimate adult survivorship, age structure for some Covered Species (e.g. desert tortoise)
- Develop and evaluate ecological models that propose relationships between biotic and abiotic variables and Covered Species

- Learn more about the ecology of Covered Species
- Identify and evaluate potential threats to Covered Species
- Develop effective and efficient non-lethal sampling protocols

Initially baseline data will be collected on all of the species, including the desert tortoise, Le Conte's thrasher, crissal thrasher, burrowing owl, Little San Bernardino Mountains linanthus, Mecca aster, and the Orocopia sage. The precise protocols to be used for these species will be developed during the baseline phase. Very little is known about a number of these species in the Plan area. In spring 2003, surveys focused on both crissal and Le Conte's thrashers were initiated to visit known locations for these species, describe Habitat correlates, and begin to test and refine species distribution models. Tests to evaluate different sampling strategies for detection of Le Conte's thrasher were initiated.

Surveys will also be completed for Little San Bernardino Mountains linanthus, Mecca aster, Orocopia sage, and burrowing owl, to better describe their distribution and refine the species distribution models. Each species will likely be surveyed along transects or within plots, using replicated sampling. In addition to presence or absence, relative abundance and other metrics will be recorded, depending on the species. For example, for the plant species characterization of the associate plant community and assessment of the presence of invasive species will be completed. For burrowing owl, some means to track reproductive success will be tested. The survey interval and frequency will be determined based on feedback from the spring 2003 results. Based on the information gathered during the baseline phase, the level of ongoing monitoring appropriate for each of the Covered Species will be determined. However, ongoing monitoring may change over time in response to Adaptive Management needs, changes in technology, or other circumstances.

Biologists from the Bureau of Land Management will monitor desert tortoises, as their most dense population is restricted to BLM administered lands at the so-called Mesa site. Data will be collected on abundance, age class distribution (size), and sex ratios at the Mesa site.

In the Indio Hills/Joshua Tree National Park Linkage Conservation Area the movement of species other than Covered Species is important to maintain Habitat connectivity and ecosystem function between the Thousand Palms Conservation Area and the Joshua Tree National Park Conservation Area. A monitoring program following the Scientific Principles will determine the use of this area by desert bighorn sheep, coyotes, and other wildlife. Data will be used to address the need for measures to ensure that wildlife can cross Dillon Road, which could include lowering of speed limits, directed fencing along the roadside, underpass construction, or signage.

Taken together, the proposed program provides the ingredients to develop and test hypotheses relating to changes in the abundances of the Covered Species and then to direct appropriate management actions. These data also provide context for observed species fluctuations so that appropriate management actions can be taken.

8.4.3 Riparian and Desert Fan Palm Communities

Riparian and Desert Fan Palm Natural Communities

- Arrowweed Scrub
- Desert Fan Palm Oasis Woodland
- Southern Arroyo Willow Riparian Forest
- Sonoran Cottonwood-Willow Riparian Forest
- Southern Sycamore-Alder Riparian Woodland

Associated Covered Species

- Arroyo toad (*Bufo microscaphus californicus)*
- Least Bell's vireo (*Vireo bellii pusillus)*
- Southern yellow bat (*Lasiurus xanthinus)*
- Southwestern willow flycatcher (*Empidonax extimus traillii)*
- Summer tanager (*Piranga rubra)*
- Triple-ribbed milkvetch (*Astragalus tricarinatus)*
- Yellow-breasted chat (*Icteria virens)*
- Yellow warbler (*Dendroica petechia brewsteri)*

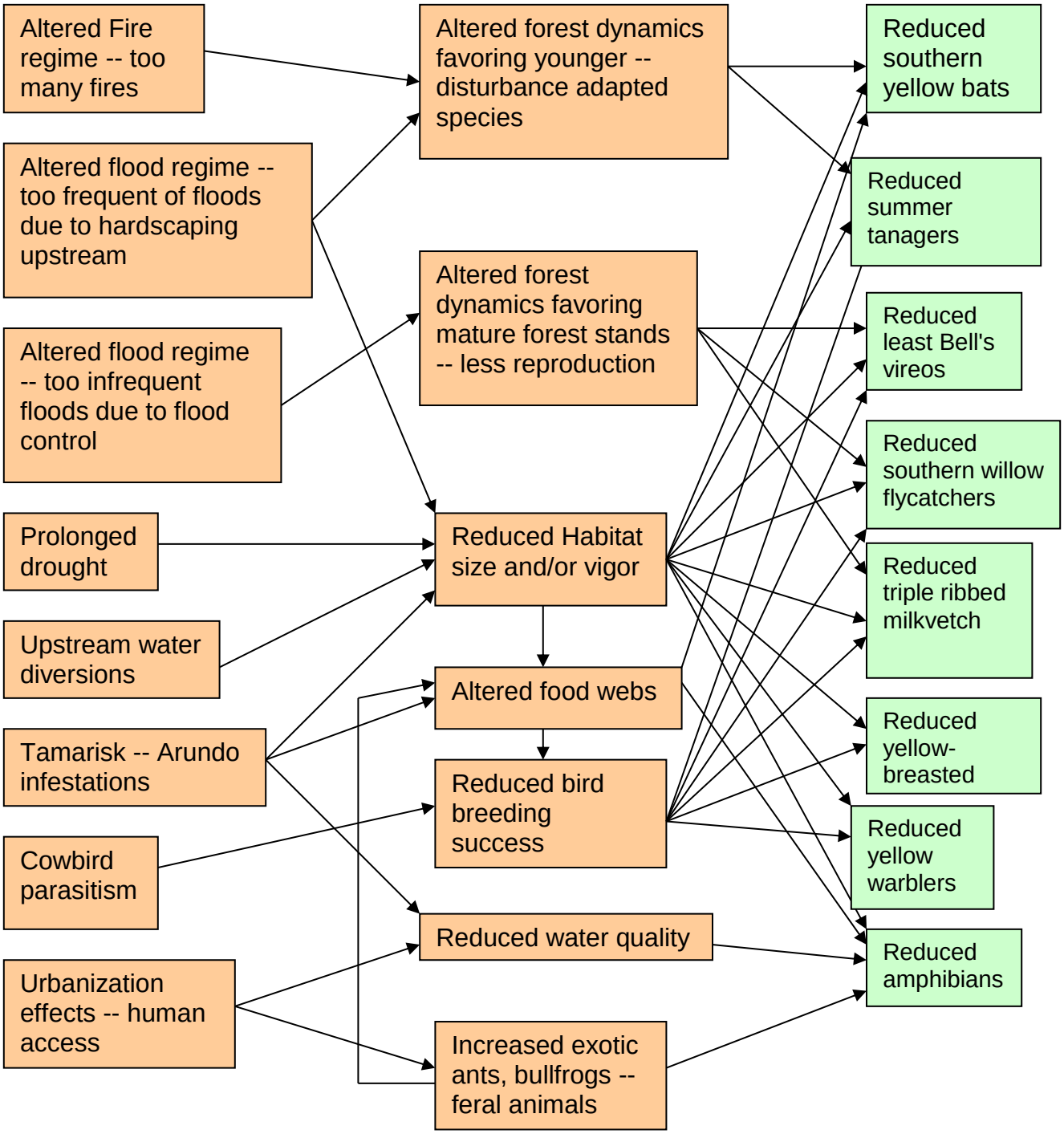
8.4.3.1 Background and Models

The riparian communities within the Plan area include the natural communities listed above. Proposed Covered Species associated with these communities are also listed above. Representative locations for these communities include Chino Canyon, Oasis de Los Osos (San Jacinto Mountains), the Whitewater River, Mission Creek, Cottonwood Creek and Stubbe Canyons (San Bernardino Mountains), Willow Hole oasis, Thousand Palms oasis (Indio Hills), the Coachella Valley Stormwater Channel and Delta area, Dos Palmas oasis, Andreas oasis, Salt Creek (Dos Palmas ACEC), and Hidden Palms as well as numerous other palm oases in the Santa Rosa Mountains. These riparian communities are generally linear, discrete, widely separated Habitats within a matrix of highly arid communities, which are inhospitable for these Covered Species.

Numerous potential threats affect these communities and the associated species Figure 8-10 is a preliminary conceptual model of threats in riparian Habitats. Many of the stressors are rooted in altered hydrologic regimes. These regimes have increasingly altered seasonality, flow frequency, volume, and purity (lack of pollutants) of water. Tamarisk, or salt cedar, (*Tamarix ramosissima)* has reduced surface water availability and increased soil salinity, dramatically altering the quality of riparian Habitats throughout the Coachella Valley and southwestern deserts (Lovich 1996, Barrows 1993). Potential threats from exotic species such as bullfrogs (*Rana catesbeiana*), cowbirds (*Molothrus ater),* and Argentine ants (*Linepithema humile*) have most likely reduced native species viability or presence. Riparian communities are generally believed to be among the most biologically diverse and productive communities, and are subject

to very real and severe threats. Because of the already introduced threats to these diverse areas, a monitoring and Adaptive Management approach is essential to insuring their continued viability.

Figure 8-10: Riparian Habitat Threats Model



In the vicinity of the Salton Sea, riparian management and restoration activities will be coordinated with the State of California Resources Agency.

8.4.3.2 Management: Riparian and Desert Fan Palm Communities

Ongoing Management. Management of some of the riparian areas where they occur within Existing Conservation Lands has focused on removal of tamarisk. For example, at the Thousand Palms Preserve and at Dos Palmas, ongoing efforts to remove tamarisk have been very successful. Other threats that could pose a problem for Covered Species and natural communities include illegal vehicle travel within washes, sand and gravel mining, illegal berming and drainage diversion. The potential impacts of these threats will be controlled and managed.

CVWD will establish permanent riparian Habitat including at least 44 acres of Sonoran cottonwood-willow riparian forest in this Conservation Area to replace the Habitat that is periodically altered by flood control maintenance activities. The 44 acres address impacts to 37 acres of Sonoran cottonwood-willow riparian forest and 46 acres (at a 1:7 ratio) of primarily tamarisk scrub interspersed with occasional cottonwoods and willows. This Habitat will provide for the Conservation of this natural community and the riparian birds covered by the Plan. Within two years of Permit issuance, a plan detailing the location, water supply, and monitoring and management responsibilities, including funding, shall be prepared by CVWD and submitted to the Wildlife Agencies for review and approval. The Habitat will be established within three years of approval by the Wildlife Agencies.

Management of lands within the Mission Creek drainage will require coordination with the Wildlands Conservancy with respect to their lands in the Mission Creek Preserve.

Adaptive Management. Adaptive Management in the riparian systems will focus on identification of threats and development of a Monitoring Program to address the management questions related to these threats. Threats are discussed in the section below. Some of the issues that have been identified to be addressed through Adaptive Management include:

1. Evaluation of the hydrological regimes that are important in riparian systems. In particular, hydrologic studies in the Salt Creek area are needed to determine if the water sources for Salt Creek are adequately protected or if additional water sources may be needed. Water sources could include canal water or existing wells.
2. Steps to enhance and restore riparian Habitat in the lower portion of the Whitewater River, if monitoring shows declines in the numbers of riparian species. Determine the potential need for additional cover to enhance the Biological Corridor, especially under the Interstate 10 bridge.

Adaptive management for desert fan palm oases will likewise focus on identification of threats and development of a Monitoring Program to address the management questions related to these threats. Issues that have been identified to be addressed through Adaptive Management include:

1. If the groundwater monitoring of wells north and south of the faultline shows substantial declines related to surface water levels at the desert fan palm oases, determine appropriate measures, which may include water conservation, restrictions on additional

water use, or surface flow alterations above the oasis, that could remediate the water supply to the oasis to baseline levels.

8.4.3.3 Monitoring: Riparian and Desert Fan Palm Communities

The following objectives will guide the development of monitoring protocols for landscapes, natural communities, and species in the various riparian Habitats.

8.4.3.3.1 Landscape Level Monitoring:

Key Monitoring Objectives:

- Collect data on environmental variables (e.g., local, regional, and global weather patterns) identified in the conceptual models
- Develop and test conceptual models about how changes to the landscape impact Covered Species
- Determine and quantify changes in Habitat that may affect Covered Species
- Assess landscape connectivity between preserves through hypothesis testing
- Relate changes in Habitat to changes in annual weather patterns

To monitor the long-term ebbs and flows of these communities, digital satellite imagery will be used to evaluate the aerial extent of riparian vegetation at each site, thus allowing change detection over time. Satellite or aerial imagery will also be used to identify potential compromises to hydrologic processes (e.g. upstream developments, new well locations, etc.). There is also potential to use satellite imagery to identify exotic species infestations, such as tamarisk, but this use has not been fully explored and tested. Although the riparian communities are dynamic in response to flood events, the rarity of these events probably warrants satellite images are taken no more frequently than every five years.

USGS gauging stations exist in Mission Creek, Deep Canyon, Salt Creek (Dos Palmas), and on the Whitewater River. Data from these stations, coupled with the two weather stations described for aeolian community monitoring, will provide information on the flood processes that affect the riparian communities. These data are collected continuously.

8.4.3.3.2 Natural Community Level Monitoring

Key Monitoring Objectives:

- Estimate distribution and abundance of exotic invasive plants
- Estimate live perennial shrub distribution and abundance
- Ground-truth the spatial extent of Habitats as shown in the satellite imagery and aerial photography
- Relate changes in vegetation to landscape-level monitoring variables

- Develop and evaluate modeled relationships between changes in vegetation, landscape level variables, and responses by Covered Species.
- Track changes in ground water levels from wells and surface water in the vicinity of fan palm oases.

To assist in monitoring ground water levels, shallow wells within these communities can be easily installed. These wells can be placed relatively inexpensively by forcing or digging 2" - 3" perforated PVC pipe into the ground until it is well within the groundwater level, with the pipe capped to prevent foreign material from falling in. Groundwater levels can then be easily measured by inserting a probe and measuring the distance from ground level to the wet mark on the probe. It is proposed to install at least two such monitoring wells at each monitoring site, one at the up-stream end of the Habitat, and the other at or near the down-stream end. The wells will be made as inconspicuous as possible to avoid vandalism, and could require a locking collar should this occur. The locations will be mapped with a GPS unit for easy location. Additionally, a water sample will be collected for testing for pollutants, with testing completed by a contracted water quality laboratory. Groundwater levels and water quality samples should be taken at each monitoring location once a year, during species monitoring surveys.

Exotic species infestations constitute a significant threat to these Habitats. Tamarisk (*Tamarix ramosissima)* is the most obvious of these weed species, but several other exotic invaders are possible (e.g. fountain grass (*Pennisetum setaceum)*, giant reed (*Arundo donax)).* A straightforward method of identifying exotic infestations is to conduct Covered Species monitoring by biologists familiar with the native and potential non-native flora. Exotic species and their general abundance will be recorded on field data forms and reported to land managers for removal or control. Efforts to control tamarisk have targeted the Dos Palmas area, which is heavily infested with tamarisk, except in areas where eradication was successful (See Section 8.4.3.2). Tamarisk control has also been underway since the 1990s in the numerous un-named palm oases in the Santa Rosa Mountains, many of which are important bighorn sheep watering holes, but is not complete. Initial control efforts and removal of tamarisk must be followed up with ongoing treatment. As a result, every 3-5 years, each palm oases will be visited, and weed control programs implemented as needed.

Exotic infestations are not limited to plants. Brown-headed cowbirds (native to portions of North America, but not California) pose a potential threat to the reproductive success of riparian nesting birds because they are nest parasites. In some areas, controlling cowbirds can have an immediate benefit to the reproductive success of nesting birds. However, in other areas, especially where natural nest predation is relatively high, controlling cowbirds may have no measurable effect (Gerald Braden, pers. comm.). Before a cowbird control effort is initiated, baseline parasitism rates versus reproductive success of the Covered Species should be determined. While conducting breeding bird surveys, qualified biologists will investigate all active nests to determine if cowbird eggs or nestlings are present. The presence and abundance of cowbirds will be noted during all bird surveys. If cowbirds appear to be a threat, cowbird traps will be built and placed in targeted areas.

Exotic ants, especially Argentine ants and fire ants, can reduce reproductive success in riparian birds by direct predation on nestlings, and possibly by disrupting natural food webs.

The presence or absence of these ants will be monitored. Managers need to keep abreast of innovative tools for ant control that may be developed elsewhere. Monitoring for these ants will involve placing baited tube vials at each monitoring site, flush to the ground, and checking their contents during bird surveys. The vials will be narrow enough to exclude vertebrates and will only be left open for a few days at a time.

Bullfrogs, other non-native frogs (e.g. African clawed frogs), and non-native fish have the potential to prey on and kill off native amphibians. During amphibian surveys, qualified biologists need to search for these exotic species, noting them on data sheets, and reporting them immediately to land managers. Temporary de-watering, seining, electro-shocking, and "hunting" with spears and guns are all potential tools to control and remove these exotics.

8.4.3.3.3 Species Level Monitoring

Key Monitoring Objectives:

- Estimate the distribution or population size of Covered Species to describe status
- Develop and evaluate ecological models that propose relationships between biotic and abiotic variables and Covered Species
- Learn more about the ecology of Covered Species
- Identify and evaluate potential threats to Covered Species
- Develop effective and efficient non-lethal sampling protocols

The landscape and Habitat level techniques described here are likely to be the most useful in implementing an Adaptive Management plan, because management tools act directly on these variables, and generally not on the Covered Species. Species-level evaluations will be performed to identify when changes in Habitat variables approach critical levels, and to insure that the species respond to the management of the Habitat variables in the predicted fashion.

Initially baseline data will be collected on all of these species, including the arroyo toad, least Bell's vireo, yellow warbler, yellow-breasted chat, southwestern willow flycatcher, summer tanager, southern yellow bat, and the triple-ribbed milkvetch. For the riparian birds, an example of the monitoring approach currently being evaluated is described in Appendix I. The precise protocols to be used for all of these riparian species will be developed during the baseline phase. Very little is known about a number of these species in the Plan area. In the spring of 2003, surveys focused on the Covered riparian bird Species. During surveys for these species, data will be collected on Habitat variables, possible causal factors of species distributions, and species distribution models. These surveys will also gather baseline data on ant populations to track invasive species impacts.

Surveys will also be completed for triple-ribbed milkvetch and arroyo toad. In addition to presence or absence, relative abundance and other metrics will be recorded, depending on the species. For example, for the milkvetch, characterization of the associated plant community and assessment of invasive species impacts will be completed. The survey interval and

frequency will be determined based on feedback from the spring 2003 results. Based on the information gathered during the baseline phase, the level of ongoing monitoring appropriate for each of the Covered Species will be determined. However, ongoing monitoring may change over time in response to Adaptive Management needs, changes in technology, or other circumstances.

Taken together, the proposed program provides the ingredients to develop and test hypotheses relating to changes in the abundances of the Covered Species and then to direct appropriate management actions. These data also provide context for observed species fluctuations so that appropriate management actions can be taken.

8.4.4 Saltbush Scrub and Alkali Flats Communities

Natural Communities

- Desert Saltbush Scrub
- Desert Sink Scrub

8.4.4.1 Background and Models

The desert saltbush scrub and desert sink scrub natural communities are not well known in the Plan Area. The model will be developed during the baseline phase.

8.4.4.2 Management: Saltbush Scrub and Alkali Flats Communities

Ongoing Management. Desert saltbush scrub and desert sink scrub communities are present in the Dos Palmas and Coachella Valley Stormwater Channel and Delta Conservation Areas. Management has not focused on the ecology of these natural communities. Management issues and questions will be identified during Plan implementation.

Adaptive Management. Adaptive Management in the desert saltbush scrub and desert sink scrub natural communities will focus on identification of threats and development of the monitoring questions to address the management issues related to these threats. Threats are discussed in the section below. Adaptive Management will focus on reduction of uncertainty about the ecology and management of this community and its associated Covered Species. The Monitoring Program will be used to address the management questions related to those threats.

8.4.4.3 Monitoring: Saltbush Scrub and Alkali Flats Communities

The following questions will guide the development of monitoring protocols at the landscape, natural community, and species level in these natural communities.

8.4.4.3.1 Landscape Level Monitoring

Key Monitoring Objectives:

- Conduct studies to understand the Essential Ecological Processes in these natural communities

8.4.4.3.2 Natural Community Level Monitoring:

Key Monitoring Objectives:

- Estimate distribution and abundance of exotic invasive plants
- Estimate live perennial shrub distribution and abundance
- Ground-truth the spatial extent of Habitats as shown in the satellite imagery and aerial photography
- Develop and evaluate modeled relationships between changes in vegetation, landscape level variables, and responses by Covered Species

8.4.4.3.3 Species Level Monitoring

Key Monitoring Objectives:

- Estimate the distribution or population size of Covered Species to describe status
- Compare distribution of flat-tailed horned lizard in saltbush scrub and desert sink scrub compared to other natural communities
- Develop and evaluate ecological models that propose relationships between biotic and abiotic variables and Covered Species
- Learn more about the ecology of Covered Species
- Identify and evaluate potential threats to Covered Species

8.4.5 Marsh Communities

Marsh Natural Communities

- Cismontane Alkali Marsh
- Coastal and Valley Freshwater Marsh

Associated Covered Species

- California black rail (*Laterallus jamaicensis)*
- Desert pupfish, (*Cyprinodon macularis)*
- Yuma clapper rail, (*Rallus longirostris yumanensis)*

8.4.5.1 Background and Models

The Plan area includes significant marsh and estuary Habitat at Dos Palmas and the north end of the Salton Sea. Covered Species within these marsh Habitats are listed in Section 8.4.5. Beyond these three species, this community supports significant populations of other marsh-nesting birds.

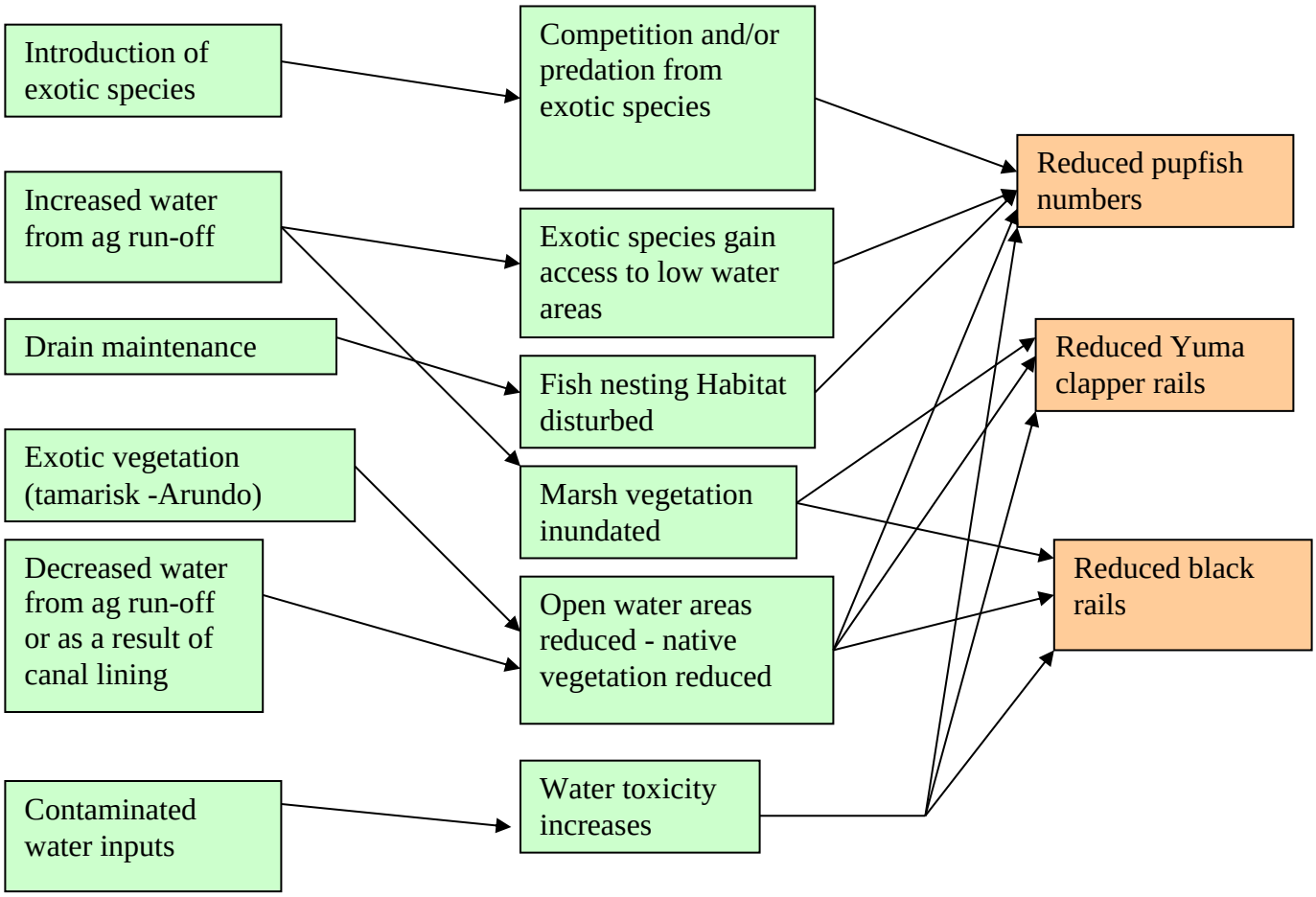
The primary threats to this community, shown in the conceptual model in Figure 8-11, include changes in water availability, water quality, and the infestation of exotic species of plants and fish. These threats can be particularly acute due to the partially anthropogenic character of both the Salton Sea and Dos Palmas. The level of the Salton Sea is maintained primarily by agricultural run-off. The immediate issue with the Salton Sea is the increasing salinity. Current efforts to stabilize and/or reduce salinity will have unknown effects on water levels, and the results are far from assured. The wetlands at Dos Palmas are partially enhanced by leakage along sections of the Coachella Canal. To provide additional water to the Los Angeles region, the canal will be lined, and the majority of this leakage will be stopped. The planning and regulatory processes for the canal-lining project stipulate that there would be no net loss of wetland Habitats. The priority for public safety and human water requirements however, means that reserve managers will not be able to control fully the water inputs to either of these systems.

In the vicinity of the Salton Sea, marsh community management and restoration activities will be coordinated with the State of California Resources Agency.

8.4.5.2 Management: Marsh Communities

Ongoing Management. The control of tamarisk is one of the tools land managers will have to improve water availability and Habitat quality. During all species level monitoring, the location of any tamarisk plants will be noted and mapped. Those locations will be provided to appropriate management officials. However, extremely dense vegetation can reduce open water Habitat for the pupfish. Models for pupfish ecology can identify vegetation characteristics that could be management targets because of their proposed affect on the fish. The challenge is establishing a target of vegetation density, above which management actions will be required. Experienced pupfish biologists generally have a gestalt of knowing Habitat that is too dense when they see it, but quantifying those levels is a more elusive matter. This problem will need to be addressed during early baseline monitoring. One straightforward way to undertake this would be to let the Covered Species' abundances dictate when vegetation density exceeds acceptable limits. However, the Habitat limits for a pupfish are very different from those for a rail. For instance, at the created marsh Habitat of Dos Palmas, separate areas

Figure 8-11: Marsh Habitat Threats Model



are managed for pupfish and for rails, allowing very different management treatments without Covered Species conflicts.

The Coachella Valley Water District (CVWD) will establish 66 acres of permanent Habitat for the California black rail and Yuma clapper rail in this Conservation Area to replace the 41 acres of Habitat in the Coachella Valley Stormwater Channel and the 25 acres of Habitat in the drains that is periodically altered by flood control and drain maintenance activities. CVWD will ensure that the water used to support the managed marsh Habitat is irrigation water from the Lower Colorado River (LCR) or is other water with the same selenium concentration as water from the LCR or that meets an EPA selenium standard for protection of aquatic life that has received a No Jeopardy determination from the USFWS, whichever is greatest. Within two years of Permit issuance, a plan detailing the location, water supply, and monitoring and management responsibilities, including funding, shall be prepared by CVWD and submitted to the Wildlife Agencies for review and approval. The Habitat will be established within three years of approval by the Wildlife Agencies of this plan. As part of its Water Management Plan, CVWD will conduct monitoring of selenium concentrations in the drains and the Coachella Valley Stormwater Channel. This monitoring will allow CVWD to determine if additional measures are warranted to reduce rail exposure to selenium.

CVWD will establish at least 25 acres of managed replacement Habitat for desert pupfish, on a 1:1 ratio at a site or sites to be determined with input from the Wildlife Agencies. The pond or ponds will use irrigation water from the LCR or other water with the same or better water quality as water from the LCR. For selenium concentrations the water can either be water from the LCR, or water that meets an EPA selenium standard for protection of aquatic life that has received a No Jeopardy determination from USFWS, whichever is greatest. It is estimated that approximately 325 acre-ft/yr of water would be required to maintain 25 acres of replacement Habitat, replacing evaporation and maintaining appropriate flow-through rate. Ongoing maintenance and adjustments will be required, including vegetation control and dike and bank maintenance, to achieve desired Habitat characteristics. This Habitat will replace the 25 acres of Habitat that is periodically altered by maintenance activities in drains and flood control channels that contain pupfish Habitat. CVWD, in coordination with IID, will also develop a study to evaluate the potential effect of routine drain maintenance on pupfish occupying the drains to determine the feasibility of modifying maintenance practices to avoid or minimize potential Take. The study will include methods of surveying for pupfish, effects of the direction in which drains are cleaned (upstream or downstream), the manner in which the drains are cleaned (one side at a time or both sides at a time), and the timing of sediment and vegetation removal. The study proposal will be prepared and submitted to the Wildlife Agencies within two years of Permit issuance. The study will be initiated in the field season immediately following approval by the Wildlife Agencies. If the findings indicate that modification of the maintenance practices would significantly minimize impacts to pupfish, CVWD will modify its maintenance practices. Within 5 years of Permit issuance, CVCC shall develop, submit for review and approval by the Wildlife Agencies, and implement a management strategy with the goal of sustaining healthy populations of desert pupfish in the Plan Area in perpetuity.

Adaptive Management. Management options for the pupfish could include the control of invasive vegetation, which should improve water availability. However, some cover should

be maintained for moderating temperatures and predator avoidance, if it is determined to be necessary. If no native cover is available, native sedges, rushes and screwbean mesquite may be planted and established before any (and all) salt cedar/tamarisk is removed. Removal of all tamarisk at once should be evaluated in terms of the potential for increased flows that may impact pupfish. If monitoring identifies them as a threat, control and management of exotic or invasive species will be implemented, in coordination with implementation of the recovery plan. If exotic fish are detected, placement of fish barriers and/or seining out remaining exotic fish may be necessary. Temporarily de-watering infected reaches may also be an option. The presence and potential impacts of Asian tapeworm, a potential pupfish parasite, will be addressed in the Monitoring and Management Program.

Management for the rail species will also address invasive species. If monitoring data indicate a threat, management will address control of invasive species, including plant species such as tamarisk and animal species such as non-native ants, brown-headed cowbirds, bullfrogs, crayfish, and other species that threaten rail Habitat. Crayfish are an exotic species that has become an important component of the diet for Yuma clapper rail in the Salton Sea basin (C. Roberts, pers. comm.); if monitoring indicates that control of crayfish is necessary, the need to establish other suitable prey for the Yuma clapper rail shall be evaluated.

Water quality and water supply issues shall also be addressed. Other threats within the Plan Area include groundwater pumping, dewatering, water diversion, drain maintenance activities, OHV use, contaminants, the lining of the Coachella Canal, and fluctuations of the Salton Sea.

8.4.5.3 Monitoring: Marsh Communities

The following objectives will guide the development of monitoring protocols for landscapes, natural communities, and species in the various marsh Habitats.

8.4.5.3.1 Landscape Level Monitoring:

Key Monitoring Objectives:

- Describe local, regional, and global weather patterns that may affect these communities
- Determine and quantify changes in Habitat that may affect Covered Species
- Assess changes in Habitat connectivity
- Identify distribution of and quality of marsh natural communities
- Relate changes in Habitat to changes in annual weather patterns

In conjunction with coverage of the aeolian systems, satellite imagery will be obtained to evaluate the areal extent and condition of the marsh vegetation. It is hoped that the relative extent of exotic vegetation, primarily tamarisk (salt cedar), versus native vegetation types can be determined.

8.4.5.3.2 Natural Community Level Monitoring:

Key Monitoring Objectives:

- Estimate distribution and abundance of exotic invasive plants
- Estimate live perennial shrub distribution and abundance
- Ground-truth the spatial extent of Habitats as shown in the satellite imagery and aerial photography
- Develop and evaluate modeled relationships between changes in vegetation, landscape level variables, and responses by Covered Species

Water levels and quality will be a focus for natural community and Habitat level monitoring. Currently there is a USGS gauging station on Salt Creek, which drains the Dos Palmas basin, and the outflow is currently measured from the primary artesian well at Dos Palmas. Additionally, water flow from the weir below all the 'natural' springs of the upper Dos Palmas oases will be monitored. While the USGS station monitors continuously, the other two water monitoring stations will be monitored monthly. Although water quality at Dos Palmas is not likely to be an issue, nevertheless, an annual water quality evaluation will occur.

At the Salton Sea, water quality and levels are already extensively monitored. Because of the intense focus on, and measurement of, these variables by a myriad of state and local agencies, no additional efforts will be required. CVWD monitors the elevation of the Salton Sea. The State Park and Imperial Irrigation District monitor water levels weekly, and Riverside County monitors water contaminants. Through monitoring and Adaptive Management, hydrologic studies for the Salt Creek area will be completed to determine if the water sources for the black rail, Yuma clapper rail, and desert pupfish Habitat are adequately protected or if additional water sources may be needed.

The CVWD will be responsible for the design and implementation of a Monitoring Program to track the success of the marsh Habitat they will create as a required measure. This Monitoring Program will be developed in coordination with the monitoring and management team for the Plan.

8.4.5.3.3 Species Level Monitoring

Key Monitoring Objectives:

- Determine if the populations of Covered Species are being sustained and restored.
- Further delimit species distribution

- Develop and evaluate ecological models that propose relationships between biotic and abiotic variables and Covered Species
- Learn more about the ecology of the rails
- Identify and evaluate potential threats to Covered Species
- Develop effective and efficient non-lethal sampling protocols

The landscape and Habitat level techniques described here are likely to be the most useful in implementing an Adaptive Management approach, because management tools act directly on these variables, and generally not on the Covered Species. Species-level evaluations will be performed to identify when changes in Habitat variables approach critical levels, and to insure that the species respond to the management of the Habitat variables in the predicted fashion.

Initially baseline data will be collected on all of these species, including the Yuma clapper rail, the California black rail, and the desert pupfish. The precise protocols to be used for these species will be developed during this baseline phase. In addition to presence or absence, abundance and other metrics will be estimated, depending on the species. The survey interval and frequency will be determined based on feedback from the spring 2003 results. Based on the information gathered during the baseline phase, the level of ongoing monitoring appropriate for each of the Covered Species will be determined. However, ongoing monitoring may change over time in response to Adaptive Management needs, changes in technology, or other circumstances.

The CVCC shall implement the following survey and handling methods to minimize impacts to the desert pupfish within the Plan Area:

a. Surveys for desert pupfish shall include the use of wire minnow traps with or without bait. In the event a new Wildlife Agency protocol is developed, this condition shall be replaced subject to review and approval by CVCC.

b. Minnow traps shall be set during daylight hours only and shall be checked for the presence of desert pupfish at least every 3 hours. No overnight trapping shall be allowed.

c. Handling of desert pupfish during surveys shall only involve taking length measurements to assess size and age class of individuals and shall require minimal exposure out of water. Any pupfish exhibiting signs of physiological stress shall be released immediately at the point of capture to minimize the potential for injury associated with such stress.

8.4.6 Desert Scrub, Chaparral, Woodland, and Forest Communities in Mountainous Areas

Chaparral Natural Communities

- Chamise Chaparral
- Redshank Chaparral
- Interior Live Oak Chaparral
- Semi-desert Chaparral

Desert Scrub Natural Communities

- Sonoran Creosote Bush Scrub on mountain slopes
- Sonoran Mixed Woody and Succulent Scrub on mountain slopes

Pinyon and Juniper Woodland Natural Communities

- Mojavean Pinyon and Juniper Woodland
- Peninsular Juniper Woodland and Scrub

Associated Covered Species

- Desert tortoise *(Gopherus agassizii)*
- Gray vireo (*Vireo vicinior)*
- Peninsular bighorn sheep *(Ovis canadensis)*

8.4.6.1 Background and Models

The Covered Species and natural communities associated with mountainous areas are listed above. Since the vast majority of montane communities, and the Habitat for the gray vireo, are in public ownership (primarily U.S. Forest Service and BLM), development is not a significant threat. Altered fire frequency and magnitude, however, remain stressors to these Habitats. Compared to the fire patterns today, historical fires were most likely more frequent but of relatively small size and intensity. The resultant historical pattern of plant communities was probably much more of a mosaic of stand ages and species composition. Fires today are arguably more infrequent and often tend to be larger and more intense. This leaves an even-aged, less diverse stand of vegetation in post-fire periods. While there is a greater awareness by land managers that fire is a natural component of the ecosystem, shifting to a more "natural" fire pattern is highly complicated by human dwellings within fire zones and by many decades of understory build up of fuels causing fires to grow into destructive conflagrations. Long-term impacts of altered fire patterns are difficult to predict and are only now beginning to be understood by land managers. However, what is clear is that very large and intense fires could

eliminate the majority of the Habitat for the Covered Species for many years, potentially resulting in their local extirpation.

The Peninsular bighorn sheep occurs in mountainous lands and on alluvial fans and washes associated with the Santa Rosa and San Jacinto Mountains Conservation Area. This species occurs in desert scrub areas, alluvial fans and washes, and to a lesser extent in the Peninsular juniper woodland and scrub community. The bighorn sheep are not known to use chaparral areas.

The primary human activities in the montane zone are hiking, hunting, mountain biking, and horseback riding. As long as these activities are restricted to designated trails, there is probably little stress to the natural communities. Figure 8-12 depicts the threats model for this assemblage.

8.4.6.2 Management: Desert Scrub, Chaparral, Woodland, and Forest Communities

Ongoing Management. Ongoing management actions will address control of exotic invasive species. Tamarisk control efforts are already underway through a coordinated effort involving CDFG, BLM, and CVMC to remove tamarisk from the canyons in the Santa Rosa Mountains. Other exotic species for which control efforts have not been coordinated include fountain grass (*Pennisetum setaceum*); methods to control this species will be researched, evaluated, and implemented as appropriate.

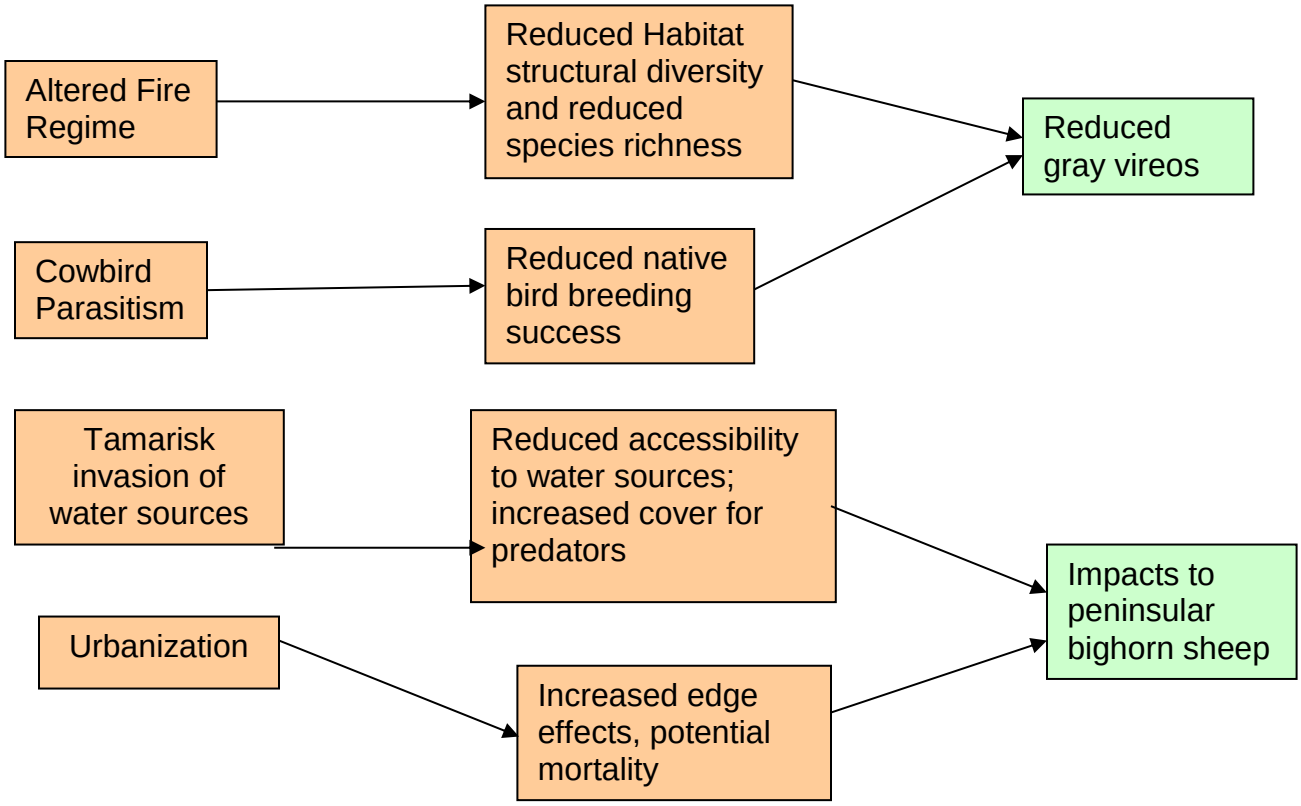
Where necessary, develop fire management guidelines within conserved areas to protect populations from fires and disturbances associated with fire suppression. Fire management is primarily an issue in the western, more mesic, portion of the Plan area where alien annual grasses may facilitate the spread of fire.

Adaptive Management. Land managers should be made aware of vireo nesting Habitats to help guide the implementation of prescribed fires and/or for fighting wildfires. If brown-headed cowbird parasitism is suspected, cowbird eggs shall be removed, the embryo killed, and the egg returned to the vireo nests. If cowbird parasitism is confirmed, cowbird trapping shall be implemented.

Appropriate management prescriptions for pinyon-juniper woodland and chaparral Habitats will be developed. Consideration should be given to the use of prescribed fire and/or standards for controlling wildfires to maintain or restore gray vireo Habitat.

Management of Trails and Public Use. An element of the Management Program in the Santa Rosa and San Jacinto Mountains Conservation Area will involve Adaptive Management of recreational activities including trail use. Specific objectives have been developed for management of recreational use. These objectives focus on the design and management of recreational activities to: (1) support predictable use patterns by trail users; (2) preserve the opportunity for bighorn sheep to access water sources and to move across the

Figure 8-12: Desert Scrub, Chaparral, and Mountain Habitats Threats Model



landscape; (3) provide opportunities for recreation that are compatible with conservation of bighorn sheep populations; (4) evaluate effectiveness of the trails program and recommend modifications to management actions if necessary. These objectives are fully described in Section 2.0 of the EIR/EIS for this Plan.

The Trails Plan will initially focus on multi-agency scientific data gathering to evaluate the effects of recreational trail use on Peninsular bighorn sheep health, habitat selection, and long-term population dynamics. The trails management program is composed of eight elements, which are described briefly below. In addition, the public use and trails management plan addresses other public access issues, and is fully described in Section 7.3.3.2.2. The eight elements, detailed in the following sections, are summarized here: (1) use of existing trails, which will remain open all year; (2) initiation in Plan year 1 of a research program designed to ascertain bighorn sheep response to, and any significant adverse impacts from, recreational trail use in the Santa Rosa and San Jacinto Mountains. This research may include manipulation or limitation of use levels or closures on selected trails as an element of the study design to address specific hypothesis-based research questions; (3) gathering of data on human trail use, primarily on trails within sensitive bighorn sheep lambing habitat and other trails as appropriate. A year-round mandatory self-issue permit system for selected trails will be part of the human use monitoring program. Ongoing monitoring of bighorn sheep populations will be expanded to

include regular monitoring of the distribution, abundance, recruitment, survival and cause-specific mortality of bighorn sheep throughout the plan area; (4) closure of three trails from June 15 through September 30 to minimize the potential impediments for access to water by bighorn sheep and other wildlife during the hot season; (5) deferral of construction of new trails, pending the results of the initial research program, monitoring of trail use, and monitoring of bighorn sheep populations; (6) implementation of a public awareness and education program; (7) annual review of the effectiveness of the public use and trails management program, including results of monitoring, research, and trail management prescriptions. This annual review will consider prudent management actions, including potential trail closures, in response to scientific data or sheep population declines below identified threshold levels; and (8) rerouting and decommissioning of trails to protect sensitive resource values, pending results of the 5-year research program.

An enforcement program will be implemented to ensure compliance with the self-issue permit program and other trail management prescriptions, described in Section 7.3.3.2.1 for selected trails in the Santa Rosa and San Jacinto Mountains Conservation Area. Enforcement personnel will have the ability to issue citations to those using trails subject to the unlimited permit program who do not have a permit. If monitoring shows continued violations of the permit requirement, the enforcement program will be evaluated and modified as needed to achieve greater compliance.

The Trails Management Subcommittee, the membership and responsibilities of which are described in Section 6.3, will annually review effectiveness of the overall trails management program, including progress reports and recommendations from the researcher(s) working on bighorn sheep within the Plan Area; an assessment of bighorn sheep population trends; recreational trail use data; compliance with the hot season closures, mandatory self-issue permits, and other trail management prescriptions; and other new data acquired. The Subcommittee will make recommendations to the RMOC (for portions of trails on non-federal land) and the Santa Rosa and San Jacinto Mountains National Monument Advisory Committee (for portions of trails on federal land) regarding modifications to the trails management program. The trails monitoring program and the research program will provide data for the trails management program. The RMOC shall meet annually, or more often as needed, with the Trails Management Subcommittee to review the results of the trails monitoring program and other relevant data, and shall advise the RMOC and the CVCC regarding any issues identified through monitoring and research.

Another specific element of the trails management program will involve trails to be rerouted and trails to be decommissioned and removed. Section 7.4.1.4.7 lists and describes trails to be decommissioned and removed because they are redundant or because they impact sensitive resource values. The Trails Management Subcommittee will coordinate with the RMUC for the Santa Rosa and San Jacinto Mountains Conservation Area/Reserve Management Unit #6, and the RMOC to implement these changes.

8.4.6.3 Monitoring: Desert Scrub, Chaparral, Woodland, and Forest Communities

The following protocols will be used to monitor landscapes, natural communities, and species in the various chaparral, woodland, and forest Habitats.

8.4.6.3.1 Landscape Level Monitoring

Key Monitoring Objectives:

- Describe local, regional, and global weather patterns that may affect these communities
- Determine and quantify changes in Habitat that may affect Covered Species
- Assess changes in landscape connectivity
- Relate changes in Habitat to changes in annual weather patterns

Satellite images will be taken in conjunction with those for the aeolian community. These images, combined with known locations for the gray vireo, could be used to develop improved species-Habitat models. These models in turn could focus searches in Habitat likely to support this species, and eventually determine the areal extent of its distribution. Fire patterns and recovery can also be tracked over time using this technology.

8.4.6.3.2 Natural Community Level Monitoring:

Key Monitoring Objectives:

- Estimate distribution and abundance of exotic invasive plants
- Estimate live perennial shrub distribution and abundance
- Ground-truth the spatial extent of Habitats as shown in the satellite imagery and aerial photography
- Develop and evaluate models about relationships between changes in vegetation, landscape level variables, and responses by covered species

Exotic species are not currently believed to be a significant threat to these communities. However, biologists will record any infestations that do occur. The perimeter areal extent of the chaparral edge will be delineated with GPS mapping each time new images are obtained. Additionally, permanent on-site digital photo documentation points will be established and monitored. Signs of disturbance from recreational uses will be assessed annually, and if problems are apparent, fencing along trails may be required.

8.4.6.3.3 Species Level Monitoring

Key Monitoring Objectives:

- Determine if the populations of Covered Species are being sustained and restored.
- Estimate adult survivorship, age structure, for some Covered Species (e.g. desert tortoise, bighorn sheep)
- Further delimit species distribution
- Develop and evaluate ecological models that propose relationships between biotic and abiotic variables and Covered Species
- Learn more about the ecology of Covered Species
- Identify and evaluate potential threats to Covered Species
- Develop effective and efficient non-lethal sampling protocols

The landscape and Habitat level techniques described here are likely to be the most useful in implementing an Adaptive Management approach, because management tools act directly on these variables, and generally not on the Covered Species. Species-level evaluations will be performed to identify when changes in Habitat variables approach critical levels, and to insure that the species respond to the management of the Habitat variables in the predicted fashion.

Initially, baseline data will be collected for species-level monitoring. For the gray vireo, an initial focus will be to determine the occurrence of this species in the Conservation Areas. At the present time its status as an extant species in this area is not known. The precise protocols to be used for will be developed during this baseline phase. In addition to presence or absence, relative abundance and other metrics will be recorded, depending on the species. The survey interval and frequency will be determined based on feedback from the spring 2003 results. Based on the information gathered during the baseline phase, the level of ongoing monitoring appropriate for each of the Covered Species will be determined. However, ongoing monitoring may change over time in response to Adaptive Management needs, changes in technology, or other circumstances.

Section 8.4.7 describes monitoring related to recreational activities and trails.

8.4.7 Focused Monitoring Questions

Several elements of the Plan require specific focus to address questions through the Monitoring Program. These monitoring questions require a sampling design that is developed to address these specific questions.

8.4.7.1 Monitoring the Effects of Public Access and Use

8.4.7.1.1 Relationship between Peninsular Bighorn Sheep and Recreational Trails

The focus of this element of the Monitoring Program will be to evaluate the use of recreational trails by hikers, equestrians, and mountain bikers as it relates to Habitat use by bighorn sheep, as described in Section 7.3.3.2.1 of the Plan. The intent for this effort is to monitor trail use to determine the levels of use of various trails in coordination with a research program, which is described in Section 8.5.1. Trail use levels and compliance with a mandatory self-issue permit system, hot season closures, and other trails management prescriptions will be assessed as part of the Monitoring Program. The effects of recreational trail use on Peninsular bighorn sheep will be assessed through the research program.

Biologists and statisticians from CDFG and USFWS have worked with CVAG and BLM to develop a preliminary sampling protocol to assess trail use. The preliminary sampling design would involve sampling personnel who would walk the trails, counting trail users. The level of sampling effort required for this program has been calculated to meet the 99% confidence interval. Four individual trail monitors are needed to collect data with an adequate sample size. Sampling is designed to address use levels on trails subject to the permit system. Trail monitoring will incorporate additional sampling of other trails as appropriate.

A mandatory self-issue permit system will be implemented on the trails or trail segments listed in Element 2, except the Eagle Canyon Trail and Goat Trails, to provide data for the human use monitoring program. These self-issue permits will be required of all trail users on a year-round basis. They will be designed to be as user-friendly as possible and will not be limited in number. The self-issue permit program is described in Section 7.3.3.2.1 under Element 3. Compliance with this program will be assessed as part of the Monitoring Program. The permits will provide an opportunity to educate trail users about trail use rules, conservation of bighorn sheep, and safety recommendations for desert hiking. Failure to have a permit in possession when using the applicable trails may result in issuance of a citation.

To date, CDFG has been conducting ongoing population monitoring of Peninsular bighorn sheep on a biannual basis in cooperation with the Bighorn Institute. Population level monitoring of bighorn sheep for the Plan will continue as a cooperative effort involving CDFG, USFWS, BLM, CVCC, and other partners, as described in Section 7.3.3.2.1 under Element 3. The Monitoring Program provides for an increased level of bighorn sheep monitoring, to be conducted on an annual basis.

8.4.7.1.2 Monitoring Other Effects of Public Access and Use

The Plan provides for public access and use of public land in the Conservation Areas consistent with Conservation Goals and Conservation Objectives. In addition to the trail monitoring described in Section 8.4.7.1.1, approved public uses will be monitored to ensure that compliance with any conditions is achieved, and the use does not result in significant adverse impacts over time. Specific recreation issues may include new trail development, trail rerouting, trail removal, cross-country travel, camping, entry with dogs, the use of pack stock,

the Murray Hill facilities, and organized group activities. This monitoring will feed back to the Management Program to assess levels of use and determine the need for altering management to protect and preserve resource values.

8.4.7.2 Assessing Biological Corridors and Linkages

The presence of a functional Biological Corridor and Linkage system is a key element of the Conservation Plan for the MSHCP Reserve System. Designated Biological Corridors at freeway undercrossings, bridges, and culverts have been identified as "pinch points" that provide connectivity between Conservation Areas. Larger, contiguous Habitat areas are designated as Linkages between Core Habitat areas. Specific Conservation Objectives target Biological Corridors and Linkages within Conservation Areas to ensure connectivity for Covered Species (See Section 4.3).

The Monitoring Program will gather data on the use and effectiveness of Biological Corridor and Linkage areas. Monitoring will assess the levels of use of freeway undercrossings and culverts by small mammals and reptiles that are Covered Species as well as larger animals including coyotes, mountains lions, and fox. Methods used to inventory and monitor use and effectiveness include track surveys, remote camera stations, road-kill reports, and radio collar transmitters. The long-term monitoring of species distribution changes that will be accomplished in the Monitoring Program will also provide data to assess the use of Linkage areas.

There are five culverts under Palm Drive within the Willow Hole Conservation Area. These culverts are 36" diameter corrugated steel that allow Big Morongo Wash to pass under Palm Drive. They are approximately 15 to 20 feet apart. The effectiveness of these culverts as a Biological Corridor will be evaluated through monitoring. If wildlife experience substantial road kill on Palm Drive, wing fences directing small animals into the culverts will be constructed (See also Section 8.5.3).

8.4.7.3 Assessing Impacts to Covered Bird Species from Overhead Power Lines

An element of the Monitoring Program will address the potential for impacts to bird species as a result of overhead power lines approved as Covered Activities (See Table 7-7). Through monitoring and associated Adaptive Management, the impacts will be assessed and necessary actions will be implemented. This may include actions to reduce or eliminate bird perching on overhead power lines. Within one year of Plan adoption, IID shall develop a maintenance plan approved by the Wildlife Agencies, for its facilities in Conservation Areas that will minimize impacts to Covered Species and natural communities.

8.4.7.4 Burrowing Owl Relocation Protocols

Measures for avoidance, minimization and mitigation of impacts to burrowing owls are described in Section 4.4.

Determination of the appropriate method of relocation, such as eviction/passive relocation or active relocation, shall be based on the specific site conditions (e.g., distance to nearest suitable habitat and presence of burrows within that habitat) in coordination with the Wildlife Agencies. Active relocation and eviction/passive relocation require the preservation and maintenance of suitable burrowing owl habitat determined through coordination with the Wildlife Agencies.

8.5 Research: Targeted Monitoring and Management Studies

8.5.1 Research on Effects of Recreation on Peninsular Bighorn Sheep

Implementation of the Plan will include a focused research program to evaluate the effects of recreational trail use on Peninsular bighorn sheep health, behavior, habitat selection, and long-term population dynamics. The overarching goal of this research program is to obtain empirical data from the Plan Area to guide trails management. Although many studies have been conducted on the impacts of recreation on bighorn sheep and other ungulates, the responses of bighorn sheep to recreational impacts is variable and not well understood. The Plan will implement an adaptive approach to trails management whereby information is gathered through management policies that are treated as experiments. Bighorn sheep biologists from CDFG, USFWS, and BLM developed a framework for this research, with input from other knowledgeable scientists. The basic questions relate to the proximate response of bighorn sheep to recreation disturbance, for example, *Is there evidence of bighorn sheep avoiding recreational trails*? The broader questions address the population-level impacts, for example, *What effect does recreation have on persistence of bighorn sheep populations?* It is unlikely that there are clear, black and white answers. There are many existing perturbations in the environment and there may be many confounding factors as well. The research will be designed to minimize impacts to bighorn sheep as a result of research activities. This section discusses the basic questions that should be addressed through this research program. The funding plan anticipates the initial field research will be completed during an approximately five-year period. The implementation of the trails research program will be initiated in Plan year one with development of a problem analysis and request for proposals. Field research may not actually begin until Plan year two. Some elements of the research may not require five years to complete. It is anticipated that interim feedback from the bighorn sheep and trails research will also be available via annual reports which will be provided to the various management committees and the CVCC for their use. The research results in their entirety will be available for review and use by the Trails Management Subcommittee, RMOC, CVCC, and other entities by no later than approximately year seven of Plan implementation; this schedule incorporates the time necessary for complete data analysis and final report preparation. The research results will be incorporated in the trails management program.

This research will be carried out through contracts, solicited by a Request for Proposals (RFP) to qualified research institutions or scientists. Funding for this research is outlined in Section 8.8.3. Development of the RFP, review of proposals, and selection of researchers would be by qualified representatives from the Wildlife Agencies, CVCC, BLM, and outside objective reviewers. The other members of this group will approve the outside reviewers. As part of the refinement of the research program and development of the RFP, a problem analysis will be prepared.

The recommended criteria for selection of the scientists and investigators chosen to study these questions include:

1. It is critical that the investigator develop specific hypotheses with rigorous rejection criteria. Even then, the results may contain some predictions, in terms of the anticipated future, long-term effects that recreation may have on bighorn sheep.
2. Investigator(s) shall be objective, with a proven record of accomplishment of carrying out rigorous scientific investigations.
3. Investigator(s) should be affiliated with a qualified research institution or have other scientific credentials.
    a. One scenario would be for an MS candidate(s) to investigate the site-specific effects of recreation on bighorn sheep and a Ph.D. candidate to coordinate all research projects and develop models to evaluate the long-term effects of recreation on bighorn sheep population dynamics.
4. Investigator(s) must have the flexibility to apply treatments to trails and areas (i.e., open or close trail(s) to test response by sheep).

Research Questions.

The following are sample questions that could be incorporated into the research design. The researcher(s) would have the flexibility to refine these questions, and pose additional questions if appropriate, based on direct observations and measurements. These questions can be addressed in part through modeling exercises, using empirical data collected to answer questions related to proximate response. The trails that will initially be the focus of the research program are listed in Section 7.3.3.2.1. Site-specific questions will be related to variables such as topography, size of Habitat patch, juxtaposition of Habitat with trail(s), etc.

1. What is the proximate response of bighorn sheep to recreation disturbance?
    - What are the immediate behavioral responses of bighorn sheep to hikers, bikers, and equestrians and what factors influence bighorn sheep responses (e.g., topography, visibility, proximity to escape terrain, elevation of the disturbance relative to the location of the sheep, season, sheep group size, frequency of disturbance, duration and magnitude of disturbance, type of disturbance, distance from disturbance, etc.)?
    - What is the relationship between distance of sheep to disturbance and their response?

- How can GPS collars be used to collect information on active and inactive periods?

2. What are the effects on energy budgets through alteration of foraging efficiency, rumination schedules, and activity schedules?

   - Does human disturbance result in changes to the activity budget such that it is different from what it is without disturbance?
   - Is decreased nutrient intake an issue? Does the animal spend more time looking around and less time feeding?
   - Develop a bioenergetics model. The effects that can be measured are going to be indices of levels of energy acquisition and activity (i.e., energy expenditure). Population level effects would have to be inferred from indices.

3. Is there a change in distribution in the absence of concomitant changes in density (e.g., sheep might move to area that is less safe (terrain) and be more vulnerable to predation, even though the new area provides adequate nutritional resources)?

   - Address adaptive mortality, such that an animal that lives in a riskier place has higher probability of predation than one living in a safer place. Could be both individual and population level – primarily through adaptive mortality (mortality increased as result of move)
   - How does movement by sheep from place with high quality forage to place with lower quality forage affect/change nutrient acquisition? If sheep move from area that provides ideal forage to an area that is adequate in terms of forage, we would expect no population level consequence. If sheep move to areas that are not adequate (moving to areas with lower carrying capacity) we would expect to see effects on recruitment of lambs and ultimately a decreased population.
   - The research design should incorporate controls unless a robust method with greater inference is used. The southern Santa Rosa Mountains south of Guadalupe Canyon may provide control areas where recreational use is very low.

4. Is bighorn sheep use of suitable Habitat lacking or significantly reduced near areas of trail use?

   - To what extent are sheep avoiding areas with trails that are receiving human use? This analysis could use existing location data points (depending on geographic bias of data). It could also be addressed with a quantitative survey of sheep droppings or radio-telemetered sheep to determine if their density is lower near trails relative to equivalent Habitat without trails.

The research program may involve the development of a predictive model to quantify the cumulative impacts of recreation on bighorn sheep. This model would address the cumulative impacts of recreation on the long-term viability of bighorn sheep (determine whether human disturbance alters the energy budget, predation risk, nutritional plane, or habitat use and connectivity of bighorn sheep, and model the demographic consequences of such changes).

This research program may require manipulation of use levels on trails. Manipulation could include increases, decreases, or prohibitions of use altogether on one or more trails, while simultaneously monitoring responses of bighorn sheep. Manipulated trail use will be based on a research study design focused on addressing specific research questions related to the impacts of trail use on Peninsular bighorn sheep. The research study design will determine which trails, if any, would be subject to manipulation of use levels. Data gathered from this research program will be used as the basis for future trails management decisions. Implementation of the research program will be coordinated with the Trails Management Subcommittee. In addition, an interim memorandum of understanding has been added as Appendix III which delineates the roles and responsibilities of the responsible agencies in implementation of the Trails Plan.

Upon completion of the research program, study results and management recommendations will be integrated into a revised public use and trails management program, using best available science, professional judgment, and wildlife management principles where study results may be less than definitive. If, by Plan Year 3, a fully funded research program, including a research plan and associated field research, has not been initiated, management action will be taken to ensure protection of lambs and ewes during the lambing season. Results from the research shall be integrated into a revised trails plan that will be implemented by Plan Year 10. If the revised trails plan is not implemented by Plan Year 10, management action will be taken to ensure protection of lambs and ewes during the lambing season.

8.5.2 Burrowing Owl Interim Conservation Strategy

Implementation of the Plan will include an interim management strategy for burrowing owls. The Plan will implement an adaptive approach to burrowing owl management whereby information is gathered through the Monitoring Program. This information will be used as the basis for development of a long-term conservation strategy for burrowing owls during the first 6 years post Permit issuance.

First 3 Years Post Permit Issuance. During the first 3 years post Permit issuance, CVCC shall implement an interim conservation strategy for burrowing owls, subject to approval of the Wildlife Agencies. This interim strategy shall involve:

a. Systematic surveys of appropriate habitat within the Conservation Areas, where access is provided, using a protocol developed through the Monitoring Program with Wildlife Agencies' concurrence to determine the distribution and abundance of burrowing owls within the Conservation Areas.
b. Management actions to be taken to eliminate potential threats and stressors to burrowing owls and to sustain the burrowing owl population. These actions may include:
    1. Installation of artificial burrows in Conservation Areas where appropriate to attract and retain burrowing owls
    2. Installation of artificial perches in Conservation Areas where appropriate to attract and retain burrowing owls
    3. Other actions as necessary to maintain a minimum of 16 pairs of burrowing owls within the Conservation Areas until data are gathered to identify a minimum number of occupied sites and carrying capacities for those sites.

Within 6 Years Post Permit Issuance. During the first 6 years post Permit issuance, research and monitoring will focus on gathering data to address specific questions through the hypothesis-based adaptive management approach. Information from the interim conservation strategy that occurs in the first 3 years shall be evaluated to guide the subsequent 3 years post Permit issuance. The data gathered during the first 6 years, together with other pertinent scientific information, will be used to develop a long-term conservation strategy for burrowing owls.

a. The Monitoring Program shall address the following questions:
   1. Territory and home range size for burrowing owl pairs in the Conservation Areas
   2. Source population for burrowing owl dispersal/immigration into Conservation Areas
   3. Reproductive success and recruitment of known burrowing owl pairs in Conservation Areas
   4. Analysis of historic and current observations of burrowing owls within the Plan Area to ascertain past and present distribution and habitat use
   5. Other questions as identified in the Adaptive Management process.

b. The long-term conservation strategy developed from the data gathered during the first 6 years post Permit issuance will be implemented. Other information obtained through the Monitoring Program and Adaptive Management may result in alterations to the long-term conservation strategy through the life of the Permit.

c. The applicable Permittees shall require that relocation of burrowing owls consistent with Section 4.4 be implemented for all Covered Activities.

8.5.3 Other Research Questions

Use of Biological Corridors and Linkages. In addition to the monitoring data that will be collected on use of biological corridors and linkages, research is needed to evaluate the size and design of effective freeway undercrossings or bridges to act as corridors. Plan Conservation Objectives require the installation of culverts or underpasses, which will act as effective corridors when roads are widened. Information is needed on the size and character of these potential future corridors. This information need is best addressed through a targeted research program.

Focused Research on Individual Covered Species. Research on individual Covered Species will be carried out as research needs are identified through the Monitoring and Management Programs. Some potential research topics for Covered Species are listed in Section 9.0 under individual species.

8.6 Data Storage and Analysis

To enable managers and wildlife agencies to evaluate the efficacy of Conservation measures, it is essential that sufficiently robust monitoring data be collected. However, these efforts will be wasted if the data are not analyzed, evaluated, and stored in a manner that allows easy retrieval and understanding by all stakeholders. Commonly observed failures of management and monitoring plans are inadequate resources designated for long-term implementation, and insufficient care given to the analysis and evaluation of collected data. Some suggest that data management, analysis, and evaluation require an additional 30% to 50% of the time above that devoted to the collection of those data (National Park Service, Vital Signs Monitoring). The monitoring protocols above include time for data management totaling nearly 40% of the time devoted to data collection. Whether this will be sufficient or not will be part of the annual adaptive evaluation of this program.

8.6.1 Data Management

Data management will be the responsibility of two full-time database managers, with oversight from the Biological Monitoring Program Administrator. Data management will require a team who understand the questions the data are designed to answer, the nature and constraints of the raw data, and the proper analysis techniques to answer the intended questions. Careful data formatting, management, and analysis are critical steps in this process. Formatting depends on the specific form in which the data are collected. The data management system must be flexible to accept different data forms, must have adequate metadata to allow different managers and investigators to ascertain how and where the data were collected, and must have long-term storage and retrieval capacity. A commitment to maintaining the data for the duration of the MSHCP is required. More detail can be found in the excellent overview by Michener and Brunt (2000). Examples are the LTER data (www.lternet.edu), and the UCR Center for Conservation Biology (www.ccb.ucr.edu). A data management system will include the following:

- The investigator (location and time of sample, methods, etc) provides appropriate metadata.
- Data entry follows standards to ensure consistency
- The data management system is compatible with systems used by other Plan participants (e.g. Access)
- Backups are prepared on a regular basis
- A highly redundant architecture
- Fully managed backup with offsite storage
- A secure and environmentally controlled location where the computer equipment is housed
- Around-the-clock data management and maintenance.
- Ultimately, data will be housed through the BIOS system of CDFG and at the CEED system at the San Diego Supercomputer Center at UCSD.

With the long period for the Plan, the database system used for the Monitoring Program will change as new technologies evolve. While the software may change, the system will always be one with many built in safeguards. The data from the Monitoring Program needs to be available so that it can be used by different agencies that use different computer systems. It also needs to be adaptable to new database programs that may develop in the future. The database management system that will ultimately be used may include elements of existing systems. Among the current database systems with which it should be compatible are CDFG's Biogeographic Information and Observation System (BIOS).

8.6.1.1 Database Consolidation

One element of data management is the consolidation of existing databases for use in the various aspects of the program including the Habitat/niche modeling process. Data on occurrences of Covered species from all accessible sources including published literature, museum records, other existing databases (e.g. CNDDB) has been and will continue to be brought together into a master database with a unique ID which is georeferenced with assigned coordinates and a maximum error estimate. This effort has used UC Berkeley's MaNIS (Mammal Networked Information System (MaNIS)) system as a standardized means to georeference museum and other historical records.

8.6.1.2 Data Handling and Storage

The methods used to handle data, from collection to analysis, are critical to the value of the data over time. Collection of data will follow standard protocols, with training for field personnel involved in recording, compiling, and entering data. Likewise, data entry and analysis will be standardized. Standard practices will be adopted to ensure efficient and consistent data handling:

1. During the planning stages for each project, all MSHCP data collectors (reserve monitors, Reserve Managers etc.) will meet to discuss data collection protocols to ensure scientific validity and consistency through time. Field data forms used by various reserve monitors will be standardized.
2. As data are processed, all versions of a data set will be archived, from raw data to a fully checked and verified form. The methods and steps used to process data will be described. The primary purpose of this practice is to make it possible to recover from data mishandling during manipulation of the original source data. It also makes it possible to verify data processing methodologies at a later date should it become necessary.
3. Metadata will accompany all data generated by this project. The current standard is the Federal Geographic Data Committee (FGDC) Metadata Standard. Any future standard will be agreed upon by the RMOC.

The responsibility for storing the official record associated with MSCHP compliance will rest with CVAG. The Monitoring Program Administrator will be responsible for compiling the data generated from the Monitoring Program. Copies of these data will be provided to the

appropriate parties, including CDFG, USFWS, and BLM. A process of "mirroring," maintaining identical copies of entire file systems on computer servers in different locations, will be followed. The mirrored file systems will create redundancy and will place the entire data set closer to those who use it most.

8.6.1.3 Data Availability

The availability of data, including whether data will be accessible to the public, will be addressed by a standard data policy within one year of Permit issuance. This policy will be adopted by the RMOC in coordination with the Monitoring Program Administrator. The intent is to make data from the Plan as available to the public as possible. The standard data policy will address consideration as to whether there are any data that are not made available to the public (e.g. some information may be proprietary). Data used for management decisions will be considered public information and will be made available to the public. With this in mind, the following practices will be followed:

1. CVCC will be the designated single point of contact for available data.
2. Metadata will accompany all datasets that are made public.

8.6.2 Data Compilation and Analysis

Data compilation and analysis will be the responsibility of the Monitoring Program Administrator. Once data are compiled, the database management personnel will be responsible for organization and storage. Data analysis will be handled by the data analysis and database management staff (see Section 8.8.2, Personnel for Monitoring Program) in conjunction with the Monitoring Program Administrator. The analysis may involve nested integration of the monitoring levels (landscape, Habitat, and species) to provide the robust power intended by the monitoring protocol design.

8.7 Program Reporting and Evaluation

Annual monitoring reports that summarize the results of each year's monitoring efforts will be provided to the Reserve Management Oversight Committee, the Reserve Management Unit Committees, and the Land Manager. The Monitoring Program Administrator will be responsible for preparing and distributing these reports. The Biological Monitoring Report will include, at a minimum, the following:

1. Objectives for the Monitoring Program for that year
2. Effects on Covered Species and Natural Communities
3. Location of sampling sites
4. Methods for data collection and variables measured
5. Frequency, timing, and duration of sampling for the variables
6. Description of the data analysis in terms of what, how, and by whom
7. Results of data analysis
8. Evaluation of progress toward achieving measurable biological goals and objectives
9. Suggested changes/feedback for Adaptive Management
10. Cause-and-effect relationships
11. A review of land use adjacency implementation compliance
12. The priorities for the next year.

The Monitoring Program Administrator will be responsible for reviewing the annual reports working in cooperation initially with the program biologists, the Land Manager and RMUCs. The MPA, Land Manager, and the respective RMUCs will evaluate the results of annual monitoring, and will address relevant questions including the following:

1. Are the protocols providing data with sufficient resolution to detect significant changes? If not, what alternatives are available? Proposals for changes shall be considered, discussed, modified per the discussion, and agreement on an implementation strategy reached.
2. Do any of the data collected with respect to species or natural communities indicate early signs of decline or degradation (independent of natural fluctuations in resources) in response to the changed occurrence of known threats? If so, are data that are more precise required? How should the monitoring design be modified to acquire data that are more precise?
3. What are the appropriate management responses and ways to implement them? If no management responses are readily available, proposals and funding for research to develop and test potential management tools should be recommended.

4. Do monitoring data indicate management actions have been effective? What are the appropriate measures of success in response to a management action? Is the design and placement of monitoring stations sufficiently sensitive to measure management effects when they occur? If the management tools are ineffective, propose and fund research to develop and test new tools.

5. Are data analyses sufficient to answer the questions above? Is the nested integration of data on landscape, natural community, and species level monitoring occurring? Does it provide the desired level of resolution and understanding? If not, review procedures, and if necessary, fund training for data analysts and lead biologists on appropriate data analysis tools.

This annual monitoring report review and evaluation will result in an analysis of the results and a series of recommendations. The results of the initial review process will be presented to the Reserve Management Oversight Committee.

To ensure consistency across land ownership boundaries, the Monitoring Program Administrator will develop annual work plans for monitoring the entire MSHCP Reserve System and will be responsible for coordinating the monitoring efforts. The Monitoring Program Administrator will submit annual work plans to the RMOC in the last quarter of each year. The work plans for the following year will include a description of proposed monitoring efforts, survey protocols, schedule for fieldwork, and an estimated budget that details personnel and equipment needs and other expenses. The estimated budget will include the identification of in-lieu or contracted services to implement the Monitoring Program. To facilitate early cost planning, the Program Administrator will also provide to the RMOC on an annual basis a 3-5 year projected schedule and estimate of cost for implementing the Monitoring Program.

8.8 Work Plan, Schedule, and Program Costs

Implementation of the Monitoring Program will be phased. As previously noted, this program begins with a framework for monitoring that will be tested and evaluated during a baseline phase, the initial five years of Plan implementation. The information gathered during the baseline phase, will determine the level of ongoing monitoring appropriate for each of the Covered Species and natural communities. The framework is designed to provide for maximum flexibility in this initial phase during which sampling protocols for long-term monitoring will be developed and tested. Once this baseline phase is concluded, a long-term Monitoring Program will be implemented. Monitoring protocols evaluated and refined during the baseline phase will be identified and described in this Monitoring Program. Protocols used during the baseline phase described in this framework may not ultimately be used in the long-term Monitoring Program. Likewise, ongoing monitoring may change over time in response to Adaptive Management needs, changes in technology, or other circumstances.

Baseline Phase - The Baseline Phase has a spatial focus with the goal of better describing where species and natural communities occur and what the correlates of their distribution are. The

Baseline Phase will begin in Year One of Plan implementation. Once adequate data are gathered, the baseline phase will involve using distributional data to pursue questions of spatial and temporal scale, and to identify important ecological relationships. The Plan's five-year baseline sampling shall be designed and implemented according to the Scientific Principles identified in Section 8.3.2.

Years 1 to 5

- Install markers for transects, sample points, plots, or other sample units in Existing Conservation Lands
- Conduct field surveys of Covered Species and natural communities to assess distribution and abundance
- Collect data on Habitat parameters associated with each Covered Species for Habitat/niche models.
- Update Natural Communities/Vegetation Map and GIS Layers
- Conduct Habitat monitoring through assessment of vegetation, vertebrate, and invertebrate communities
- Obtain satellite imagery and other remote sensing tools to track landscape-level parameters
- Establish weather monitoring stations
- Evaluate data for development of long-term monitoring protocols, intervals for monitoring
- Develop, evaluate, and refine Covered Species Habitat/niche models
- Continue field surveys of Covered Species and natural communities
- Determine extent to which biotic and abiotic factors may be used as potential indicators or monitoring surrogates

Long-term Monitoring Phase - The long-term implementation of the Monitoring Program will commence with the completion of the baseline phase. The focus of this phase is to measure the effectiveness of Conservation strategy for conserving and restoring covered populations and communities, and to identify current and potential threats.

Years 6 to 10 (ongoing)

- Initiate monitoring of Covered Species using protocols developed in baseline phase. The sampling interval will vary depending on the species or natural community being sampled.
- Continue to evaluate and modify protocols as necessary
- Reduce uncertainty in ecological knowledge, and the response of the system to management actions, through surveys, experiments, and Adaptive Management
- Conserve, enhance, and recover populations of Covered Species as appropriate.

Lands within the MSHCP Reserve System already under Conservation ownership, called Existing Conservation Lands (See Section 8.2.3) will be the initial focus of monitoring activities during the baseline phase. As new lands are added to the MSHCP Reserve System, they will be subject to the same data gathering process and phased implementation. Field surveys on these lands to determine occurrence and distribution of Covered Species will be initiated the first season after acquisition. Within two years, they will be fully incorporated into the Monitoring Program. If this occurs during the Baseline Phase, these new Reserve Lands will be subject to the same protocols and methodologies as are currently in use in the Monitoring and Management Program. If these lands are added during the long-term monitoring phase, they will be subject to protocols established for the long-term Monitoring Program.

8.8.1 Personnel for Management Program

Personnel for the Management Program include a full-time Land Manager who will be responsible for oversight and management of the Permittee lands in the MSHCP Reserve System. The program includes a full-time Assistant Land Manager to assist the Land Manager, beginning in year one. Three additional Assistant Land Managers phased in from years seven through 23 are also included in the budget. These assistant reserve managers are added as new lands are acquired. A part-time administrative assistant is also included; this position increases as additional staff is added to the MSHCP Reserve System Management Program. The estimated costs for the Management Program for the 75 years of the permit are shown in Table 8-9. The personnel costs given in Table 8-9 include all costs associated with a full-time ranger, including vehicle, insurance, equipment, as well as salary and benefits.

Land Manager. One permanent, full-time, senior level (1 PY) Land Manager will be responsible for oversight and coordination of all Management Programs on the Permittee Lands, in coordination with the other Existing Conservation Lands. The Land Manager will work with the management committees, Monitoring Program Administrator, and scientific advisors as needed to ensure integration of the Management and Monitoring Programs.

Assistant Land Managers. The Assistant Land Managers (4 PY) will assist the Land Manager in implementation of the Management Program, including on the ground management activities and projects. There will ultimately be four assistant managers, phased in as acres are added to the MSHCP Reserve System. Assistant Land Managers would be involved in maintenance activities such as fencing and Habitat maintenance and restoration projects.

Ranger-Warden. The Management Program will provide for two full-time (2 PY) ranger-wardens to implement the patrolling and law enforcement functions in the Management Program. The ranger-wardens will be fully trained law enforcement personnel. Coordination with other law enforcement personnel in federal, state, and local agencies will also be required.

Table 8-9: CVMSHCP Management Program Budget – 75 year (3.29% inflation factor)

Table 8-9: CVMSHCP Management Program Budget - 75 year (3.29% inflation factor)

FY Ending June 30	Base Salary	PY Salary [1]	2008 Year 1	2009 Year 2	2010 Year 3	2011 Year 4	2012 Year 5
Personnel							
Reserve Land Manager	$ 82,000	90,200	$ 90,200	$ 93,200	$ 96,300	$ 99,500	$ 102,800
Asst. Reserve Manager (4)[2]	68,300	75,130	$ 75,100	$ 77,600	$ 80,200	$ 82,800	$ 85,500
Ranger-Warden (2)	80,000	88,000	$ 176,000	$ 181,800	$ 187,800	$ 194,000	$ 200,400
Field Crew Labor (contract)	36,000	39,600	$ 39,600	$ 40,900	$ 42,200	$ 43,600	$ 45,000
Admin. Assistant (0.25-0.5)[2]	39,700	43,670	$ 13,895	$ 14,400	$ 14,900	$ 15,400	$ 15,900
Personnel Subtotal			$ 394,795	$ 407,900	$ 421,400	$ 435,300	$ 449,600
Staff per Year - Subtotal			4.25	4.25	4.25	4.25	4.25
Personnel Cost Without Inflation			394,795	395,000	395,000	395,000	395,000
Equipment and Supplies							
Site Protection & Maintenance			$ 25,000	$ 25,800	$ 26,600	$ 27,500	$ 28,400
Habitat Maintenance and Rest.			$ 9,700	$ 4,000	$ 4,100	$ 4,200	$ 4,300
Field Equipment and Supplies			$ 61,300	$ 13,900	$ 14,400	$ 14,900	$ 15,400
Office Equipment			$ 44,600	$ 39,900	$ 41,200	$ 42,600	$ 44,000
Public Education Services			$ 9,000	$ 5,700	$ 5,900	$ 6,100	$ 6,300
Equipment Subtotal			$ 149,600	$ 89,300	$ 92,200	$ 95,300	$ 98,400
Subtotal - Estimated Cost			$ 544,395	$ 497,200	$ 513,600	$ 530,600	$ 548,000
10% Contingency			$ 54,440	$ 49,720	$ 51,360	$ 53,060	$ 54,800
Administrative Overhead (10%)			$ 54,440	$ 49,720	$ 51,360	$ 53,060	$ 54,800
Total - Estimated Cost			$ 653,274	$ 596,640	$ 616,320	$ 636,720	$ 657,600

[1] This salary includes benefits, worker' compensation, 10% administrative overhead

[2] These positions are phased in as the number of acres acquired increases

Source: Coachella Valley Mountain Conservancy; MuniFinancial.

Table 8-9: CVMSHCP Management Program Budget – 75 year (3.29% inflation factor) (*cont.*)

2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
$ 106,200	$ 109,700	$ 113,300	$ 117,000	$ 120,800	$ 124,800	$ 128,900	$ 133,100	$ 137,500	$ 142,000
$ 88,300	$ 167,600	$ 173,100	$ 178,300	$ 183,600	$ 189,100	$ 194,800	$ 200,600	$ 206,600	$ 286,200
$ 207,000	$ 213,800	$ 220,800	$ 228,100	$ 235,600	$ 243,400	$ 251,400	$ 259,700	$ 268,200	$ 277,000
$ 46,500	$ 48,000	$ 49,600	$ 51,200	$ 52,900	$ 54,600	$ 56,400	$ 58,300	$ 60,200	$ 62,200
$ 16,400	$ 26,900	$ 27,800	$ 28,700	$ 29,600	$ 30,600	$ 31,600	$ 32,600	$ 33,700	$ 34,800
$ 464,400	$ 566,000	$ 584,600	$ 603,300	$ 622,500	$ 642,500	$ 663,100	$ 684,300	$ 706,200	$ 802,200
4.25	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	6.5
395,000	468,000	468,000	468,000	468,000	468,000	468,000	468,000	468,000	517,000
$ 29,300	$ 30,300	$ 31,300	$ 32,300	$ 33,400	$ 34,500	$ 35,600	$ 36,800	$ 38,000	$ 39,300
$ 4,400	$ 4,500	$ 4,600	$ 4,800	$ 5,000	$ 5,200	$ 5,400	$ 5,600	$ 5,800	$ 6,000
$ 15,900	$ 16,400	$ 16,900	$ 17,500	$ 18,100	$ 18,700	$ 19,300	$ 19,900	$ 20,600	$ 21,300
$ 45,400	$ 46,900	$ 48,400	$ 50,000	$ 51,600	$ 53,300	$ 55,100	$ 56,900	$ 58,800	$ 60,700
$ 6,500	$ 6,700	$ 6,900	$ 7,100	$ 7,300	$ 7,500	$ 7,700	$ 8,000	$ 8,300	$ 8,600
$ 101,500	$ 104,800	$ 108,100	$ 111,700	$ 115,400	$ 119,200	$ 123,100	$ 127,200	$ 131,500	$ 135,900
$ 565,900	$ 670,800	$ 692,700	$ 715,000	$ 737,900	$ 761,700	$ 786,200	$ 811,500	$ 837,700	$ 938,100
$ 56,590	$ 67,080	$ 69,270	$ 71,500	$ 73,790	$ 76,170	$ 78,620	$ 81,150	$ 83,770	$ 93,810
$ 56,590	$ 67,080	$ 69,270	$ 71,500	$ 73,790	$ 76,170	$ 78,620	$ 81,150	$ 83,770	$ 93,810
$ 679,080	$ 804,960	$ 831,240	$ 858,000	$ 885,480	$ 914,040	$ 943,440	$ 973,800	$ 1,005,240	$ 1,125,720

Table 8-9: CVMSHCP Management Program Budget – 75 year (3.29% inflation factor) (*cont.*)

2023 Year 16	2024 Year 17	2025 Year 18	2026 Year 19	2027 Year 20	2028 Year 21	2029 Year 22	2030 Year 23	2031 Year 24
$ 146,700	$ 151,500	$ 156,500	$ 161,600	$ 166,900	$ 172,400	$ 178,100	$ 184,000	$ 190,100
$ 294,800	$ 303,600	$ 312,700	$ 322,100	$ 331,800	$ 341,800	$ 352,100	$ 440,000	$ 453,200
$ 286,100	$ 295,500	$ 305,200	$ 315,200	$ 325,600	$ 336,300	$ 347,400	$ 358,800	$ 370,600
$ 32,100	$ 33,200	$ 34,300	$ 35,400	$ 36,600	$ 37,800	$ 39,000	$ 40,300	$ 41,600
$ 35,900	$ 37,100	$ 38,300	$ 39,600	$ 40,900	$ 42,200	$ 43,600	$ 45,000	$ 46,500
$ 795,600	$ 820,900	$ 847,000	$ 873,900	$ 901,800	$ 930,500	$ 960,200	$ 1,068,100	$ 1,102,000
6.5	6.5	6.5	6.5	6.5	6.5	6.5	7.5	7.5
498,000	498,000	498,000	498,000	498,000	498,000	498,000	498,000	538,000
$ 40,600	$ 41,900	$ 43,300	$ 44,700	$ 46,200	$ 47,700	$ 49,300	$ 50,900	$ 52,600
$ 6,200	$ 6,400	$ 6,600	$ 6,800	$ 7,000	$ 7,200	$ 7,400	$ 7,600	$ 7,900
$ 22,000	$ 22,700	$ 23,400	$ 24,200	$ 25,000	$ 25,800	$ 26,600	$ 27,500	$ 28,400
$ 62,700	$ 64,800	$ 66,900	$ 69,100	$ 71,400	$ 73,700	$ 76,100	$ 78,600	$ 81,200
$ 8,900	$ 9,200	$ 9,500	$ 9,800	$ 10,100	$ 10,400	$ 10,700	$ 11,100	$ 11,500
$ 140,400	$ 145,000	$ 149,700	$ 154,600	$ 159,700	$ 164,800	$ 170,100	$ 175,700	$ 181,600
$ 936,000	$ 965,900	$ 996,700	$ 1,028,500	$ 1,061,500	$ 1,095,300	$ 1,130,300	$ 1,243,800	$ 1,283,600
$ 93,600	$ 96,590	$ 99,670	$ 102,850	$ 106,150	$ 109,530	$ 113,030	$ 124,380	$ 128,360
$ 93,600	$ 96,590	$ 99,670	$ 102,850	$ 106,150	$ 109,530	$ 113,030	$ 124,380	$ 128,360
$ 1,123,200	$ 1,159,080	$ 1,196,040	$ 1,234,200	$ 1,273,800	$ 1,314,360	$ 1,356,360	$ 1,492,560	$ 1,540,320

Table 8-9: CVMSHCP Management Program Budget – 75 year (3.29% inflation factor) (*cont.*)

2032	2033	2034	2035	2036	2037	2038	2039	2040
Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32	Year 33
$ 196,400	$ 202,900	$ 209,600	$ 216,500	$ 223,600	$ 231,000	$ 238,600	$ 246,400	$ 254,500
$ 466,800	$ 480,800	$ 495,200	$ 510,100	$ 525,400	$ 541,200	$ 557,400	$ 574,100	$ 591,300
$ 382,800	$ 395,400	$ 408,400	$ 421,800	$ 435,700	$ 450,000	$ 464,800	$ 480,100	$ 495,900
$ 43,000	$ 44,400	$ 45,900	$ 47,400	$ 49,000	$ 50,600	$ 52,300	$ 54,000	$ 55,800
$ 48,000	$ 49,600	$ 51,200	$ 52,900	$ 54,600	$ 56,400	$ 58,300	$ 60,200	$ 62,200
$ 1,137,000	$ 1,173,100	$ 1,210,300	$ 1,248,700	$ 1,288,300	$ 1,329,200	$ 1,371,400	$ 1,414,800	$ 1,459,700
7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
538,000	538,000	538,000	538,000	538,000	538,000	538,000	538,000	538,000
$ 54,300	$ 56,100	$ 57,900	$ 59,800	$ 61,800	$ 63,800	$ 65,900	$ 68,100	$ 70,300
$ 8,200	$ 8,500	$ 8,800	$ 9,100	$ 9,400	$ 9,700	$ 10,000	$ 10,300	$ 10,600
$ 29,300	$ 30,300	$ 31,300	$ 32,300	$ 33,400	$ 34,500	$ 35,600	$ 36,800	$ 38,000
$ 83,900	$ 86,700	$ 89,600	$ 92,500	$ 95,500	$ 98,600	$ 101,800	$ 105,100	$ 108,600
$ 11,900	$ 12,300	$ 12,700	$ 13,100	$ 13,500	$ 13,900	$ 14,400	$ 14,900	$ 15,400
$ 187,600	$ 193,900	$ 200,300	$ 206,800	$ 213,600	$ 220,500	$ 227,700	$ 235,200	$ 242,900
$ 1,324,600	$ 1,367,000	$ 1,410,600	$ 1,455,500	$ 1,501,900	$ 1,549,700	$ 1,599,100	$ 1,650,000	$ 1,702,600
$ 132,460	$ 136,700	$ 141,060	$ 145,550	$ 150,190	$ 154,970	$ 159,910	$ 165,000	$ 170,260
$ 132,460	$ 136,700	$ 141,060	$ 145,550	$ 150,190	$ 154,970	$ 159,910	$ 165,000	$ 170,260
$ 1,589,520	$ 1,640,400	$ 1,692,720	$ 1,746,600	$ 1,802,280	$ 1,859,640	$ 1,918,920	$ 1,980,000	$ 2,043,120

Table 8-9: CVMSHCP Management Program Budget – 75 year (3.29% inflation factor) (*cont.*)

2041	2042	2043	2044	2045	2046	2047	2048	2049
Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40	Year 41	Year 42
$ 262,900	$ 271,500	$ 280,400	$ 289,600	$ 299,100	$ 308,900	$ 319,100	$ 329,600	$ 340,400
$ 609,000	$ 627,300	$ 646,100	$ 665,500	$ 685,500	$ 706,100	$ 727,300	$ 749,100	$ 771,600
$ 512,200	$ 529,100	$ 546,500	$ 564,500	$ 583,100	$ 602,300	$ 622,100	$ 642,600	$ 663,700
$ 57,600	$ 59,500	$ 61,500	$ 63,500	$ 65,600	$ 67,800	$ 70,000	$ 72,300	$ 74,700
$ 64,200	$ 66,300	$ 68,500	$ 70,800	$ 73,100	$ 75,500	$ 78,000	$ 80,600	$ 83,300
$ 1,505,900	$ 1,553,700	$ 1,603,000	$ 1,653,900	$ 1,706,400	$ 1,760,600	$ 1,816,500	$ 1,874,200	$ 1,933,700
7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
538,000	538,000	538,000	538,000	538,000	538,000	538,000	538,000	538,000
$ 72,600	$ 75,000	$ 77,500	$ 80,000	$ 82,600	$ 85,300	$ 88,100	$ 91,000	$ 94,000
$ 10,900	$ 11,300	$ 11,700	$ 12,100	$ 12,500	$ 12,900	$ 13,300	$ 13,700	$ 14,200
$ 39,300	$ 40,600	$ 41,900	$ 43,300	$ 44,700	$ 46,200	$ 47,700	$ 49,300	$ 50,900
$ 112,200	$ 115,900	$ 119,700	$ 123,600	$ 127,700	$ 131,900	$ 136,200	$ 140,700	$ 145,300
$ 15,900	$ 16,400	$ 16,900	$ 17,500	$ 18,100	$ 18,700	$ 19,300	$ 19,900	$ 20,600
$ 250,900	$ 259,200	$ 267,700	$ 276,500	$ 285,600	$ 295,000	$ 304,600	$ 314,600	$ 325,000
$ 1,756,800	$ 1,812,900	$ 1,870,700	$ 1,930,400	$ 1,992,000	$ 2,055,600	$ 2,121,100	$ 2,188,800	$ 2,258,700
$ 175,680	$ 181,290	$ 187,070	$ 193,040	$ 199,200	$ 205,560	$ 212,110	$ 218,880	$ 225,870
$ 175,680	$ 181,290	$ 187,070	$ 193,040	$ 199,200	$ 205,560	$ 212,110	$ 218,880	$ 225,870
$ 2,108,160	$ 2,175,480	$ 2,244,840	$ 2,316,480	$ 2,390,400	$ 2,466,720	$ 2,545,320	$ 2,626,560	$ 2,710,440

Table 8-9: CVMSHCP Management Program Budget – 75 year (3.29% inflation factor) (*cont.*)

2050 Year 43	2051 Year 44	2052 Year 45	2053 Year 46	2054 Year 47	2055 Year 48	2056 Year 49	2057 Year 50	2058 Year 51
$ 351,600	$ 363,200	$ 375,100	$ 387,400	$ 400,100	$ 413,300	$ 426,900	$ 440,900	$ 455,400
$ 794,700	$ 818,500	$ 843,100	$ 868,400	$ 894,500	$ 921,300	$ 948,900	$ 977,400	$ 1,006,700
$ 685,500	$ 708,100	$ 731,400	$ 755,500	$ 780,400	$ 806,100	$ 832,600	$ 860,000	$ 888,300
$ 77,200	$ 79,700	$ 82,300	$ 85,000	$ 87,800	$ 90,700	$ 93,700	$ 96,800	$ 100,000
$ 86,000	$ 88,800	$ 91,700	$ 94,700	$ 97,800	$ 101,000	$ 104,300	$ 107,700	$ 111,200
$ 1,995,000	$ 2,058,300	$ 2,123,600	$ 2,191,000	$ 2,260,600	$ 2,332,400	$ 2,406,400	$ 2,482,800	$ 2,561,600
7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
538,000	538,000	538,000	538,000	538,000	538,000	538,000	538,000	538,000
$ 97,100	$ 100,300	$ 103,600	$ 107,000	$ 110,500	$ 114,100	$ 117,900	$ 121,800	$ 125,800
$ 14,700	$ 15,200	$ 15,700	$ 16,200	$ 16,700	$ 17,200	$ 17,800	$ 18,400	$ 19,000
$ 52,600	$ 54,300	$ 56,100	$ 57,900	$ 59,800	$ 61,800	$ 63,800	$ 65,900	$ 68,100
$ 150,100	$ 155,000	$ 160,100	$ 165,400	$ 170,800	$ 176,400	$ 182,200	$ 188,200	$ 194,400
$ 21,300	$ 22,000	$ 22,700	$ 23,400	$ 24,200	$ 25,000	$ 25,800	$ 26,600	$ 27,500
$ 335,800	$ 346,800	$ 358,200	$ 369,900	$ 382,000	$ 394,500	$ 407,500	$ 420,900	$ 434,800
$ 2,330,800	$ 2,405,100	$ 2,481,800	$ 2,560,900	$ 2,642,600	$ 2,726,900	$ 2,813,900	$ 2,903,700	$ 2,996,400
$ 233,080	$ 240,510	$ 248,180	$ 256,090	$ 264,260	$ 272,690	$ 281,390	$ 290,370	$ 299,640
$ 233,080	$ 240,510	$ 248,180	$ 256,090	$ 264,260	$ 272,690	$ 281,390	$ 290,370	$ 299,640
$ 2,796,960	$ 2,886,120	$ 2,978,160	$ 3,073,080	$ 3,171,120	$ 3,272,280	$ 3,376,680	$ 3,484,440	$ 3,595,680

Table 8-9: CVMSHCP Management Program Budget – 75 year (3.29% inflation factor) (*cont.*)

2059 Year 52	2060 Year 53	2061 Year 54	2062 Year 55	2063 Year 56	2064 Year 57	2065 Year 58	2066 Year 59	2067 Year 60
$ 470,400	$ 485,900	$ 501,900	$ 518,400	$ 535,500	$ 553,100	$ 571,300	$ 590,100	$ 609,500
$ 1,036,900	$ 1,068,000	$ 1,100,000	$ 1,133,000	$ 1,167,000	$ 1,202,000	$ 1,238,100	$ 1,275,200	$ 1,313,500
$ 917,500	$ 947,700	$ 978,900	$ 1,011,100	$ 1,044,400	$ 1,078,800	$ 1,114,300	$ 1,151,000	$ 1,188,900
$ 103,300	$ 106,700	$ 110,200	$ 113,800	$ 117,500	$ 121,400	$ 125,400	$ 129,500	$ 133,800
$ 114,900	$ 118,700	$ 122,600	$ 126,600	$ 130,800	$ 135,100	$ 139,500	$ 144,100	$ 148,800
$ 2,643,000	$ 2,727,000	$ 2,813,600	$ 2,902,900	$ 2,995,200	$ 3,090,400	$ 3,188,600	$ 3,289,900	$ 3,394,500
7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
538,000	538,000	538,000	538,000	538,000	538,000	538,000	538,000	538,000
$ 129,900	$ 134,200	$ 138,600	$ 143,200	$ 147,900	$ 152,800	$ 157,800	$ 163,000	$ 168,400
$ 19,600	$ 20,200	$ 20,900	$ 21,600	$ 22,300	$ 23,000	$ 23,800	$ 24,600	$ 25,400
$ 70,300	$ 72,600	$ 75,000	$ 77,500	$ 80,000	$ 82,600	$ 85,300	$ 88,100	$ 91,000
$ 200,800	$ 207,400	$ 214,200	$ 221,200	$ 228,500	$ 236,000	$ 243,800	$ 251,800	$ 260,100
$ 28,400	$ 29,300	$ 30,300	$ 31,300	$ 32,300	$ 33,400	$ 34,500	$ 35,600	$ 36,800
$ 449,000	$ 463,700	$ 479,000	$ 494,800	$ 511,000	$ 527,800	$ 545,200	$ 563,100	$ 581,700
$ 3,092,000	$ 3,190,700	$ 3,292,600	$ 3,397,700	$ 3,506,200	$ 3,618,200	$ 3,733,800	$ 3,853,000	$ 3,976,200
$ 309,200	$ 319,070	$ 329,260	$ 339,770	$ 350,620	$ 361,820	$ 373,380	$ 385,300	$ 397,620
$ 309,200	$ 319,070	$ 329,260	$ 339,770	$ 350,620	$ 361,820	$ 373,380	$ 385,300	$ 397,620
$ 3,710,400	$ 3,828,840	$ 3,951,120	$ 4,077,240	$ 4,207,440	$ 4,341,840	$ 4,480,560	$ 4,623,600	$ 4,771,440

Table 8-9: CVMSHCP Management Program Budget – 75 year (3.29% inflation factor) (*cont.*)

2068 Year 61	2069 Year 62	2070 Year 63	2071 Year 64	2072 Year 65	2073 Year 66	2074 Year 67	2075 Year 68	2076 Year 69
$ 629,600	$ 650,300	$ 671,700	$ 693,800	$ 716,600	$ 740,200	$ 764,600	$ 789,800	$ 815,800
$ 1,352,900	$ 1,393,500	$ 1,435,300	$ 1,478,400	$ 1,522,800	$ 1,568,500	$ 1,615,600	$ 1,664,100	$ 1,714,000
$ 1,228,000	$ 1,268,400	$ 1,310,100	$ 1,353,200	$ 1,397,700	$ 1,443,700	$ 1,491,200	$ 1,540,300	$ 1,591,000
$ 138,200	$ 142,700	$ 147,400	$ 152,200	$ 157,200	$ 162,400	$ 167,700	$ 173,200	$ 178,900
$ 153,700	$ 158,800	$ 164,000	$ 169,400	$ 175,000	$ 180,800	$ 186,700	$ 192,800	$ 199,100
$ 3,502,400	$ 3,613,700	$ 3,728,500	$ 3,847,000	$ 3,969,300	$ 4,095,600	$ 4,225,800	$ 4,360,200	$ 4,498,800
7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
538,000	538,000	538,000	538,000	538,000	538,000	538,000	538,000	538,000
$ 173,900	$ 179,600	$ 185,500	$ 191,600	$ 197,900	$ 204,400	$ 211,100	$ 218,000	$ 225,200
$ 26,200	$ 27,100	$ 28,000	$ 28,900	$ 29,900	$ 30,900	$ 31,900	$ 32,900	$ 34,000
$ 94,000	$ 97,100	$ 100,300	$ 103,600	$ 107,000	$ 110,500	$ 114,100	$ 117,900	$ 121,800
$ 268,700	$ 277,500	$ 286,600	$ 296,000	$ 305,700	$ 315,800	$ 326,200	$ 336,900	$ 348,000
$ 38,000	$ 39,300	$ 40,600	$ 41,900	$ 43,300	$ 44,700	$ 46,200	$ 47,700	$ 49,300
$ 600,800	$ 620,600	$ 641,000	$ 662,000	$ 683,800	$ 706,300	$ 729,500	$ 753,400	$ 778,300
$ 4,103,200	$ 4,234,300	$ 4,369,500	$ 4,509,000	$ 4,653,100	$ 4,801,900	$ 4,955,300	$ 5,113,600	$ 5,277,100
$ 410,320	$ 423,430	$ 436,950	$ 450,900	$ 465,310	$ 480,190	$ 495,530	$ 511,360	$ 527,710
$ 410,320	$ 423,430	$ 436,950	$ 450,900	$ 465,310	$ 480,190	$ 495,530	$ 511,360	$ 527,710
$ 4,923,840	$ 5,081,160	$ 5,243,400	$ 5,410,800	$ 5,583,720	$ 5,762,280	$ 5,946,360	$ 6,136,320	$ 6,332,520

Table 8-9: CVMSHCP Management Program Budget – 75 year (3.29% inflation factor) (*cont.*)

2077 Year 70	2078 Year 71	2079 Year 72	2080 Year 73	2081 Year 74	2082 Year 75
$ 842,600	$ 870,300	$ 898,900	$ 928,500	$ 959,000	$ 990,600
$ 1,765,400	$ 1,818,400	$ 1,873,000	$ 1,929,200	$ 1,987,100	$ 2,046,700
$ 1,643,300	$ 1,697,400	$ 1,753,200	$ 1,810,900	$ 1,870,500	$ 1,932,000
$ 184,800	$ 190,900	$ 197,200	$ 203,700	$ 210,400	$ 217,300
$ 205,700	$ 212,500	$ 219,500	$ 226,700	$ 234,200	$ 241,900
$ 4,641,800	$ 4,789,500	$ 4,941,800	$ 5,099,000	$ 5,261,200	$ 5,428,500
7.5	7.5	7.5	7.5	7.5	7.5
538,000	538,000	538,000	538,000	538,000	538,000
$ 232,600	$ 240,300	$ 248,200	$ 256,400	$ 264,800	$ 273,500
$ 35,100	$ 36,300	$ 37,500	$ 38,700	$ 40,000	$ 41,300
$ 125,800	$ 129,900	$ 134,200	$ 138,600	$ 143,200	$ 147,900
$ 359,400	$ 371,200	$ 383,400	$ 396,000	$ 409,000	$ 422,500
$ 50,900	$ 52,600	$ 54,300	$ 56,100	$ 57,900	$ 59,800
$ 803,800	$ 830,300	$ 857,600	$ 885,800	$ 914,900	$ 945,000
$ 5,445,600	$ 5,619,800	$ 5,799,400	$ 5,984,800	$ 6,176,100	$ 6,373,500
$ 544,560	$ 561,980	$ 579,940	$ 598,480	$ 617,610	$ 637,350
$ 544,560	$ 561,980	$ 579,940	$ 598,480	$ 617,610	$ 637,350
$ 6,534,720	$ 6,743,760	$ 6,959,280	$ 7,181,760	$ 7,411,320	$ 7,648,200

Field Crew Labor. The field crew labor will provide for contract labor to accomplish specific management tasks such as fencing, exotic species removal, and small construction projects. The labor crews would work under the supervision of the Assistant Land Managers and the Land Manager.

Administrative Assistant. Administrative assistance for the reserve management staff is provided on a part-time basis (0.25 to 0.5 PY). The hours available for this position are increased in association with the addition of assistant managers to the staff.

8.8.2 Personnel for Monitoring Program

The personnel required for the first five years during the baseline phase will comprise an integrated team, with each specialist responsible for contributing to an integrated program. The program tasks are summarized below and are described for a sample one-year period in Table 8-10, which outlines the work plan for the Monitoring Program in years one through five. Individuals for each position must possess previous experience in the relevant field and a demonstrated ability to complete the functions described in this Plan.

Project Management. One permanent, full-time, senior level (1 PY) Monitoring Program Administrator will be responsible for holding all projects to the standards of the best available science. The Administrator will work with the management committees and scientific advisors as needed to implement the Monitoring Program.

Biotic Surveys. A team of biologists will conduct surveys of Covered Species and associated natural communities. The field biology team will be overseen by the Monitoring Program Administrator and supervised by a permanent, associate-level Community Ecologist/Field Supervisor responsible for field training and supervision of survey teams. The monitoring teams and their tasks will include:

Team I:

Personnel/Team Members:

1 permanent, full-time, associate-level ecologist as team leader (1 PY)

4 temporary, full-time, Seasonal Aides (4 @ 0.75 PYs = 3 PYs)

1 temporary, full-time associate-level entomologist (0.5 PY)

Tasks:

Covered Species Surveys

- Plant Species Surveys (March to May). Objectives: test and refine species distribution models and determine Habitat correlates, revisit historic record locations to see if species is extant at site and if suitable Habitat remains.

Table 8-10: Monitoring Program Tasks: Years 1-5

Monitoring Level Monitoring activity	**Baseline Phase**											
	JAN	*FEB*	*MAR*	*APRIL*	*MAY*	*JUNE*	*JULY*	*AUG*	*SEPT*	*OCT*	*NOV*	*DEC*
Species Level												
Covered perennial plant surveys						◊	◊	◊				
Covered annual plant surveys			◊	◊	◊							
Covered insect surveys	●	●	●									
Covered bird surveys					♦	♦	♦	♦				
Covered mammal surveys				■	■	■						
Sand community species surveys						◊	◊	◊				
Desert tortoise surveys				◊	◊							
Natural Community Level												
Habitat Monitoring on Transects												
1. Sand Compaction				◊	◊							
2. Perennial shrub abundance												
3. Annual and invasive plants			◊	◊								
4. Arthropod surveys			◊	◊								
5. Riparian Habitat surveys								♦	♦			
Landscape Level												
Continuous weather data recording												
Acquire & Analyze Digital Images/ Satellite Images												
Data Analysis – All Levels												
Data management	●	●	◊●	◊♦■	◊♦■	◊♦■	◊♦	◊♦	◊♦			
Data analysis 1. GIS modeling										❖	❖	❖

◊ = Team I, ♦ = Team II, ■ = Team III, ● = Entomologist, ❖ = Data Analyst

- Reptile Species (Sand) Surveys (June to August) establish permanent study sites in sand communities across the Coachella Valley, collect baseline data on species distribution and abundance for reptile Covered Species
- Mammal Species Surveys (April to July) establish permanent study sites in sand communities across the Coachella Valley, collect baseline data on species distribution and abundance for Coachella Valley round-tailed ground squirrel.
- Desert tortoise Surveys (April to May)
- Insect Surveys (January to March) establish permanent study sites in sand communities across the Coachella Valley, collect baseline data on species distribution and abundance for insect Covered Species

Natural Community Surveys.

- Sand Transects (June to August). Objectives: establish permanent study sites in sand communities across the Coachella Valley, collect baseline data on biodiversity, species distribution and abundance for plant, arthropod and vertebrate communities, characterize sand and soil variables.

Team II:

Personnel/Team Members:

- 1 permanent, full-time, associate-level ecologist as team leader (same position as Team I, no additional PYs)
- 2 temporary, full-time, Seasonal Aides (2 @ 0.50 PYs = 3 PYs)

Tasks:

Covered Species Surveys

- Riparian Birds (April to July). Objectives: test and refine species distribution models and determine Habitat correlates, quantify threats as possible correlates of species distributions, gather baseline data on ant community to track invasive species impacts.
- Crissal and LeConte's Thrasher transects (April to May). Objectives: test and refine species distribution models and determine Habitat correlates, revisit historic record locations to see if species is extant at site and if suitable Habitat remains, test different sampling strategies for detection of Le Conte's thrasher.

Team III:

Personnel/Team Members:

- temporary, part-time, associate-level mammalogist (0.25 PY)
- temporary, part-time, assistant-level mammalogists (0.25 PY)

Tasks:

Covered Species Surveys

- Palm Springs Pocket Mouse Surveys (April to June). Objectives: conduct trapping surveys for Palm Springs pocket mouse to refine species distribution models and determine Habitat correlates.
- Southern Yellow Bat Surveys (April to June)

Team IV:

Personnel/Team Members:

- temporary, full-time, Seasonal Aides (3 @ 0.75 PYs = 2.25 PYs)
- temporary, part-time research associate

Tasks:

Trail Use Monitoring and Permit Compliance Monitoring

- Monitoring of trail use according to protocol developed by CDFG, BLM, and CVCC.
- Research program on effects of recreational use on bighorn sheep as described in Section 8.5.1.

Abiotic Surveys. The team of biologists, depending on their relative workload, will accomplish surveys of abiotic factors and natural community sampling. The Vertebrate Ecologist/Field Supervisor will be responsible for acquisition and interpretation of aerial photos and other remote sensing images.

Data Analysis and Database Management.

- Data Analysis Project Director: one full-time, permanent, senior-level (PhD) data analyst with experience in multivariate statistics, spatial analysis, trend analysis and detection (0.5 PY).
- GIS Development and Analysis: one part-time, permanent database manager/GIS technician with experience in database management (NCEAS, BIOS, UFO structure), GIS, and remote sensing (0.5 PY).

Sample Field Work Schedule (from 2003).

- Sand Transects (February to July). Objectives: establish permanent study sites in sand communities across the Coachella Valley, collect baseline data on biodiversity, species distribution and abundance for plant, arthropod and vertebrate communities, characterize sand and soil variables, survey Covered Species in sand Habitats.
- Riparian Birds (April to July). Objectives: test and refine species distribution models and determine Habitat correlates, quantify threats as possible correlates of species distributions, gather baseline data on ant community to track invasive species impacts.

- Crissal and LeConte's thrasher transects (April to May). Objectives: test and refine species distribution models and determine Habitat correlates, revisit historic record locations to see if species is extant at site and if suitable Habitat remains, test different sampling strategies for detection of Le Conte's thrasher.
- Target Plant Species Surveys (January to August). Objectives: test and refine species distribution models and determine Habitat correlates, revisit historic record locations to see if species is extant at site and if suitable Habitat remains.
- Coachella Valley Jerusalem Cricket Survey (December to March). Objectives: refine species distribution, develop new non-lethal sampling techniques.

8.8.3 Program Cost Estimates

The cost estimates for the implementation of both the Monitoring and Management Programs, presented in Tables 8-9 (management budget) and 8-11 (monitoring budget), are dependent on assumptions regarding how these tasks will be completed. A more detailed budget for the Management Program, illustrating the costs for years one thru five of Plan Implementation, is presented in Table 8-12. It should be noted that some costs associated with land acquisition have been attributed as land improvement costs (See Section 5.1.2.2). These costs associated with land acquisition, including fencing, signage, removal of trash and invasive species, are not included in the Management Program budget. Section 5.2 of Appendix I provides detail on the land improvement costs.

Since this is, by definition, an adaptive program, change is inevitable. Estimating costs for changes that will occur on unknown timetables and Habitat trajectories, is obviously problematic, and introduces a potential error to any cost estimates. One untested assumption is that costs for implementing a particular monitoring or management method will be roughly equal to alternative methods should changes to recommended protocols occur. Contingency funds are incorporated in the budget to address this variable.

An Adaptive Management fund is incorporated into the Plan budget. This fund will provide $100,000 annually to cover the uncertainties of Adaptive Management. This fund is in addition to management budget. The Adaptive Management fund could be used for a research project or focused study to address a particular management issue identified in the Monitoring Program and/or the Management Program. Funds might be used to fund a university or graduate student project to address a management issue. Examples of potential Adaptive Management fund projects include:

- An evaluation of the impacts of and methods to control an invasive plant species on one or a group of Covered Species
- An evaluation of the impacts of changes in hydrology to one of the conserved natural communities (mesquite hummocks, desert dry wash woodland)

Table 8-11: CVMSHCP Monitoring Program Budget – 75 year (3.29% inflation factor)

Table 8-11: Monitoring Program Budget - 75 Years (3.29% inflation factor)

FY Ending June 30	2003		2008	2009	2010	2011	2012	2013	2014	2015
	Base Salary	PY Salary	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
ADMINISTRATION										
Personnel - All Species except sheep										
Monitoring Program Admin (1)	$ 100,000	$ 100,000	$ -	$ -	$ -	$ -	$ -	$ 100,000	$ 103,000	$ 106,100
Vertebrate Ecol - Field Supervisor (1)	90,000	90,000	$ 90,000	$ 93,000	$ 96,100	$ 99,300	$ 102,600	$ 106,000	$ 109,500	$ 113,100
Entomologist (1 @ 0.5)	80,000	40,000	$ 40,000	$ 41,300	$ 42,700	$ 44,100	$ 45,600	$ 47,100	$ 48,600	$ 50,200
Associate Biologist (1)	80,000	80,000	$ 80,000	$ 82,600	$ 85,300	$ 88,100	$ 91,000	$ 94,000	$ 97,100	$ 100,300
Biologist - Mammalogy (1@0.5)	70,000	35,000	$ 35,000	$ 36,200	$ 37,400	$ 38,600	$ 39,900	$ 41,200	$ 42,600	$ 44,000
Biologist - Ornithology (1-2@0.5)	70,000	70,000	$ 70,000	$ 72,300	$ 74,700	$ 77,200	$ 79,700	$ 41,150	$ 42,500	$ 43,900
Seasonal Aide - Ornithology (1@0.5)	30,000	15,000	$ 15,000	$ 15,500	$ 16,000	$ 16,500	$ 17,000	$ 17,600	$ 18,200	$ 18,800
Seasonal Aide (4-5@0.75)	30,000	112,500	$ 112,500	$ 116,200	$ 120,000	$ 123,900	$ 128,000	93,000	$ 96,100	$ 99,300
Personnel - Sheep and Trails										
Seasonal Aide (3@0.75)	30,000	67,500	$ 67,500	$ 69,700	$ 72,000	$ 74,400	$ 76,800	$ 79,300	$ 81,900	$ 84,600
Graduate Researcher	60,000	24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000			
Sheep - Monitoring										
Personnel		50,000	$ 50,000	$ 51,600	$ 53,300	$ 55,100	$ 56,900	$ 58,800	$ 60,700	$ 62,700
Personnel - Data Analysis										
GIS Analyst (1 @ 0.5)	80,000	40,000	$ 40,000	$ 41,300	$ 42,700	$ 44,100	$ 45,600	$ 47,100	$ 48,600	$ 50,200
GIS Technician (1 @ 0.5)	70,000	35,000	$ 35,000	$ 36,200	$ 37,400	$ 38,600	$ 39,900	$ 41,200	$ 42,600	$ 44,000
Personnel Subtotal			$ 659,000	$ 678,800	$ 701,600	$ 723,900	$ 747,000	$ 766,450	$ 791,400	$ 817,200
One-time Cost Items										
Revise/Update Natural Communities Map			$ 100,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Equipment and Supplies										
Satellite/Aerial Imagery			$ 15,000	$ 3,000	$ 3,100	$ 3,200	$ 3,300	$ 3,400	$ 3,500	$ 3,600
Sampling Gear			$ 15,000	$ 15,500	$ 16,000	$ 5,000	$ 5,200	$ 5,400	$ 5,600	$ 5,800
Transect Set-up & Maintenance			$ 5,000	$ 5,200	$ 5,400	$ 5,600	$ 5,800	$ 1,000	$ 1,000	$ 1,000
Radio-tracking Equipment			$ 3,000	$ 600	$ 620	$ 640	$ 660	$ 680	$ 700	$ 720
Other Supplies			$ 5,000	$ 1,000	$ 1,030	$ 1,060	$ 1,090	$ 1,130	$ 1,170	$ 1,210
Weather Stations (3)			$ 6,000	$ 200	$ 210	$ 220	$ 230	$ 240	$ 250	$ 260
Vehicle Costs			$ 18,400	$ 19,000	$ 19,600	$ 20,200	$ 20,900	$ 21,600	$ 22,300	$ 23,000
Sheep Monitoring		65,000	$ 65,000	$ 67,100	$ 69,300	$ 71,600	$ 74,000	$ 76,400	$ 78,900	$ 81,500
Sheep Monitoring/Research	$ 120,000	48,000	$ 48,000	$ 49,600	$ 51,200	$ 52,900	$ 54,600	$ -	$ -	$ -
Equipment Subtotal			$ 180,400	$ 161,200	$ 166,460	$ 160,420	$ 165,780	$ 109,850	$ 113,420	$ 117,090
Subtotal - Estimated Cost			$ 939,400	$ 840,000	$ 868,060	$ 884,320	$ 912,780	$ 876,300	$ 904,820	$ 934,290
10% Contingency			$ 93,940	$ 84,000	$ 86,806	$ 88,432	$ 91,278	$ 87,630	$ 90,482	$ 93,429
Total - Estimated Cost			$ 1,033,340	$ 924,000	$ 954,866	$ 972,752	$ 1,004,058	$ 963,930	$ 995,302	$ 1,027,719

Table 8-11: CVMSHCP Monitoring Program Budget – 75 year (3.29% inflation factor) (*cont.*)

2016 Year 9	2017 Year 10	2018 Year 11	2019 Year 12	2020 Year 13	2021 Year 14	2022 Year 15	2023 Year 16	2024 Year 17	2025 Year 18	2026 Year 19	2027 Year 20
$ 109,300	$ 112,600	$ 116,000	$ 119,500	$ 123,100	$ 126,800	$ 130,600	$ 134,500	$ 138,500	$ 142,700	$ 147,000	$ 151,400
$ 116,800	$ 120,600	$ 124,600	$ 128,700	$ 132,900	$ 137,300	$ 141,800	$ 146,500	$ 151,300	$ 156,300	$ 161,400	$ 166,700
$ 51,900	$ 53,600	$ 55,400	$ 57,200	$ 59,100	$ 61,000	$ 63,000	$ 65,100	$ 67,200	$ 69,400	$ 71,700	$ 74,100
$ 103,600	$ 107,000	$ 110,500	$ 114,100	$ 117,900	$ 121,800	$ 125,800	$ 129,900	$ 134,200	$ 138,600	$ 143,200	$ 147,900
$ 45,400	$ 46,900	$ 48,400	$ 50,000	$ 51,600	$ 53,300	$ 55,100	$ 56,900	$ 58,800	$ 60,700	$ 62,700	$ 64,800
$ 45,300	$ 46,800	$ 48,300	$ 49,900	$ 51,500	$ 53,200	$ 55,000	$ 56,800	$ 58,700	$ 60,600	$ 62,600	$ 64,700
$ 19,400	$ 20,000	$ 20,700	$ 21,400	$ 22,100	$ 22,800	$ 23,600	$ 24,400	$ 25,200	$ 26,000	$ 26,900	$ 27,800
$ 102,600	$ 106,000	$ 109,500	$ 113,100	$ 116,800	$ 120,600	$ 124,600	$ 128,700	$ 132,900	$ 137,300	$ 141,800	$ 146,500
$ 87,400	$ 90,300	$ 93,300	$ 96,400	$ 99,600	$ 102,900	$ 106,300	$ 109,800	$ 113,400	$ 117,100	$ 121,000	$ 125,000
$ 64,800	$ 66,900	$ 69,100	$ 71,400	$ 73,700	$ 76,100	$ 78,600	$ 81,200	$ 83,900	$ 86,700	$ 89,600	$ 92,500
$ 51,900	$ 53,600	$ 55,400	$ 57,200	$ 59,100	$ 61,000	$ 63,000	$ 65,100	$ 67,200	$ 69,400	$ 71,700	$ 74,100
$ 45,400	$ 46,900	$ 48,400	$ 50,000	$ 51,600	$ 53,300	$ 55,100	$ 56,900	$ 58,800	$ 60,700	$ 62,700	$ 64,800
$ 843,800	$ 871,200	$ 899,600	$ 928,900	$ 959,000	$ 990,100	$ 1,022,500	$ 1,055,800	$ 1,090,100	$ 1,125,500	$ 1,162,300	$ 1,200,300
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 3,700	$ 3,800	$ 3,900	$ 4,000	$ 4,100	$ 4,200	$ 4,300	$ 4,400	$ 4,500	$ 4,600	$ 4,800	$ 5,000
$ 6,000	$ 6,200	$ 6,400	$ 6,600	$ 6,800	$ 7,000	$ 7,200	$ 7,400	$ 7,600	$ 7,900	$ 8,200	$ 8,500
$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000
$ 740	$ 760	$ 790	$ 820	$ 850	$ 880	$ 910	$ 940	$ 970	$ 1,000	$ 1,030	$ 1,060
$ 1,250	$ 1,290	$ 1,330	$ 1,370	$ 1,420	$ 1,470	$ 1,520	$ 1,570	$ 1,620	$ 1,670	$ 1,720	$ 1,780
$ 270	$ 280	$ 290	$ 300	$ 310	$ 320	$ 330	$ 340	$ 350	$ 360	$ 370	$ 380
$ 23,800	$ 24,600	$ 25,400	$ 26,200	$ 27,100	$ 28,000	$ 28,900	$ 29,900	$ 30,900	$ 31,900	$ 32,900	$ 34,000
$ 84,200	$ 87,000	$ 89,900	$ 92,900	$ 96,000	$ 99,200	$ 102,500	$ 105,900	$ 109,400	$ 113,000	$ 116,700	$ 120,500
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 120,960	$ 124,930	$ 129,010	$ 133,190	$ 137,580	$ 142,070	$ 146,660	$ 151,450	$ 156,340	$ 161,430	$ 166,720	$ 172,220
$ 964,760	$ 996,130	$ 1,028,610	$ 1,062,090	$ 1,096,580	$ 1,132,170	$ 1,169,160	$ 1,207,250	$ 1,246,440	$ 1,286,930	$ 1,329,020	$ 1,372,520
$ 96,476	$ 99,613	$ 102,861	$ 106,209	$ 109,658	$ 113,217	$ 116,916	$ 120,725	$ 124,644	$ 128,693	$ 132,902	$ 137,252
$ 1,061,236	$ 1,095,743	$ 1,131,471	$ 1,168,299	$ 1,206,238	$ 1,245,387	$ 1,286,076	$ 1,327,975	$ 1,371,084	$ 1,415,623	$ 1,461,922	$ 1,509,772

Table 8-11: CVMSHCP Monitoring Program Budget – 75 year (3.29% inflation factor) (*cont.*)

2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	Year 31	Year 32
$ 155,900	$ 160,600	$ 165,400	$ 170,400	$ 175,500	$ 180,800	$ 186,200	$ 191,800	$ 197,600	$ 203,500	$ 209,600	$ 215,900
$ 172,200	$ 177,900	$ 183,800	$ 189,800	$ 196,000	$ 202,400	$ 209,100	$ 216,000	$ 223,100	$ 230,400	$ 238,000	$ 245,800
$ 76,500	$ 79,000	$ 81,600	$ 84,300	$ 87,100	$ 90,000	$ 93,000	$ 96,100	$ 99,300	$ 102,600	$ 106,000	$ 109,500
$ 152,800	$ 157,800	$ 163,000	$ 168,400	$ 173,900	$ 179,600	$ 185,500	$ 191,600	$ 197,900	$ 204,400	$ 211,100	$ 218,000
$ 66,900	$ 69,100	$ 71,400	$ 73,700	$ 76,100	$ 78,600	$ 81,200	$ 83,900	$ 86,700	$ 89,600	$ 92,500	$ 95,500
$ 66,800	$ 69,000	$ 71,300	$ 73,600	$ 76,000	$ 78,500	$ 81,100	$ 83,800	$ 86,600	$ 89,400	$ 92,300	$ 95,300
$ 28,700	$ 29,600	$ 30,600	$ 31,600	$ 32,600	$ 33,700	$ 34,800	$ 35,900	$ 37,100	$ 38,300	$ 39,600	$ 40,900
$ 151,300	$ 156,300	$ 161,400	$ 166,700	$ 172,200	$ 177,900	$ 183,800	$ 189,800	$ 196,000	$ 202,400	$ 209,100	$ 216,000
$ 129,100	$ 133,300	$ 137,700	$ 142,200	$ 146,900	$ 151,700	$ 156,700	$ 161,900	$ 167,200	$ 172,700	$ 178,400	$ 184,300
$ 95,500	$ 98,600	$ 101,800	$ 105,100	$ 108,600	$ 112,200	$ 115,900	$ 119,700	$ 123,600	$ 127,700	$ 131,900	$ 136,200
$ 76,500	$ 79,000	$ 81,600	$ 84,300	$ 87,100	$ 90,000	$ 93,000	$ 96,100	$ 99,300	$ 102,600	$ 106,000	$ 109,500
$ 66,900	$ 69,100	$ 71,400	$ 73,700	$ 76,100	$ 78,600	$ 81,200	$ 83,900	$ 86,700	$ 89,600	$ 92,500	$ 95,500
$ 1,239,100	$ 1,279,300	$ 1,321,000	$ 1,363,800	$ 1,408,100	$ 1,454,000	$ 1,501,500	$ 1,550,500	$ 1,601,100	$ 1,653,200	$ 1,707,000	$ 1,762,400
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 5,200	$ 5,400	$ 5,600	$ 5,800	$ 6,000	$ 6,200	$ 6,400	$ 6,600	$ 6,800	$ 7,000	$ 7,200	$ 7,400
$ 8,800	$ 9,100	$ 9,400	$ 9,700	$ 10,000	$ 10,300	$ 10,600	$ 10,900	$ 11,300	$ 11,700	$ 12,100	$ 12,500
$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000
$ 1,090	$ 1,130	$ 1,170	$ 1,210	$ 1,250	$ 1,290	$ 1,330	$ 1,370	$ 1,420	$ 1,470	$ 1,520	$ 1,570
$ 1,840	$ 1,900	$ 1,960	$ 2,020	$ 2,090	$ 2,160	$ 2,230	$ 2,300	$ 2,380	$ 2,460	$ 2,540	$ 2,620
$ 390	$ 400	$ 410	$ 420	$ 430	$ 440	$ 450	$ 460	$ 470	$ 480	$ 490	$ 500
$ 35,100	$ 36,300	$ 37,500	$ 38,700	$ 40,000	$ 41,300	$ 42,700	$ 44,100	$ 45,600	$ 47,100	$ 48,600	$ 50,200
$ 124,500	$ 128,600	$ 132,800	$ 137,200	$ 141,700	$ 146,400	$ 151,200	$ 156,200	$ 161,300	$ 166,600	$ 172,100	$ 177,800
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 177,920	$ 183,830	$ 189,840	$ 196,050	$ 202,470	$ 209,090	$ 215,910	$ 222,930	$ 230,270	$ 237,810	$ 245,550	$ 253,590
$ 1,417,020	$ 1,463,130	$ 1,510,840	$ 1,559,850	$ 1,610,570	$ 1,663,090	$ 1,717,410	$ 1,773,430	$ 1,831,370	$ 1,891,010	$ 1,952,550	$ 2,015,990
$ 141,702	$ 146,313	$ 151,084	$ 155,985	$ 161,057	$ 166,309	$ 171,741	$ 177,343	$ 183,137	$ 189,101	$ 195,255	$ 201,599
$ 1,558,722	$ 1,609,443	$ 1,661,924	$ 1,715,835	$ 1,771,627	$ 1,829,399	$ 1,889,151	$ 1,950,773	$ 2,014,507	$ 2,080,111	$ 2,147,805	$ 2,217,589

Table 8-11: CVMSHCP Monitoring Program Budget – 75 year (3.29% inflation factor) (*cont.*)

2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051
Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40	Year 41	Year 42	Year 43	Year 44
$ 222,400	$ 229,100	$ 236,000	$ 243,100	$ 250,400	$ 257,900	$ 265,600	$ 273,600	$ 281,800	$ 290,300	$ 299,000	$ 308,000
$ 253,900	$ 262,300	$ 270,900	$ 279,800	$ 289,000	$ 298,500	$ 308,300	$ 318,400	$ 328,900	$ 339,700	$ 350,900	$ 362,400
$ 113,100	$ 116,800	$ 120,600	$ 124,600	$ 128,700	$ 132,900	$ 137,300	$ 141,800	$ 146,500	$ 151,300	$ 156,300	$ 161,400
$ 225,200	$ 232,600	$ 240,300	$ 248,200	$ 256,400	$ 264,800	$ 273,500	$ 282,500	$ 291,800	$ 301,400	$ 311,300	$ 321,500
$ 98,600	$ 101,800	$ 105,100	$ 108,600	$ 112,200	$ 115,900	$ 119,700	$ 123,600	$ 127,700	$ 131,900	$ 136,200	$ 140,700
$ 98,400	$ 101,600	$ 104,900	$ 108,400	$ 112,000	$ 115,700	$ 119,500	$ 123,400	$ 127,500	$ 131,700	$ 136,000	$ 140,500
$ 42,200	$ 43,600	$ 45,000	$ 46,500	$ 48,000	$ 49,600	$ 51,200	$ 52,900	$ 54,600	$ 56,400	$ 58,300	$ 60,200
$ 223,100	$ 230,400	$ 238,000	$ 245,800	$ 253,900	$ 262,300	$ 270,900	$ 279,800	$ 289,000	$ 298,500	$ 308,300	$ 318,400
$ 190,400	$ 196,700	$ 203,200	$ 209,900	$ 216,800	$ 223,900	$ 231,300	$ 238,900	$ 246,800	$ 254,900	$ 263,300	$ 272,000
$ 140,700	$ 145,300	$ 150,100	$ 155,000	$ 160,100	$ 165,400	$ 170,800	$ 176,400	$ 182,200	$ 188,200	$ 194,400	$ 200,800
$ 113,100	$ 116,800	$ 120,600	$ 124,600	$ 128,700	$ 132,900	$ 137,300	$ 141,800	$ 146,500	$ 151,300	$ 156,300	$ 161,400
$ 98,600	$ 101,800	$ 105,100	$ 108,600	$ 112,200	$ 115,900	$ 119,700	$ 123,600	$ 127,700	$ 131,900	$ 136,200	$ 140,700
$ 1,819,700	$ 1,878,800	$ 1,939,800	$ 2,003,100	$ 2,068,400	$ 2,135,700	$ 2,205,100	$ 2,276,700	$ 2,351,000	$ 2,427,500	$ 2,506,500	$ 2,588,000
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 7,600	$ 7,900	$ 8,200	$ 8,500	$ 8,800	$ 9,100	$ 9,400	$ 9,700	$ 10,000	$ 10,300	$ 10,600	$ 10,900
$ 12,900	$ 13,300	$ 13,700	$ 14,200	$ 14,700	$ 15,200	$ 15,700	$ 16,200	$ 16,700	$ 17,200	$ 17,800	$ 18,400
$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000
$ 1,620	$ 1,670	$ 1,720	$ 1,780	$ 1,840	$ 1,900	$ 1,960	$ 2,020	$ 2,090	$ 2,160	$ 2,230	$ 2,300
$ 2,710	$ 2,800	$ 2,890	$ 2,990	$ 3,090	$ 3,190	$ 3,290	$ 3,400	$ 3,510	$ 3,630	$ 3,750	$ 3,870
$ 520	$ 540	$ 560	$ 580	$ 600	$ 620	$ 640	$ 660	$ 680	$ 700	$ 720	$ 740
$ 51,900	$ 53,600	$ 55,400	$ 57,200	$ 59,100	$ 61,000	$ 63,000	$ 65,100	$ 67,200	$ 69,400	$ 71,700	$ 74,100
$ 183,600	$ 189,600	$ 195,800	$ 202,200	$ 208,900	$ 215,800	$ 222,900	$ 230,200	$ 237,800	$ 245,600	$ 253,700	$ 262,000
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 261,850	$ 270,410	$ 279,270	$ 288,450	$ 298,030	$ 307,810	$ 317,890	$ 328,280	$ 338,980	$ 349,990	$ 361,500	$ 373,310
$ 2,081,550	$ 2,149,210	$ 2,219,070	$ 2,291,550	$ 2,366,430	$ 2,443,510	$ 2,522,990	$ 2,604,980	$ 2,689,980	$ 2,777,490	$ 2,868,000	$ 2,961,310
$ 208,155	$ 214,921	$ 221,907	$ 229,155	$ 236,643	$ 244,351	$ 252,299	$ 260,498	$ 268,998	$ 277,749	$ 286,800	$ 296,131
$ 2,289,705	$ 2,364,131	$ 2,440,977	$ 2,520,705	$ 2,603,073	$ 2,687,861	$ 2,775,289	$ 2,865,478	$ 2,958,978	$ 3,055,239	$ 3,154,800	$ 3,257,441

Table 8-11: CVMSHCP Monitoring Program Budget – 75 year (3.29% inflation factor) (*cont.*)

2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063
Year 45	Year 46	Year 47	Year 48	Year 49	Year 50	Year 51	Year 52	Year 53	Year 54	Year 55	Year 56
$ 317,200	$ 326,700	$ 336,500	$ 346,600	$ 357,000	$ 367,700	$ 378,700	$ 390,100	$ 401,800	$ 413,900	$ 426,300	$ 439,100
$ 374,300	$ 386,600	$ 399,300	$ 412,400	$ 426,000	$ 440,000	$ 454,500	$ 469,500	$ 484,900	$ 500,900	$ 517,400	$ 534,400
$ 166,700	$ 172,200	$ 177,900	$ 183,800	$ 189,800	$ 196,000	$ 202,400	$ 209,100	$ 216,000	$ 223,100	$ 230,400	$ 238,000
$ 332,100	$ 343,000	$ 354,300	$ 366,000	$ 378,000	$ 390,400	$ 403,200	$ 416,500	$ 430,200	$ 444,400	$ 459,000	$ 474,100
$ 145,300	$ 150,100	$ 155,000	$ 160,100	$ 165,400	$ 170,800	$ 176,400	$ 182,200	$ 188,200	$ 194,400	$ 200,800	$ 207,400
$ 145,100	$ 149,900	$ 154,800	$ 159,900	$ 165,200	$ 170,600	$ 176,200	$ 182,000	$ 188,000	$ 194,200	$ 200,600	$ 207,200
$ 62,200	$ 64,200	$ 66,300	$ 68,500	$ 70,800	$ 73,100	$ 75,500	$ 78,000	$ 80,600	$ 83,300	$ 86,000	$ 88,800
$ 328,900	$ 339,700	$ 350,900	$ 362,400	$ 374,300	$ 386,600	$ 399,300	$ 412,400	$ 426,000	$ 440,000	$ 454,500	$ 469,500
$ 280,900	$ 290,100	$ 299,600	$ 309,500	$ 319,700	$ 330,200	$ 341,100	$ 352,300	$ 363,900	$ 375,900	$ 388,300	$ 401,100
$ 207,400	$ 214,200	$ 221,200	$ 228,500	$ 236,000	$ 243,800	$ 251,800	$ 260,100	$ 268,700	$ 277,500	$ 286,600	$ 296,000
$ 166,700	$ 172,200	$ 177,900	$ 183,800	$ 189,800	$ 196,000	$ 202,400	$ 209,100	$ 216,000	$ 223,100	$ 230,400	$ 238,000
$ 145,300	$ 150,100	$ 155,000	$ 160,100	$ 165,400	$ 170,800	$ 176,400	$ 182,200	$ 188,200	$ 194,400	$ 200,800	$ 207,400
$ 2,672,100	$ 2,759,000	$ 2,848,700	$ 2,941,600	$ 3,037,400	$ 3,136,000	$ 3,237,900	$ 3,343,500	$ 3,452,500	$ 3,565,100	$ 3,681,100	$ 3,801,000
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 11,300	$ 11,700	$ 12,100	$ 12,500	$ 12,900	$ 13,300	$ 13,700	$ 14,200	$ 14,700	$ 15,200	$ 15,700	$ 16,200
$ 19,000	$ 19,600	$ 20,200	$ 20,900	$ 21,600	$ 22,300	$ 23,000	$ 23,800	$ 24,600	$ 25,400	$ 26,200	$ 27,100
$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000
$ 2,380	$ 2,460	$ 2,540	$ 2,620	$ 2,710	$ 2,800	$ 2,890	$ 2,990	$ 3,090	$ 3,190	$ 3,290	$ 3,400
$ 4,000	$ 4,130	$ 4,270	$ 4,410	$ 4,560	$ 4,710	$ 4,860	$ 5,020	$ 5,190	$ 5,360	$ 5,540	$ 5,720
$ 760	$ 780	$ 800	$ 820	$ 840	$ 870	$ 900	$ 930	$ 960	$ 990	$ 1,020	$ 1,050
$ 76,500	$ 79,000	$ 81,600	$ 84,300	$ 87,100	$ 90,000	$ 93,000	$ 96,100	$ 99,300	$ 102,600	$ 106,000	$ 109,500
$ 270,600	$ 279,500	$ 288,700	$ 298,200	$ 308,000	$ 318,100	$ 328,600	$ 339,400	$ 350,600	$ 362,100	$ 374,000	$ 386,300
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 385,540	$ 398,170	$ 411,210	$ 424,750	$ 438,710	$ 453,080	$ 467,950	$ 483,440	$ 499,440	$ 515,840	$ 532,750	$ 550,270
$ 3,057,640	$ 3,157,170	$ 3,259,910	$ 3,366,350	$ 3,476,110	$ 3,589,080	$ 3,705,850	$ 3,826,940	$ 3,951,940	$ 4,080,940	$ 4,213,850	$ 4,351,270
$ 305,764	$ 315,717	$ 325,991	$ 336,635	$ 347,611	$ 358,908	$ 370,585	$ 382,694	$ 395,194	$ 408,094	$ 421,385	$ 435,127
$ 3,363,404	$ 3,472,887	$ 3,585,901	$ 3,702,985	$ 3,823,721	$ 3,947,988	$ 4,076,435	$ 4,209,634	$ 4,347,134	$ 4,489,034	$ 4,635,235	$ 4,786,397

Table 8-11: CVMSHCP Monitoring Program Budget – 75 year (3.29% inflation factor) (*cont.*)

2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075
Year 57	Year 58	Year 59	Year 60	Year 61	Year 62	Year 63	Year 64	Year 65	Year 66	Year 67	Year 68
$ 452,300	$ 465,900	$ 479,900	$ 494,300	$ 509,100	$ 524,400	$ 540,100	$ 556,300	$ 573,000	$ 590,200	$ 607,900	$ 626,100
$ 552,000	$ 570,200	$ 589,000	$ 608,400	$ 628,400	$ 649,100	$ 670,500	$ 692,600	$ 715,400	$ 738,900	$ 763,200	$ 788,300
$ 245,800	$ 253,900	$ 262,300	$ 270,900	$ 279,800	$ 289,000	$ 298,500	$ 308,300	$ 318,400	$ 328,900	$ 339,700	$ 350,900
$ 489,700	$ 505,800	$ 522,400	$ 539,600	$ 557,400	$ 575,700	$ 594,600	$ 614,200	$ 634,400	$ 655,300	$ 676,900	$ 699,200
$ 214,200	$ 221,200	$ 228,500	$ 236,000	$ 243,800	$ 251,800	$ 260,100	$ 268,700	$ 277,500	$ 286,600	$ 296,000	$ 305,700
$ 214,000	$ 221,000	$ 228,300	$ 235,800	$ 243,600	$ 251,600	$ 259,900	$ 268,500	$ 277,300	$ 286,400	$ 295,800	$ 305,500
$ 91,700	$ 94,700	$ 97,800	$ 101,000	$ 104,300	$ 107,700	$ 111,200	$ 114,900	$ 118,700	$ 122,600	$ 126,600	$ 130,800
$ 484,900	$ 500,900	$ 517,400	$ 534,400	$ 552,000	$ 570,200	$ 589,000	$ 608,400	$ 628,400	$ 649,100	$ 670,500	$ 692,600
$ 414,300	$ 427,900	$ 442,000	$ 456,500	$ 471,500	$ 487,000	$ 503,000	$ 519,500	$ 536,600	$ 554,300	$ 572,500	$ 591,300
$ 305,700	$ 315,800	$ 326,200	$ 336,900	$ 348,000	$ 359,400	$ 371,200	$ 383,400	$ 396,000	$ 409,000	$ 422,500	$ 436,400
$ 245,800	$ 253,900	$ 262,300	$ 270,900	$ 279,800	$ 289,000	$ 298,500	$ 308,300	$ 318,400	$ 328,900	$ 339,700	$ 350,900
$ 214,200	$ 221,200	$ 228,500	$ 236,000	$ 243,800	$ 251,800	$ 260,100	$ 268,700	$ 277,500	$ 286,600	$ 296,000	$ 305,700
$ 3,924,600	$ 4,052,400	$ 4,184,600	$ 4,320,700	$ 4,461,500	$ 4,606,700	$ 4,756,700	$ 4,911,800	$ 5,071,600	$ 5,236,800	$ 5,407,300	$ 5,583,400
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 16,700	$ 17,200	$ 17,800	$ 18,400	$ 19,000	$ 19,600	$ 20,200	$ 20,900	$ 21,600	$ 22,300	$ 23,000	$ 23,800
$ 28,000	$ 28,900	$ 29,900	$ 30,900	$ 31,900	$ 32,900	$ 34,000	$ 35,100	$ 36,300	$ 37,500	$ 38,700	$ 40,000
$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000
$ 3,510	$ 3,630	$ 3,750	$ 3,870	$ 4,000	$ 4,130	$ 4,270	$ 4,410	$ 4,560	$ 4,710	$ 4,860	$ 5,020
$ 5,910	$ 6,100	$ 6,300	$ 6,510	$ 6,720	$ 6,940	$ 7,170	$ 7,410	$ 7,650	$ 7,900	$ 8,160	$ 8,430
$ 1,080	$ 1,110	$ 1,140	$ 1,170	$ 1,210	$ 1,250	$ 1,290	$ 1,330	$ 1,370	$ 1,410	$ 1,450	$ 1,490
$ 113,100	$ 116,800	$ 120,600	$ 124,600	$ 128,700	$ 132,900	$ 137,300	$ 141,800	$ 146,500	$ 151,300	$ 156,300	$ 161,400
$ 399,000	$ 412,100	$ 425,700	$ 439,700	$ 454,200	$ 469,100	$ 484,500	$ 500,400	$ 516,900	$ 533,900	$ 551,500	$ 569,600
$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 568,300	$ 586,840	$ 606,190	$ 626,150	$ 646,730	$ 667,820	$ 689,730	$ 712,350	$ 735,880	$ 760,020	$ 784,970	$ 810,740
$ 4,492,900	$ 4,639,240	$ 4,790,790	$ 4,946,850	$ 5,108,230	$ 5,274,520	$ 5,446,430	$ 5,624,150	$ 5,807,480	$ 5,996,820	$ 6,192,270	$ 6,394,140
$ 449,290	$ 463,924	$ 479,079	$ 494,685	$ 510,823	$ 527,452	$ 544,643	$ 562,415	$ 580,748	$ 599,682	$ 619,227	$ 639,414
$ 4,942,190	$ 5,103,164	$ 5,269,869	$ 5,441,535	$ 5,619,053	$ 5,801,972	$ 5,991,073	$ 6,186,565	$ 6,388,228	$ 6,596,502	$ 6,811,497	$ 7,033,554

Table 8-11: CVMSHCP Monitoring Program Budget – 75 year (3.29% inflation factor) (*cont.*)

2076 Year 69	2077 Year 70	2078 Year 71	2079 Year 72	2080 Year 73	2081 Year 74	2082 Year 75
$ 644,900	$ 664,200	$ 684,100	$ 704,600	$ 725,700	$ 747,500	$ 769,900
$ 814,200	$ 841,000	$ 868,700	$ 897,300	$ 926,800	$ 957,300	$ 988,800
$ 362,400	$ 374,300	$ 386,600	$ 399,300	$ 412,400	$ 426,000	$ 440,000
$ 722,200	$ 746,000	$ 770,500	$ 795,800	$ 822,000	$ 849,000	$ 876,900
$ 315,800	$ 326,200	$ 336,900	$ 348,000	$ 359,400	$ 371,200	$ 383,400
$ 315,600	$ 326,000	$ 336,700	$ 347,800	$ 359,200	$ 371,000	$ 383,200
$ 135,100	$ 139,500	$ 144,100	$ 148,800	$ 153,700	$ 158,800	$ 164,000
$ 715,400	$ 738,900	$ 763,200	$ 788,300	$ 814,200	$ 841,000	$ 868,700
$ 610,800	$ 630,900	$ 651,700	$ 673,100	$ 695,200	$ 718,100	$ 741,700
$ 450,800	$ 465,600	$ 480,900	$ 496,700	$ 513,000	$ 529,900	$ 547,300
$ 362,400	$ 374,300	$ 386,600	$ 399,300	$ 412,400	$ 426,000	$ 440,000
$ 315,800	$ 326,200	$ 336,900	$ 348,000	$ 359,400	$ 371,200	$ 383,400
$ 5,765,400	$ 5,953,100	$ 6,146,900	$ 6,347,000	$ 6,553,400	$ 6,767,000	$ 6,987,300
$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 24,600	$ 25,400	$ 26,200	$ 27,100	$ 28,000	$ 28,900	$ 29,900
$ 41,300	$ 42,700	$ 44,100	$ 45,600	$ 47,100	$ 48,600	$ 50,200
$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000
$ 5,190	$ 5,360	$ 5,540	$ 5,720	$ 5,910	$ 6,100	$ 6,300
$ 8,710	$ 9,000	$ 9,300	$ 9,610	$ 9,930	$ 10,260	$ 10,600
$ 1,530	$ 1,580	$ 1,630	$ 1,680	$ 1,730	$ 1,780	$ 1,830
$ 166,700	$ 172,200	$ 177,900	$ 183,800	$ 189,800	$ 196,000	$ 202,400
$ 588,300	$ 607,700	$ 627,700	$ 648,400	$ 669,700	$ 691,700	$ 714,500
$ -	$ -	$ -	$ -	$ -	$ -	$ -
$ 837,330	$ 864,940	$ 893,370	$ 922,910	$ 953,170	$ 984,340	$ 1,016,730
$ 6,602,730	$ 6,818,040	$ 7,040,270	$ 7,269,910	$ 7,506,570	$ 7,751,340	$ 8,004,030
$ 660,273	$ 681,804	$ 704,027	$ 726,991	$ 750,657	$ 775,134	$ 800,403
$ 7,263,003	$ 7,499,844	$ 7,744,297	$ 7,996,901	$ 8,257,227	$ 8,526,474	$ 8,804,433

Table 8-12: BUDGET FOR COACHELLA VALLEY MSHCP RESERVE SYSTEM

MANAGEMENT: YEARS 1 - 5 OF MSHCP IMPLEMENTATION

Detail of Management Costs

MANAGEMENT	SALARY OR ITEM EXPLANATION	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
PERSONNEL - SALARIES & BENEFITS						
PROJECT ADMINISTRATION						
Reserve Land Manager	90,200	90,200	93,200	96,300	99,500	102,800
Assistant Reserve Land Manager (4)	75,130	75,100	77,600	80,200	82,800	85,500
Ranger-Warden (2)[1]	88,000	176,000	181,800	187,800	194,000	200,400
Labor/Field Crews	39,600	39,600	40,900	42,200	43,600	45,000
Administrative Assistant	43,670	13,895	14,400	14,900	15,400	15,900
PERSONNEL - EXPENSE TOTALS		394,795	407,900	421,400	435,300	449,600
TOTAL STAFF (Pys) PER YEAR		4.25	4.25	4.25	4.25	4.25
SITE PROTECTION/MAINTENANCE						
Fencing - Materials	annual repair	11,400	11,775	12,162	12,563	12,976
Fencing - Gates, Locks	5 @ $925	3,000	3,096	3,198	3,303	3,412
Non-organic debris removal	Equip., dump fees	10,000	10,309	10,600	10,973	11,329
Trash containers	10, 18 x 24 @ $30	200	207	213	220	228
Septic Tank	pumping	400	413	427	441	455
Subtotal		25,000	25,800	26,600	27,500	28,400
HABITAT MAINT. & RESTORATION						
Invasive Plant Control - Herbicide	40 gal @ $108.60	4,400	2,200	2,300	2,400	2,500
Invasive Animal - Cowbird Control	10 traps	5,000	1,700	1,700	1,700	1,700
Invasive Animal Control - Other	1 trap	300	100	100	100	100
Subtotal		9,700	4,000	4,100	4,200	4,300
FIELD EQUIPMENT AND SUPPLIES						
GPS Unit and supplies		4,000	800	800	800	800
Vehicle - Small pickup (2)		50,000	6,300	6,300	6,300	6,300
Vehicle Fuel & Insurance		6,200	6,200	6,700	7,200	7,700
Cellular phone	phone unit	300	100	100	100	100
Chemical sprayer	5 gal	100	100	100	100	100
Chainsaw - tamarisk removal		700	400	400	400	400
Subtotal		61,300	13,900	14,400	14,900	15,400

Table 8-12: BUDGET FOR COACHELLA VALLEY MSHCP RESERVE SYSTEM (cont.)

MANAGEMENT: YEARS 1 - 5 OF MSHCP IMPLEMENTATION
Detail of Management Costs

	SALARY OR ITEM EXPLANATION	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
OFFICE EQUIPMENT						
Utilities	elec., gas, water	15,000	15,000	15,100	15,300	15,600
Telephone	annual charges	2,400	2,400	2,500	2,600	2,700
Insurance - Structure, Contents		20,300	20,300	20,600	20,900	21,100
Office Supplies		400	400	500	600	700
Furniture		400	100	200	300	400
Office machines - copier, fax		500	100	200	300	400
E-mail		400	400	500	600	700
Computer, PC	laptop	2,300	600	700	800	900
Computer software		400	100	200	300	400
Laser Printer		500	100	200	300	400
GIS Software	ArcView	2,000	400	500	600	700
Subtotal		44,600	39,900	41,200	42,600	44,000
PUBLIC EDUCATION, SERVICES						
Nature Center	maint./constr.	1,300	1,300	1,300	1,300	1,300
Preserve Office	maint./constr.	1,000	1,000	1,000	1,000	1,000
Residence		2,000	2,000	2,000	2,000	2,000
Boardwalk	constr. Repair	500	500	500	500	500
Boundary signage		1,600	300	400	500	600
Interpretive Signage		2,600	300	400	500	600
Interpretive Kiosk		0	300	300	300	300
Subtotal		9,000	5,700	5,900	6,100	6,300
TOTAL PERSONNEL COSTS PER YEAR		394,795	407,900	421,400	435,300	449,600
TOTAL EQUIP. & SUPPLIES PER YEAR		149,600	89,300	92,200	95,300	98,400
SUBTOTAL - ESTIMATED COST		544,395	497,200	513,600	530,600	548,000
CONTINGENCY EXPENSE (10%)		54,440	49,720	51,360	53,060	54,800
ADMINISTRATIVE OVERHEAD (10%)		54,440	49,720	51,360	53,060	54,800
TOTAL MANAGEMENT COSTS PER YR.		653,274	596,640	616,320	636,720	657,600

[1] Estimate for ranger/warden includes salary, benefits, vehicle & all costs associated with a ranger on patrol.

- Evaluation of the hydrological regimes that are important in riparian systems. In particular, hydrologic studies in the Salt Creek area are needed to determine if the water sources for Salt Creek are adequately protected or if additional water sources may be needed.
- Steps to enhance and restore riparian Habitat in the lower portion of the Whitewater River, if monitoring shows declines in the numbers of riparian species.
- Determine the potential need for additional cover to enhance the Biological Corridor, especially under the Interstate 10 bridge.
- A management action to address an unexpected impact to a Covered Species

These funds will not be required every year for monitoring and management implementation. In years they are not needed, the funds will instead serve as a research fund, supporting the necessary research that is called for in the Plan. In a given year when the $100,000 is not needed, it will be held in the fund and the fund will continue to grow.

Caltrans, CVWD, IID, and MSWD as an obligation of their participation in the Plan will contribute to the endowment for the Monitoring Program, Management Program, and Adaptive Management. These contributions are described in Sections 6.6.1 and 6.6.2.

Another important assumption is that funding levels estimated here are largely additional to existing management funds (i.e. funds currently available to manage the existing Dos Palmas Preserve / ACEC). To the extent that such activities and costs are separable, only additional costs occurring through the adoption of the CV MSHCP are included here.

For the monitoring of trail use and the research on impacts of recreational activity on Peninsular bighorn sheep, the costs will be shared between the CVCC and the BLM, to the extent federal funding is available. These costs have been apportioned based on the land ownership of areas where existing and future perimeter trails occur. The ratio of private, local, or state lands to BLM lands is approximately 40% to 60%. Where federal funding is available, costs for these programs will be apportioned based on this ratio. Specific details on the human-use monitoring and research costs related to trails and bighorn sheep are incorporated in Table 8-11.

In the event that funding from state and federal partners is not available, CVCC is required to fully fund the Trails Plan-related research. The objective of the study will be evaluation of the potential effects of recreational trail use on wild bighorn sheep. A separate study of captive bighorn sheep related to the Palm Desert to La Quinta Connector Trail will be initiated pending available funds for research.

- The CVCC Monitoring Program budget (See Table 8-11) identifies the funding for personnel, equipment, and supplies for the research program. The total budget for the trails research program is $900,000 for 5 years, or $180,000 per year. The Monitoring Program budget includes funds for the research program should funding from state and federal partners not be available. Funding from BLM, USFWS, CDFG, or other agency partners that is available in any year of the research program can be used to supplement or replace CVCC funding.

In the event funding from state and federal partners is not available, the CVCC shall ensure funding for monitoring of bighorn sheep under the Plan. Monitoring of bighorn sheep will include distribution, abundance, and lamb and adult survival in the Conservation Areas on an annual basis, with the information provided to the Wildlife Agencies in the annual report. As noted in Section 7.3.3.2.1, monitoring of bighorn sheep will be a cooperative effort involving CDFG, USFWS, BLM, CVCC, and other partners, with funding provided primarily by CDFG, to the extent possible, and CVCC. Costs related to the personnel, equipment, and supplies for monitoring bighorn sheep are identified in Table 8-11. The CVCC share of this funding is $115,000 ($50,000 for personnel, $65,000 for equipment and supplies) per year. USFWS and CDFG, to the extent possible, will provide in-kind funding for staff to assist in coordination of the monitoring program.

The USFWS, BLM, CDPR, CDFG, and CNLM all have existing staff dedicated to the management of portions of the Plan area. Those current efforts are assumed to be continuing so the management cost estimates presented here are in addition to those ongoing efforts.

The Property Analysis Record (PAR), used here to calculate program costs, used state/federal level costs for the monitoring budget estimates, and used state level cost estimates for the management budget.

Trail construction and maintenance costs, parking lot construction and maintenance, visitor centers and displays are not included here. These costs and funding sources will be determined in Plan implementation. A limited amount of funding is provided for development of an environmental education program. These can be extremely effective tools to achieve Conservation goals at many levels, and as such, may be considered for addition to the Management Program in the future. Brochure development and printing are included here as minimal efforts to meet the need for public information/education. If existing facilities, such as the Coachella Valley Fringe-toed Lizard Preserve and Salton Sea State Recreation Area, adopt larger education responsibilities for the Plan, these costs could be reduced substantially.

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