APPENDIX G-7

ELEMENTS OF THE ADAPTIVE MANAGEMENT PROGRAM FOR THE RMV OPEN SPACE THAT CONTRIBUTE TO MAINTAINING AND ENHANCING LONG-TERM NET HABITAT VALUE

Elements of the Adaptive Management Program for the RMV Open Space that Contribute to Maintaining and Enhancing Long-Term Net Habitat Value

The NCCP Conservation Guidelines define the manner in which the creation and long-term adaptive management of reserves provide for assuring no net reduction, over the long term, in the ability of the subregion to sustain populations of Identified Species (termed "target species" in the Conservation Guidelines) and their associated habitats:

> *…subregional NCCPs will designate a system of interconnected reserves designed to: (1) promote biodiversity, (2) provide for high likelihoods for persistence of target species in the subregion, and (3) provide for no net loss of habitat value from the present taking into account management and enhancement. No net loss of habitat value means no net reduction in the ability of the subregion to maintain viable populations of target species over the long-term.*
>
> *With improved techniques for management and restoration, the goal of no net loss of habitat value may be attainable even if there is a net loss of habitat acreage.*
> (NCCP Conservation Guidelines, November 1993, CDFG, pg. 9)

Thus, the purpose of adaptive management within the framework of the statewide NCCP/HCP Program is to maintain and, where feasible, enhance the long-term net habitat value within a subregion.

Establishing the RMV Open Space is clearly the necessary pre-condition for maintaining net habitat value and for enhancing net habitat value over the long-term. However, it is the Adaptive Management Program that creates the implementation mechanism for both protecting and increasing net habitat value on a long-term basis. The RMV Open Space Adaptive Management Program is premised on concepts presented in the NCCP Conservation Guidelines and in the Southern Orange County NCCP Science Advisors Report. As stated in the latter Report:

> *Adaptive management assumes that managers will take actions (including leaving habitats undisturbed) that modify present ecosystem structure and function with the aim of moving the system towards a more desirable state or keeping it within some acceptable limits. This process takes advantage of the information generating opportunities that management activities create. The process is based on a feedback loop in which individual management activities are flexible and can be changed as new information becomes available or as conditions or priorities change [cites]. Adaptive management is iterative, meaning that managers constantly monitor and evaluate the consequences of their activities and refine them.*
> (Science Advisors Report, pp. 22-23; cf. Fish & Game Code Sections 2805(a) and 2852)

This management focus is necessarily embodied in the monitoring program for the RMV Open Space. As stated in the Science Advisors Report:

> *The biological monitoring program should be developed specifically to measure and evaluate the effects of management activities. It should identify and measure variables that permit <u>iterative refinement</u> of the management program.*
> (Science Advisors, Principles for Adaptive Management, pg. 4, emphasis added)

Appendix J describes the RMV Open Space Adaptive Management Program focus on "environmental factors known or thought to be directly or indirectly responsible for ecosystem changes." Appendix J goes on to indicate, "These factors, called 'environmental stressors,' may have both adverse and beneficial effects on ecosystem characteristics such as vegetation communities and species." Hence by addressing "environmental stressors," the Adaptive Management Program focuses on factors that influence the habitat value of the RMV Open Space. The "environmental stressor" approach to managing

and monitoring natural resources provides a conceptual method, along with an applied management system for testing concepts that is amenable to an enhanced understanding of causal relationships that can be addressed through management actions. According to Noon (2003), and as further reviewed in Appendix J:

> *To be most meaningful, a monitoring program should provide insights into cause-and-effect relations between environmental stressors or between specific management practices and anticipated ecosystem responses. Prior knowledge of the factors likely to stress an ecological system or the expected outcomes from management should be incorporated into the selection of variables to measures and the sampling design. Indicators should be chosen based on a conceptual model that clearly indicates stressors (e.g., pollutants, management practices) and indicators with pathways that lead to effects on the structure and function of the ecological system (NRC 1995, 2000). This process enables the monitoring program to investigate relations between anticipated stressors, or between management practices and environmental consequences, and provides the opportunity to develop predictive models.*
> [Noon 2003, pg 3]

Hence, the uncertainties addressed by the Adaptive Management Program are not "data gaps" relating to species proposed for regulatory coverage such as the species "data gaps" referenced in the USFWS Five-Point Policy (dated June 1, 2000). Given the abundant data gathered regarding listed species on RMV lands , species data gaps are not an issue. Instead, the uncertainties that are addressed by the Adaptive Management Program are the scientific uncertainties inherent in our understandings of complex habitat considerations as vegetation communities and ecosystem processes react to both natural and anthropogenic stressors over time.

Appendix J describes the methodology used to prioritize management measures and strategies for the RMV Open Space vegetation communities and site-specific resources. Appendix J also reviews the adaptive management models that will be used in carrying out the management program. This section will further review the various substantive elements of the overall management program in relation to the manner in which these program elements contribute to maintaining and increasing net habitat value on a long-term basis.

Goals of the Adaptive Management Program in Relation to the Objective of Maintaining, and Where Feasible, Increasing Net Habitat Value over the Long-Term

Appendix J identified three broad goals for the Adaptive Management Program, each of which is related to the objective of maintaining, and where feasible, increasing net habitat value of the RMV Open Space over the long-term:

Goal 1 Ensure the persistence of a native-dominated vegetation mosaic in the RMV Open Space –

The Adaptive Management Program is comprised of four steps to ensure the persistence of a native-dominated vegetation mosaic in the RMV Open Space: **(1)** preparation of conceptual stressor models and conceptual management plans for vegetation communities; **(2)** periodic assessment of the status of the vegetation communities; **(3)** management of the vegetation communities; and **(4)** evaluation of the effect of the management actions. With regard to conceptual stressor models, these models address management and monitoring of resources at three fundamental scales: **(1)** natural community landscape mosaic; **(2)** specific vegetation communities and habitats; and **(3)** species and species assemblages. Although there is overlap, dependence and interaction among the different scales, clearly stated conceptual relationships and

coordinated management objectives at all three scales will need to be articulated in order to help maintain and, where feasible, increase net habitat value:

(1) "Landscape management" pertains to the dynamic and interacting biotic natural communities and abiotic factors within the subregion, and focuses on the natural processes that maintain the condition and dynamics of the natural communities (see Goal "(3)" below).

(2) "Management and monitoring of specific vegetation communities and habitats" refers to site-specific conditions, as contrasted with the broader landscape scale that focuses on the dynamic interaction of biotic and abiotic processes. The Adaptive Management Program addresses vegetation communities through periodic monitoring and adaptive management of the major native-dominated vegetation communities in the RMV Open Space (coastal sage scrub, chaparral, grassland, riparian/wetlands and woodlands). Vegetation communities will be monitored and managed in terms of net habitat value, recognizing natural stressor-induced changes (i.e., *intrinsic drivers*) that occur in vegetation community associations that will alter the relative amounts of the community at any given time (e.g., natural succession, fire flooding, etc.). Special habitats, such as vernal pools, and habitat functions, such as habitat linkages/wildlife corridors, are also addressed at this scale.

(3) "Management and monitoring of species and species assemblages" refers to maintaining species populations, including Identified Species or other "focal species" (indicator or umbrella species).

Passive management will be the default initial approach to natural, periodic perturbations or disturbances of vegetation communities (e.g., major flood events). Active management will be employed where direct active manipulation may be effective in addressing a vegetation community that is becoming degraded and no longer responding naturally. Particular emphasis is placed on monitoring and responding to potential "stressors" affecting one or more of the major vegetation communities.

Goal 2 Restore the quality of degraded vegetation communities and other habitat types –

Habitat restoration is broadly defined as the process of intentionally altering a degraded habitat area or creating new habitat to re-establish a defined pre-existing habitat or ecosystem or enhance the functioning of a degraded habitat or ecosystem. The goal of restoration is to emulate the structure, function, diversity and dynamics of the habitat or ecosystem. This goal generally will be achieved through implementation of several coordinated/integrated restoration plans and related management plans, including:

- A Habitat Restoration Plan that includes: (1) coastal sage scrub and valley needlegrass grassland (coastal sage scrub/native grassland) restoration plans; and (2) riparian/wetlands restoration plans focusing initially on controlling flows in Gobernadora Creek and invasives control in San Juan Creek

- A Fire Management Plan

- A Grazing Management Plan

- An Invasive Species Control Plan

Elements of the initial enhancement and restoration program are responses to past and present "stressors," including prior conversion of coastal sage scrub and native grasslands to non-native annual grasslands, the conversion of riparian habitat due to the impacts of giant reed (giant reed) and erosion in portions of lower Gobernadora Creek resulting from excessive surface and subsurface water supplies from upstream areas. Enhancement and restoration measures often include the integration of two or more management plan elements in relation to specific restoration actions (e.g., invasive species control in San Juan Creek in combination with measures to increase water supplies for arroyo toad and least Bell's vireo habitat). Further, the Management Plans listed above – Fire, Grazing and Invasive Species Control,– are also central elements or tools to be used by the Adaptive Management Program in response to future "stressors" of vegetation communities identified over time.

Goal 3 Maintain and restore biotic and abiotic natural processes, at all identified scales, for the RMV Open Space.

The Science Advisors fashioned a new tenet of reserve design – Tenet 7 – to focus on maintaining ecosystem processes and structures. Particular emphasis was placed on fire and on hydrologic/erosional processes. With regard to fire, the Adaptive Management Program will combine fieldwork information derived from undertaking experimental prescribed burns for habitat management and restoration purposes with baseline and comparative information assembled both for RMV Open Space and from other protected open space areas.

With regard to geomorphologic processes, information gained and lessons learned from the future implementation of the Habitat Restoration Plan, including the Gobernadora restoration plan, the San Juan Creek restoration plan and the restoration of soils regimes in upper Cristianitos and upper Gabino, will be related to the Baseline Conditions Report analyses of geomorphology and terrains, hydrology, sediment yield and transport, water quality and groundwater and the species-directed information presented in the Geomorphic and Hydrologic Needs of Aquatic and Riparian Endangered Species Report. The combination of applied adaptive management restoration actions and prior baseline studies will provide the foundation for future adaptive management actions directed toward riparian/wetlands system processes. In these ways, the Adaptive Management Program will be able to gain further understandings of fundamental processes – within the context of the unique attributes of each sub-basin reflected in the Southern NCCP Planning Guidelines and Watershed and Sub-Basin Planning Principles – in order to maintain and to increase net habitat value of the RMV Open Space over the long-term.

The mitigation contributions of the Adaptive Management Program will be reviewed under three broad headings:

(1) Adaptive Management Goals and Objectives for each of the five major vegetation communities (coastal sage scrub, chaparral, grasslands, riparian/wetlands and woodlands) and site-specific resources (vernal pools, Identified Species of plants and habitat linkages/wildlife movement corridors) addressed by the Adaptive Management Program, including specific restoration measures proposed to be included in the first implementation phases of the Adaptive Management Program;

(2) Analysis of the role that will be played by the Management Plans, both in the initial phases of the Adaptive Management Program and over the long term; and

(3) Analysis of the manner in which management measures (including enhancement and restoration actions) will increase net habitat value so as to contribute to recovery of listed species in the Southern Subregion.

Adaptive Management Goals and Objectives

This section reviews the manner in which the overall goals and objectives, as well as management and enhancement/restoration recommendations, define the framework and implementation programs for helping maintain and increase net habitat value for each of the habitat resources, including the five major vegetation communities identified as the habitat focus for the RMV Open Space, vernal pools, Identified Species of plants and habitat linkages/wildlife movement corridors. For each of the foregoing resources, the following are identified and reviewed:

- Broad goals ,
- Management objectives
- Stressors
- Enhancement/restoration measures

The following subsections contain materials excerpted from Appendix J, The Adaptive Management Program. The reason for assembling these excerpts is to allow a focused summary of elements of the Adaptive Management Program that help articulate its contribution to maintaining and increasing net habitat value (all of the elements of the Adaptive Management Program contribute to net habitat value but the excerpted elements allow for a more focused understanding of the Adaptive Management Program's contributions).

Coastal Sage Scrub Vegetation Community – Goals, Objectives, Potential Stressors and Management, Enhancement and Restoration Actions

a. Adaptive Management Goals and Objectives

The conservation goals for adaptive management of coastal sage scrub and associated focal species are:

Maintain the physiographic diversity of coastal sage scrub and associated focal species in the RMV Open Space.

Restore coastal sage scrub and enhance the quality of degraded existing coastal sage scrub in the RMV Open Space such that the net habitat value of the existing coastal sage scrub system within the subregion is maintained.

Consistent with these goals, the following management objectives will be addressed to help maintain and enhance long-term habitat value:

Conduct monitoring of coastal sage scrub and focal species in a manner that allows RMV to track the long-term habitat value of the coastal sage scrub habitat community.

Restore 375 acres of coastal sage scrub in designated locations to enhance habitat carrying capacity and connectivity.

Manage coastal sage scrub fire regimes such that a natural diversity of age-stands is maintained throughout the RMV Open Space.

Manage cattle grazing to sustain net habitat value and diversity of coastal sage scrub.

Control exotics invasions of coastal sage scrub, especially along the RMV Open Space-urban interface or other identified vulnerable areas (e.g., along existing paved and dirt roads, utility easements).

b. Stressors Management Considerations Associated with the Coastal Sage Scrub Vegetation Community

Conceptual stressor models are presented in Appendix J-2 for coastal sage scrub and associated focal species. The key stressors on the coastal sage scrub vegetation community are fire, over-grazing and exotic species, with drought as a natural stressor to a lesser extent. Management issues generally fall into two categories: (1) general, habitat-wide issues; and (2) species-specific management issues. Management issues relevant to several species include:

- Fire management
- Grazing management
- Invasive plant and animal species control
- Non-native and native mesopredators
- Brown-headed cowbird nest parasitism
- Use of roads and trails
- Use of pesticides and fertilizers
- Noise
- Artificial lighting

c. Restoration of Coastal Sage Scrub

The Adaptive Management Program includes a coastal sage scrub restoration plan comprised of two main components:

1. Pre-designated restoration of areas in the near term to mitigate for authorized losses of coastal sage scrub to development and/or to increase net habitat value of the coastal sage scrub vegetation community; and

2. Case-by-case restoration undertaken during the course of long-term adaptive management of the RMV Open Space in response to changing conditions and emergencies.

(1) Near-Term Restoration Priorities

The main goal of the coastal sage scrub restoration plan is to establish coastal sage scrub in areas that would contribute to the RMV Open Space by increasing the carrying capacity for the California gnatcatcher and other sage scrub species. With this goal in mind, several areas have been tentatively identified for coastal sage scrub restoration (Appendix J):

- Sulphur Canyon in the Gobernadora sub-basin;

- Several side canyons between Chiquita Ridge and Chiquita Creek;

- Upper Gabino coastal sage scrub/native grassland restoration to reduce downstream impacts of fine sediments on aquatic species in Gabino and Cristianitos creeks.

- The details of the coastal sage scrub restoration program are provided in the coastal sage scrub/native grassland restoration plan component of the Habitat Restoration Plan.

(2) Long-Term Restoration Priorities

Case-by-case restoration of coastal sage scrub also will occur over the long term under the Adaptive Management Program as areas suitable for restoration are identified. Types of areas that may warrant active restoration include the following:

- Existing areas of degraded coastal sage scrub that are not naturally recovering through passive management;

- Areas that are degraded or disturbed by future natural events and that are unlikely to recover naturally (e.g., an area that has burned too frequently);

- Areas that have been temporarily disturbed either by authorized (e.g., an approved infrastructure project) or unauthorized (e.g., an illegal trail) activity; and

- Specific adaptive management research involving restoration treatments.

The key management activities of the restoration plan are listed here:

- Identification of priority coastal sage scrub restoration areas;

- Revegetation of existing degraded habitat;

- Re-establishment of coastal sage scrub in areas that have been converted to annual grassland or disturbed habitat due to human activities or too frequent fires;

- Control of invasive or exotic plant and wildlife species, such as artichoke thistle, black mustard, Argentine ants, fire ants, and cowbirds;

- Fire management activities;

- Management of grazing and other agricultural activities that adversely affect habitat values and diversity; and

- Controlling public access and recreation to protect/enhance habitat values, including seasonal restrictions during nesting or temporary restrictions designed to provide opportunities for recovery of overused areas.

Chaparral Vegetation Community – Goals, Objectives, Potential Stressors and Management, Enhancement and Restoration Actions

a. Adaptive Management Goals and Objectives

The conservation goals for adaptive management of chaparral and associated focal species:

- Maintain the physiographic diversity of chaparral and associated focal species in the RMV Open Space.

- Restore and enhance the quality of future degraded chaparral in the RMV Open Space such that net habitat value of the existing chaparral system is preserved.

Consistent with these goals, the following management objectives will be addressed to help maintain and enhance habitat value:

- Conduct monitoring of chaparral and focal species in manner that allows reserve owners/managers to track the long-term habitat value of the chaparral system.

- Manage chaparral fire regimes such that a natural diversity of age-stands and resprouters/obligate seeders is maintained throughout the RMV Open Space and that existing chaparral stands do not irreversibly type-convert to grassland.

- Manage cattle grazing such that adverse impacts to chaparral are controlled to preserve net habitat value and that existing chaparral stands do not irreversibly type-convert to grassland.

- Control exotics invasions of chaparral, especially along the RMV Open Space-urban interface or other identified vulnerable areas (e.g., along existing paved and dirt roads, utility easements).

The chaparral vegetation community in the RMV Open Space generally is healthy, and, at this time, no specific areas warranting restoration have been identified. However, areas within the RMV Open Space requiring restoration may be identified in the future, either as a result of more detailed field investigation of existing conditions or as triggered by natural or human-induced events (e.g., frequent wildfires).

b. Stressors Management Associated with the Chaparral Vegetation Community

Because chaparral appears to be more resilient to state-transitions than coastal sage scrub, it is anticipated that passive management will be the predominant management approach for this community within the RMV Open Space. As noted above, partly reflecting this resiliency and because it has a relatively low Importance Value score pursuant to the Appendix J-1 analysis, chaparral received a low Vegetation Community Ranking score with regard to management priorities.

The greatest risk to maintaining healthy stands of chaparral in the RMV Open Space appears to be frequent fire. Short fire intervals (< 25 years) in chaparral may eliminate obligate seeding species in favor of resprouters and very frequent fires (1, 2 or 3 year intervals) may result in invasion by exotic weeds and annual grasses (e.g., *Brassic nigra*, *Bromus* spp., *Schismus barbatus*) (e.g., Haidinger and Keeley 1993; Keeley 1986; Zedler 1983). The fire management of chaparral is treated in detail in the Fire Management Plan. Although over-grazing also is a

potential stressor, biologists familiar with the RMV property have not observed a significant adverse effect of grazing on chaparral.

The conceptual stressor model for chaparral focal species presented in Appendix J depicts known and potential stressors. The stressors management issues for chaparral species are essentially the same as for coastal sage scrub species because of the broad overlap between the two lists. They include:

- Fire management
- Grazing management
- Invasive plant and animal species control
- Non-native and native mesopredators
- Brown-headed cowbird nest parasitism
- Use of roads and trails
- Use of pesticides and fertilizers
- Noise
- Artificial lighting

c. Restoration of Chaparral

The Adaptive Management Program includes case-by-case restoration of chaparral undertaken during the course of long-term adaptive management of the RMV Open Space, with the overall goal on maintaining the existing diversity of chaparral in the RMV Open Space.

The main objective of the chaparral restoration program is to restore chaparral in areas that are degraded or disturbed by future natural events and where it is determined that such areas will not, or are unlikely to, recover naturally (e.g., an area that has burned too frequently). The objective of restoring areas that are disturbed in the future is important for maintaining long-term net habitat value. As documented in several studies, frequent disturbances of chaparral (e.g., fire) can result in state-transition to annual grassland and weedy, disturbed habitats. Likewise, areas that have been temporarily disturbed either by authorized (e.g., an approved infrastructure project) or unauthorized (e.g., an illegal trail) activity may be at risk of long-term degradation. In such cases, restoration may be required to re-establish chaparral to both maintain existing habitat value and protect adjacent areas from invasions by exotic species that could be established without intervention.

Annual and Native Grasslands Vegetation Community – Goals, Objectives, Potential Stressors and Management, Enhancement and Restoration Actions

a. Adaptive Management Goals and Objectives

The conservation goals for adaptive management of grasslands and associated focal species:

- Maintain the physiographic diversity of native and annual grasslands and associated focal species in the Habitat Reserve.

- Restore native grassland and enhance the quality of degraded existing native grassland in the RMV Open Space such that net habitat value of the existing grassland system is preserved.

Consistent with these goals, the following management objectives will be addressed to help maintain and enhance habitat value:

- Conduct monitoring of grassland and focal species in manner that allows RMV to track the long-term habitat value of the grassland habitat community.

- Restore 200 acres of native grassland to maintain and enhance habitat quality, diversity, and connectivity over the long-term.

- Manage native grassland fire regimes such that germination of native grasses (*Nasella* spp.) is enhanced

- Manage cattle grazing to facilitate restoration of existing areas of native grassland.

- Control invasions of herbaceous exotic species in both native and annual grasslands, including artichoke thistle, mustards and sweet fennel.

b. Stressors Management Associated with Grasslands Communities

Because the management issues related to annual and native grasslands are quite different, they are discussed separately.

1. Annual Grassland

For the most part management of annual grasslands will be passive, except for the control of artichoke thistle. This species readily invades disturbed annual grassland and is especially pernicious in southern Orange County in areas where control programs are absent. On RMV lands, ongoing control efforts over the past 30 years have limited the occurrence and spread of artichoke thistle. The control of artichoke thistle is discussed in the Invasive Species Control Plan. Other common exotic species such as black mustard and sweet fennel may be kept in check by fire and grazing management.

Much of the management related to annual grasslands will be directed toward limiting the conversion of other upland native communities (coastal sage scrub, chaparral, oak woodland, and native grassland) to annual grassland so that the long-term net habitat value of the RMV Open Space is not diminished. From the perspective of habitat value, passive conversion of annual grassland and shrub habitats to native grassland in the RMV Open Space is not considered an adverse effect that would require management.

2. Native Grassland

Existing native grasslands in the RMV Open Space likely will require substantial active management because they are subject to "stressors" invasions by annual grasses and other exotic forbs. For example, of the approximately 1,020 acres of valley needlegrass grasslands mapped by Dudek on RMV in 2001, or included from other mapping efforts, only 17 acres (2 percent) were mapped as high quality (> 25 percent cover of needlegrass), 580 acres (57 percent) were medium quality (10-25 percent cover), 294 acres (29 percent) were low quality (~10 percent cover), and 128 acres (12 percent) had no rating (these areas were from previous mapping efforts that did not quantitatively assess quality). All native grasslands in the RMV Open Space have a substantial non-native component that likely will need to be actively managed to sustain and enhance the quality of the existing native grassland. Common non-native species observed by DUDEK in native grasslands include filarees (*Erodium* spp.),

bromes (*Bromus hordaceous, B. diandrus, B. madritensis*), wild oat (A*vena* spp.), black mustard (*Brassica* nigra), tocalote (*Centaurea* melitensis), smooth cat's-ear (*Hypochoeris glabra*), common catchfly (*Silene gallica*), bristly ox-tongue (*Picris echiodes*), and Russian-thistle (*Salsola tragus*). As stated by Menke (1996):

> *Introduced, alien grasses and forbs native to southern France, Spain and Portugal present a formidable obstacle to restoration and enhancement of native perennial grass populations in California foothill and valley grasslands. … Their diverse set of plant growth forms and phonologies cause fierce resource competition for light and water beginning soon after fall germination and often continue for the entire growing season.* Fremontia 1996, pg 22)

c. Restoration of Native Grassland

The Adaptive Management Program includes a native grassland restoration plan comprised of three main components:

1. Pre-designated restoration of areas with native grassland to mitigate for authorized losses to development;

2. Pre-designated restoration of coastal sage scrub/grassland; and

3. Case-by-case restoration undertaken during the course of long-term adaptive management of the RMV Open Space.

The main goals of the native grassland restoration program are: (1) to enhance native grasslands in selected areas that currently support low quality grasslands (i.e., <10 percent cover of native grass); (2) to restore native grasslands in appropriate areas that currently support annual grasslands; and (3) restore a mix of coastal sage scrub and native grassland in appropriate areas.

(1) Near-term Restoration Priorities

With these goals in mind, several areas have been tentatively identified for native grassland restoration or coastal sage scrub/native grassland restoration (*Appendix J):*

- Upper Cristianitos
- Portions of Blind Canyon

In some areas, the desired habitat is a mosaic of coastal sage scrub and native grassland that emulates the surrounding habitat characteristics. Such areas (*Appendix J*) include:

- Upper Gabino

Case-by-case restoration of native grassland also may occur under the Adaptive Management Program. As part of the management of the RMV Open Space, RMV will identify areas suitable or desirable for restoration. Instances that may warrant active restoration consist of the following:

(2) Long-Term Restoration Priorities

- Existing areas of degraded or low quality native grassland that are not naturally recovering through passive management;

- Areas that are degraded or disturbed by future natural events and it is determined that they will not, or are unlikely to, recover naturally (e.g., an area that has burned too frequently or is infested with exotic species);

- Areas that have been temporarily disturbed either by authorized (e.g., an approved infrastructure project) or unauthorized (e.g., an illegal trail) activity; and

- Specific adaptive management research involving restoration treatments.

The details of the native grassland restoration program are provided in the coastal sage scrub/native grassland restoration plan element of the Habitat Restoration Plan. The key management activities of the plan are listed here:

- Identification of priority native grassland restoration areas;

- Revegetation of existing degraded habitat;

- Re-establishment of native grassland in selected areas in upper Cristianitos that currently support annual grassland;

- Grazing management;

- Fire management; and

- Control of invasive or exotic plants such as non-native grasses (bromes, oats, wild rye), artichoke thistle, black mustard, and other non-native forbs.

Grazing will be the preferred management technique in the RMV Open Space because it meshes well with the existing and future cattle operations on the Ranch. Also, as suggested by Menke (1991), grazing is a primary component of native grassland restoration and management, with fire as a secondary component. Appropriately timed grazing can have several beneficial effects on the vigor native grasslands:

- Removal of litter and thatch
- Recycling of nutrients
- Stimulation of tillering (sprouting of new stalks)
- Removal and control of alien species
- Reduced transpiration (loss of water) by alien species making more water available for native grasses

Fire can also have beneficial effects on native grassland, especially with regard to reducing litter and thatch and alien species, but frequent burning can damage native grasses. Menke (1991) recommends that burning be used every third or fourth year. In addition, burning may be an effective management tool for native grasslands in conjunction with managing coastal sage scrub and chaparral. In natural mosaics of shrublands, openings often support small patches of native grassland. Periodic burning of sage scrub and chaparral likely will help maintain these native grassland patches and enhance biodiversity and habitat value in these areas.

Wetland/Riparian Vegetation Community – Goals, Objectives, Potential Stressors and Management, Enhancement and Restoration Actions

a. Adaptive Management Goals and Objectives

The conservation goals for adaptive management of wetland/riparian habitats and associated focal species are:

- Maintain the physiographic diversity of wetland/riparian habitats and associated focal species in the RMV Open Space.

- Restore wetland/riparian habitats and enhance the quality of wetland/riparian habitats in the RMV Open Space such that the net habitat value of the existing wetland/riparian habitat system is preserved.

Consistent with these goals, the following management objectives will be addressed to help maintain and enhance habitat value of the wetland/riparian habitat system in the RMV Open Space. These primary objectives are captured by the SAMP tenets stated here:

i. No net loss of acreage and functions of the waters of the U.S./State
ii. Maintain/restore riparian ecosystem integrity
iii. Protect headwaters
iv. Maintain/protect/restore riparian corridors
v. Maintain and/or restore floodplain connection
vi. Maintain and/or restore sediment sources and transport equilibrium
vii. Maintain adequate buffer for protection of riparian corridors
viii. Protect riparian areas and associated habitats of listed and sensitive species.

With respect to objective viii, the "Geomorphic and Hydrologic Needs of Aquatic and Riparian Endangered Species" document was prepared in support of the Southern NCCP/HCP and SAMP/MSAA process to provide information on the physical processes that significantly affect structural habitat and life history requirements of listed riparian/wetland species in the planning area – arroyo toad, least Bell's vireo and southwestern willow flycatcher.

The Watershed and Sub-basin Planning Principles describes the relationship of the watershed planning principles to the SAMP tenets in format that allows a direct translation to appropriate management actions. As an example, Tenet 1 of no net loss of acreage and functions of the waters of the U.S./State is related to the following watershed planning principles:

- Principle 2: emulate existing runoff/infiltration patterns
- Principle 3: address potential effects of future land uses on hydrology
- Principle 5: maintain geomorphic structure of major tributaries/floodplains
- Principle 8: protect existing groundwater recharge areas.

Although these are stated as "planning principles," they also are adaptive management principles because their function will have to be monitored and potentially managed over the long term.

b. Stressors Management Considerations Associated with the Wetland/ Riparian Vegetation Community

As with other habitats, the Adaptive Management Program for wetland/riparian habitats will involve two basic types of management activities:

1. Passive Management
2. Active Management
   a. Routine Management
   b. Experimental Management

These two approaches are described in Appendix X. However, the wetland/riparian systems are often much more complex than the upland systems, probably more sensitive to disturbances (e.g., giant reed or tamarisk invasion, surface flow and ground water levels), and likely will require more active management than the upland systems.

(1) Species' Geomorphic and Hydrologic Needs

The "Geomorphic and Hydrologic Needs of Aquatic and Riparian Endangered Species" summarizes the landscape processes and specific habitat requirement for listed riparian species that occur in the RMV Open Space- arroyo toad, least Bell's vireo and southwestern willow flycatcher. General issues that likely will require near-term active management at a landscape watershed and sub-basin level, include:

- Emulating natural flood regimes to maintain coarse sediment yields, storage and transport processes.
- Emulating, to the extent feasible, the existing runoff and infiltration patterns in consideration of specific terrains, soil types and ground covers.
- Emulating natural timing of peak flows of each sub-basin relative to mainstem creeks.
- Managing existing groundwater recharge areas supporting riparian zones and maximize groundwater recharge of alluvial aquifers to the extent consistent with aquifer capacity and habitat management goals.
- Managing water quality through various strategies, with an emphasis on natural treatment systems such as water quality wetlands, swales and infiltration areas and application of Best Management Practices.

(2) Near-Term Habitat Management Priorities

Issues that likely will require near-term active management at a habitat level include:

- Management of excessive surface and subsurface water flows and sediment in Gobernadora Creek.
- Potential increase in water supply to San Juan Creek.
- Control of invasive exotic plant species such as giant reed, tamarisk and pampas grass in riparian zones, particularly in San Juan Creek.
- Management of ponds and other open waters with lacustrine and fresh emergent vegetation.
- Grazing management.

- Fire management.

- Control of human access and recreational activities in wetland/riparian habitat areas.

- Management of sand and gravel mining operations.

(3) Near-Term Species Management Issues

Issues that likely will require near-term active management at the species and species assemblage level include:

- Control of cowbirds.
- Control of Argentine and red imported fire ants.
- Control of human activities around sensitive nesting areas.
- Control of vehicular traffic in the RMV Open Space.
- Control of exotic aquatic predators (bullfrogs, crayfish, introduced fishes)
- Control of terrestrial mesopredators (feral cats, dogs, skunks, raccoons, opossums)
- Control of collections and harassment by humans.
- Provision of adequate wildlife crossings/habitat linkages and fences along roadways at key crossing locations.
- Control of artificial lighting and noise.

(4) Experimental Adaptive Management Hypotheses

Adaptive management actions should be undertaken within the framework of experimental management hypotheses to the extent feasible. A substantial amount of baseline work has already been completed on RMV that will provide a basis for experimental management hypotheses. This baseline work is summarized in the following documents:

- Geomorphic and Hydrologic Needs of Aquatic and Riparian Endangered Species
- Slope Wetlands Report
- Vernal Pools Report

d. Restoration of Wetland/Riparian Vegetation Communities

The Adaptive Management Program Habitat Restoration Plan includes a wetland/riparian restoration plan comprised of two main components:

1. Pre-designated enhancement and revegetation areas; and

2. Case-by-case restoration undertaken during the course of long-term adaptive management of the RMV Open Space.

(1) Near-Term Restoration Priorities

The wetland/riparian restoration plan is intended to complement and supplement the protection and management measures for the wetland/riparian ecosystem in the RMV Open Space. The goals of this integrated protection and restoration program are to:

- Maintain and restore riparian ecosystem integrity
- Maintain/protect/restore riparian corridors

To achieve these goals, restoration, including invasive species control, is recommended for middle San Juan Creek, Gobernadora Creek, upper Gabino Creek, and lower Cristianitos Creek. Identification of these areas for restoration is based on a riparian system invasive species mapping by PCR (2002) and GLA (2003) as well as the Watershed and Sub-basin Planning Principles.

- Middle San Juan Creek between the creek crossing south of the Colorspot Nursery and the RMV boundary near Bell Canyon supports abundant giant reed and scattered locations of pampas grass and tamarisk. This reach of San Juan Creek supports a major population of the arroyo toad and important populations of yellow warbler and yellow-breasted chat.

- Gobernadora Creek is recommended for riparian/wetland restoration to address: (1) the historic meander conditions; and (2) excessive sediment input resulting from upstream land uses. Restoration may include the construction of a detention/water quality basin below Coto de Caza (Gobernadora Multipurpose Basin). The GERA portion of the creek supports important populations of the least Bell's vireo, southwestern willow flycatcatcher, yellow warbler, and yellow-breasted chat. Creation of wetland breeding habitat for the tricolored blackbird should be considered a priority in the Gobernadora area because breeding populations have regularly occurred in the ponds in southern Coto de Caza. Northward extension of riparian habitats from GERA also would provide additional breeding habitats for vireo, flycatcher, chat, warbler, raptors and other wetland species such as two-striped garter snake.

- Upper Gabino Creek currently generates fine sediment due to extensive gully formation in the headwaters area. To address this excessive sediment generation and reduce downstream impacts, both upland habitat restoration and wetland/riparian restoration is recommended. Depending on the type of wetland restoration in upper Gabino Canyon, several wildlife species could benefit, including two-striped garter snake, southwestern pond turtle, tricolored blackbird, and the riparian birds listed above.

- Lower Cristianitos Creek supports patches of tamarisk near the confluence and giant reed and pampas grass west of the TRW facility south to the RMV boundary. This reach supports important populations of the arroyo toad and yellow-breasted chat, a well as several nest sites for least Bell's vireo. Restoration in this area also would benefit several listed species downstream of the RMV boundary Cristianitos and San Mateo creeks: least Bell's vireo, southwestern willow flycatcher, tidewater goby and southern steelhead.

In addition to habitat restoration focused on the control of invasive exotic species, several smaller scale creek stabilizations are recommended to address locally induced headcuts in Chiquita Creek and upper Cristianitos Creek.

(2) Long-Term Restoration Priorities

Wetland/riparian enhancement and restoration also will be conducted on a case-by-case basis over the long-term monitoring and management of the RMV Open Space. Through

the periodic overall vegetation communities monitoring program and focused frequent monitoring of potential exotics hotspots, RMV will target areas for local enhancement and restoration. Because the invasion of the wetland/riparian areas by giant reed, tamarisk and pampas grass is dynamically related to natural events and somewhat unpredictable, RMV will develop protocols for checking areas susceptible to invasions.

As discussed for upland habitats, the case-by-case enhancement and restoration actions primarily will be the decision of the RMV. However, because invasions of exotic species into riparian systems have profound implications for downstream resources, and are likely to cross different ownerships it will be crucial for RMV to coordinate with upstream landowners, specifically the County of Orange (Casper's Regional Park) for San Juan Creek. Restoration in a downstream location will have little long-term beneficial effect if upstream sources of invasives also are not controlled. Generally, restoration should start in the upstream locations and work downstream.

Woodlands Vegetation Community – Goals, Objectives, Potential Stressors and Management, Enhancement and Restoration Actions

a. Adaptive Management Goals and Objectives

The conservation goals for adaptive management of oak woodland habitats and associated focal species are:

- Ensure the persistence of the physiographic diversity of oak woodland habitats and associated focal species in the RMV Open Space.

- Restore oak woodland habitats and enhance the quality of oak woodland habitats in the RMV Open Space such that the net habitat value of the existing wetland/riparian habitat system is preserved.

Consistent with these goals, the following management objectives will be addressed to help maintain and enhance long-term habitat value of the oak woodland habitat system in the RMV Open Space:

- Conduct monitoring of oak woodlands and focal species in a manner that allows RMV to track the long-term habitat value of the oak woodland system.

- Maintain appropriate subsurface hydrology to avoid under- and over-watering.

- Manage fire regimes in oak woodlands such that a natural diversity and balance of age-stands are maintained throughout the RMV Open Space; i.e., there is an appropriate mix of mature trees and recruitment of new trees.

- Manage cattle grazing such that adverse impacts to oak woodlands are controlled to preserve net habitat value.

- Control exotics invasions of oak woodlands, especially along the RMV Open Space-urban interface or other identified vulnerable areas (e.g., along existing paved and dirt roads, utility easements).

- Maintain suitable nesting habitat in oak woodlands, and specifically potential nest cavities in snags, dead or decaying limbs, and hollow trunks for species such as acorn

woodpecker, ash-throated flycatcher, Nuttall's woodpecker and western screech owl. As a primary cavity nester (i.e., species that excavate their own holes for nests), acorn woodpeckers may be a keystone species for secondary cavity nesters that utilize abandoned holes.

- Retain large oaks (> 50 dbh) to the maximum extent possible to provide granaries for acorn woodpeckers.

- Identify trees with high acorn productivity.

- Maintain acorn production to support establishment of new trees, as well as provide forage for native wildlife such as acorn woodpeckers, scrub jays, squirrels, mice and mule deer. (It is important to maintain native predators of acorns, seedlings and saplings because they may be important components of the oak woodland ecosystem, especially in regard to dispersal of acorns or mycorrhizal fungi. Acorn predators such as mice also provide food for other oak woodland species such as Cooper's hawks and white-tailed kites.)

- Protect seedlings and saplings in stands of oak woodlands in the RMV Open Space, including by the use of protective structures where necessary.

- Maintain the complex understory of shrubs, grasses annual forbs, leaf litter and downed woody debris that provide habitat for a variety of wildlife species.

- Maintain native habitats adjacent to oak woodlands in the RMV Open Space to the extent possible to preserve the landscape mosaic.

- Maintain upper trophic predators such as bobcats and coyotes within oak woodlands to control native and non-native mesopredators.

- Restore oak woodlands in areas that currently support stands that are damaged or stressed by natural or anthropogenic events, and the adverse impact may not be naturally reversible (e.g., irrigation of drought-stressed trees). At this time specific areas warranting restoration of oak woodlands have not been identified. However, areas within the RMV Open Space requiring restoration may be identified in the future, either as a result of more detailed field investigation of existing conditions or as triggered by natural or anthropogenic events.

- Conduct management activities and disturbance events (e.g., prescribed fire, disking, mowing, grazing) outside the breeding season of oak woodland wildlife species to the extent feasible.

b. Stressors Management Considerations Associated with Woodlands

(1) Habitat Management Priorities

Issues that likely will require active management at a habitat level include:

- Control of invasive exotic plant species, especially annual grasses.

- Management of surface and subsurface hydrology to avoid both over- and under-watering.

- Grazing management.
- Fire management.
- Control of predation on seedlings and saplings.
- Maintain snags, decaying wood, and dead limbs to provide nesting habitat for primary and secondary cavity species (i.e., acorn woodpecker, Nuttall's woodpecker, ash-throated flycatcher, and western screech owl).
- Maintain understory litter and debris to provide habitat for understory species (i.e., orange-throated whiptail and lark sparrow).

(2) Species Management Priorities

Issues that likely will require active management at the species and species assemblage levels include:

- Control of Argentine and red imported fire ants.
- Control of human activities around sensitive nesting areas.
- Control of vehicular traffic in the RMV Open Space.
- Control of terrestrial mesopredators (feral cats, dogs, skunks, raccoons, opossums)
- Control of artificial lighting and noise

c. Restoration of Woodlands

The Adaptive Management Program provides for case-by-case restoration of oak woodlands undertaken during the course of long-term adaptive management of the RMV Open Space, with the overall goal on maintaining the existing diversity and habitat value of oak woodlands in the RMV Open Space.

The two main objectives of the oak woodlands restoration program are:

1. To restore oak woodlands in areas that support existing mature trees, but where recruitment and regeneration are being inhibited by factors such as exotic weeds and grasses or over-grazing.
2. To restore oak woodlands in areas that are degraded or disturbed by future natural events and it is determined that they will not, or are unlikely to, recover naturally (e.g., an area that has burned too frequently).

The first objective of restoring oak woodlands in areas that currently are degraded by non-native exotics or over-grazing will be achieved by focusing the restoration effort in degraded areas adjacent to healthy stands of oak woodland to the extent possible. A near-term management task will be to identify any such areas in the RMV Open Space. Following management recommendations of CalPIF (2002), sites identified for restoration should then be prioritized on basis of their proximity to high quality sites and their likely success of regeneration and

transplanted oak viability. Restoration of sites in close proximity to existing high quality sites have a better chance of being colonized by oak woodland species.

The second objective of restoring areas that are disturbed in the future is important for maintaining long-term net habitat value. For example, sites that currently support high quality oak woodlands but are damaged by a high intensity fire or several fires in a short period of time may be identified for restoration.

As part of the management of lands in the RMV Open Space supporting oak woodlands, RMV will identify areas suitable or desirable for restoration. Generally it will be the decision of RMV whether to undertake an enhancement or restoration project in the RMV Open Space. However, where the project may affect adjacent ownerships, or be affected by habitat conditions on other ownerships, a coordinated effort may be desirable. For example, if restoration is called for following a wildfire that affected both RMV Open Space and adjacent lands, the effort should be to include both areas to provide the greatest net benefit to the RMV Open Space.

Restoration sites will be evaluated for their suitability including water table and soil conditions. Merrick et al. (1999) describe a knowledge-based model to evaluate sites for restoration suitability for valley oak (Q. lobata). If oaks currently are present or the site supported oaks in the recent past, it is considered to be suitable. If the site is not currently occupied by oaks, but has high soil water holding capacity, a high water table and loam soils, it is considered favorable for restoration.

Vernal Pools – Goals, Objectives, Potential Stressors and Management Actions

a. Adaptive Management Issues

The RMV Open Space supports two main areas of vernal pools. The Dudek/PCR study conducted in 2001 mapped three pools on Chiquita Ridge and three pools on the Radio Tower Road mesa located between Highway 74 and Trampas Canyon. The large pool on Chiquita Ridge supports both the Riverside and San Diego fairy shrimp and a smaller pool supports the San Diego fairy shrimp. Two of the three pools on the Radio Tower Road mesa support both species and the third supports only the San Diego fairy shrimp. Important populations of the western spadefoot toad also occur in the Chiquita Ridge and Radio Tower Road pools.

Five main issues are relevant to the adaptive management of the vernal pools and associated species in the RMV Open Space:

1. Hydrology
   a. Water quality
2. Grazing
3. Invasive exotic species
4. Human disturbance

Hydrology is a key management issue because the flora and fauna of the vernal pools have evolved adaptations to the unique hydrological conditions of vernal pools. Although dramatic year-to-year variations in rainfall occur, and vernal pools species are well adapted to this variation, over the long-term too little inundation may not support the full life cycle of the vernal pool species and extended inundation may lead to mortality of the species that are not truly adapted to an aquatic existence (Barry 1998; USFWS 1998). Extended runoff from developed areas can be a substantial problem for vernal pools (e.g., Clark et al. 1998). In order for the vernal pools in the RMV Open Space to persist and support species such as the Riverside and San

Diego fairy shrimp, they will need to be managed such that the normal hydrological variation is maintained.

Vernal pools species have adapted to specific water quality tolerances. Alteration in alkalinity, pH, turbidity, and water temperature may have significant impacts on vernal pools species (Simovitch et al. 1996).

Grazing can have both positive and negative impacts on vernal pools. Grazing helps control of the proliferation of invasive exotics species such as annual grasses that choke out native plants (e.g., Barry 1998), but poorly timed grazing can result in trampling of fairly shrimp cysts and hatchlings. The management issue is timing grazing in way that helps control non-native plants, but does not interfere with the reproductive cycle of vernal plant and animal species. Lis and Eggeman (2000) describe an adaptive management study where a combination of grazing and burning was used to control invasive species in vernal pools in the Dales Lake Ecological Reserve in Tehama County, California. They found that carefully timed grazing did not interfere with fairy shrimp reproduction of any immediate negative effects on rare plants. They concluded that while grazing "may not return the vernal pool landscape to its condition five hundred years ago…it is likely to move the landscape in that direction." (pg.23). Prescribed burning as a management tool for grasslands generally, and vernal pools specifically, also is recommended by Pollack and Kan (1998) based on studies on the Jepson Prairie Preserve showing that late-spring burning reduces non-native grasses and increases the dominance of native species. They also suggest that a combined burning-grazing regime can be used to reduce fire intensity.

Invasive exotic species threaten vernal pools because they compete with and displace the native plants and they also interfere with normal surface runoff patterns essential for sustaining vernal pool hydrology (e.g. Barry 1998). The problem with most non-natives occurs in drier years when moisture conditions are conducive to annual grasses such as bromes (Bromus spp.) and wild oats (Avena spp.) (USFWS 1998). During wetter years these annual grasses are reduced, but several non-native species such as rabbit's-foot grass (Polypogon monspeliensis), wild rye (Lolium spp.) and brass-buttons (Cotula coronopifolia) still can dominate vernal pools (USFWS 1998).

b. Adaptive Management Goals and Objectives

The overall goal of the Adaptive Management Program for vernal pools and associated species is to maintain existing vernal pools and plants and wildlife species that occur in the pools within the RMV Open Space. This broad goal will be achieved by meeting the following management objectives:

- Conduct monitoring of vernal pools and associated species in a manner that allows **RMV** to track the long-term status of the vernal pools and species.

- Manage the hydrological regime of the pools by maintaining the existing local contributing hydrological sources (i.e., the local contributing watershed of the vernal pool).

- Eliminate or control any identified existing threats to existing vernal pools, including poorly timed grazing and invasion of pools and the surrounding hydrology source area by non-native species.

- Develop management tools to control the proliferation of non-native species, including grazing, prescribed burns, mowing and selective weeding.

- Manage water quality to emulate baselines conditions in the vernal pools in the RMV Open Space known to support the Riverside and San Diego fairy shrimp.

- Control public access to vernal pools.

c. Stressors Management Considerations Associated with Vernal Pools

The primary management approach for vernal pools in the RMV Open Space will be passive. These pools are not likely to suffer the same level of disturbance that many other preserved pools complexes do that are in close proximity to urban development, such as increased runoff, pesticides, trampling by the public, off-road vehicles, trash dumping, and pets and feral animals. The Chiquita Ridge pools are located approximately 1,000 feet east of the Ladera Ranch and the Radio Tower Road pools are located 1,000 feet west of planned development in Trampas Canyon to the east and 3,500 feet southeast of planned Ortega Gateway development. The potential Trampas Canyon, and Ortega Gateway development areas have no connection to the hydrologic source areas for the vernal pools and thus no effects on hydrology or water quality. In addition, the vernal pools are located far enough away from potential development areas such that trespass by the public into vernal pools areas should be minimal.

Stressors impacts will be addressed through the following management tools:

- Grazing
- Prescribed fire
- Mowing
- Selective Weeding
- Fencing

Identified Plant Species – Goals, Objectives, Potential Stressors And Potential Management Actions

a. Adaptive Management Issues

Potential stressors identified in Appendix J for the Identified Plant Species (chaparral beargrass, Coulter's saltbush, many-stemmed dudleya, salt spring checkerbloom, southern tarplant and thread-leaved brodiaea) include too-frequent fire, non-native plants, over-grazing, human activities and altered hydrology. The main stressor is identified as non-native or exotic plant species including artichoke thistle, ryegrass, bromes, wild oats, smooth cat's ear, Crete hedypnosis, mustards and wild radish. The impact of exotic species can be exacerbated by drought, too-frequent fire and over-grazing.

b. Adaptive Management Goals and Objectives

The overall goal for plant Identified Species is to maintain major and important populations of Identified Species in the RMV Open Space. This overall goal will be achieved through the following management objectives:

- Conduct periodic monitoring of major and important populations of Identified Species in a manner that tracks the long-term status of the species in the RMV Open.

- Control invasions of herbaceous exotic species in areas supporting major and important populations of Identified Species.

- Manage grazing to avoid adverse impacts to, and to the extent feasible benefit, major and important populations of Identified Species.

- Manage fire to avoid adverse impacts to, and to the extent feasible benefit, major and important populations of Identified Species.

- Maintain habitat to support plant dispersal and pollinators between major and important populations to the extent possible.

c. Potential Management and Restoration Actions

The management actions for each Identified Plant Species are different, as each species has different needs. The following is a summary of the management actions for each species.

- Thread-leaved brodiaea: exotics control through multiple techniques including continuation of current timed grazing practices for the Chiquadora Ridge population and the lower Cristianitos Canyon population. An experimental adaptive management study is recommended for the lower Cristianitos Canyon population to determine the effects of continuing the current grazing which does not avoid the flowering season and/or prescribed burns as an exotics control technique. Translocation of impacted brodiaea is described in detail in the Plant Species Translocation, Propagation and Management Plan.

- Chaparral beargrass: no management actions are recommended for this species pending the outcome of three-year interval monitoring program.

- Coulter's saltbush: no management actions are recommended for this species pending the outcome of a five-year monitoring program to define stressors. Translocation of impacted Coulter's saltbush is described in detail in the Plant Species Translocation, Propagation and Management Plan.

- Many-stemmed dudleya: exotics control through multiple techniques including continuation of current timed grazing practices for the Chiquadora Ridge, Chiquita Ridge and the lower Cristianitos Canyon populations. Monitoring is recommended for the lower Cristianitos Canyon population to determine the effects of continuing the current grazing which does not avoid the flowering season and/or prescribed burns as an exotics control technique. Translocation of impacted dudleya is described in detail in the Plant Species Translocation, Propagation and Management Plan.

- Salt Spring Checkerbloom: no management actions are recommended for this species pending the outcome of three-year interval monitoring program.

- Southern Tarplant: no management actions are recommended for this species pending the outcome of three-year interval monitoring program. Translocation of impacted tarplant is described in detail in the Plant Species Translocation, Propagation and Management Plan.

Wildlife Movement Corridors – Goals, Objectives, Potential Stressors and Potential Management Actions

Appendix J describes the approach to monitoring and management of key habitat linkages and wildlife corridors. Both avian and ground-dwelling species will be monitored and managed to ensure that the habitat linkages and wildlife corridors are functioning as designed.

a. Potential Stressors Management Considerations Associated with Wildlife Movement Corridors

Maintaining functional habitat linkages and wildlife corridors both within the RMV Open Space and to habitat areas outside the open space (i.e., CNF, Camp Pendleton) will be essential for conserving landscape ecosystem processes, habitats and species in the Southern Subregion. Generally threats to habitat linkages and wildlife corridors are greater than to "interior" habitat blocks within the RMV Open Space because linkages corridors have a greater perimeter edge-to-area ratio than large habitat blocks (i.e., they tend to be longer and more narrow or have more edge variations). Mostly as a result of relatively greater edge area, potential constraints and threats to functioning habitat linkages and wildlife corridors include:

- Disturbance and degradation of habitat quality such that habitat linkages may no longer provide suitable "live-in" habitat for sedentary species or that mobile species no longer use corridors for movement or dispersal. Disturbance or degradation of habitat may include loss of protective cover that provides refugia or invasion by exotic wildlife and plant species that displace native vegetation communities and native wildlife species.

- Higher levels of human disturbance such as illegal trails, off-road vehicles, trampling of vegetation, trash and garbage dumping, and accidental and deliberation ignitions of fires.

- Increased chance of vehicle collisions where roads cross linkages and corridors.

- Increased lighting and noise.

- Increased urban run-off.

b. Adaptive Management Goals and Objectives

The adaptive management goals for habitat linkages and wildlife corridors include the following:

- Maintain the function of key habitat linkages and wildlife corridors within the RMV Open Space.

- Maintain the function of key habitat linkages and wildlife corridors that connect to important resources areas outside the planning area, including the, CNF, and Camp Pendleton.

These broad goals will be achieved by meeting the following monitoring and management objectives:

- Monitor occupation and/or uses of identified key habitat linkages and wildlife corridors by the species identified as using or depending on these linkages and corridors.

- Maintain suitable habitat in the key habitat linkages and wildlife corridors for the species associated with the specific linkage/corridor.

- Identify and rectify constraints to use or movement (e.g., physical obstacles or bottlenecks) or sources of habitat disturbance or degradation in key habitat linkages and wildlife corridors.

c. Potential Stressor Management Actions

Based on the results of the monitoring program, if certain desired species are absent or uncommon at important habitat linkages or wildlife corridors in the RMV Open Space, appropriate management actions may be taken, including, but not limited to:

- Enhancement or restoration of the corridor with natural vegetation to provide additional cover.
- Placement of fencing to funnel wildlife to safe crossings and away from exposed roadways.
- Redirection or placement of lighting.
- Placement of sound walls or other methods of attenuating noise.
- Fencing or gating to control unauthorized human access and activities.
- Control of native and domestic mesopredators.

Summary of the Contributions of Near-Term and Long-Term Management of Vegetation Communities, Site Specific Habitats and Species and Habitat Linkages/Wildlife Corridors to Helping Maintain and Increase Net Habitat Value Over the Long-Term.

a. Near Term Management and Restoration of High Priority Vegetation Communities and Site Specific Resources

With regard to near-term net habitat value considerations, currently existing stressors are identified and specific management and enhancement/restoration actions are set forth in the Habitat Restoration Plan component of the Adaptive Management Program with regard to the three major vegetation communities selected as the focus of near-term vegetation community management actions (coastal sage scrub, grasslands and riparian/wetlands – see the Upland Habitat Restoration Plan and Aquatic Resources Habitat Restoration Plan elements of the Habitat Restoration Plan). Table XX summarizes the near term habitat management and enhancement/restoration actions for each of the three priority vegetation communities.

TABLE -1
NEAR TERM MANAGEMENT AND RESTORATION ACTIONS OF THREE PRIORITY VEGETATION COMMUNITIES

Habitat Type	Management Action	Restoration Acres/Location
Coastal Sage Scrub	Manage coastal sage scrub fire regimes to maintain natural diversity of age-stands. Manage cattle grazing to sustain net habitat value and diversity of CSS. Control exotic invasives within CSS.	375 acres total of restoration in: Sulphur Canyon; Chiquita Ridge/Creek; and Upper Gabino (combined coastal sage scrub/native grassland restoration site).
Grasslands	Manage native grassland fire regime to enhance germination of native grasses. Manage cattle grazing to facilitate restoration of existing areas of native grassland. Control invasions of herbaceous exotic species in both native and annual grasslands, including artichoke thistle, mustards and sweet fennel.	200 acres total of restoration in: Upper Cristianitos; Portions of Blind Canyon mesa; and Upper Gabino (combined coastal sage scrub/native grassland restoration site)
Wetlands/Riparian	Management of excessive surface and subsurface water flows and sediment in Gobernadora Creek. Management of potential increase in water supply to San Juan Creek. Control of invasive exotic plant species such as giant reed, tamarisk and pampas grass in riparian zones, particularly in San Juan Creek and the San Mateo Watershed.	Exotic species control, including bullfrogs, fire ants, etc. Restoration actions in the following areas: Invasives control in Middle San Juan Creek between Cow Camp crossing and RMV boundary. Invasives control in Lower Cristianitos Creek west of the TRW facility to RMV boundary. Restoration in Gobernadora to address 1) historic meander and 2) excessive surface, subsurface flows and sediment from upstream. Restoration may include construction of Gobernadora Multipurpose Basin. Restoration in Upper Gabino to address fine sediment generation.

b. Long Term Management of Vegetation Communities

As summarized above, for each of the five major vegetation communities, the Adaptive Management Program sets forth overall goals and specific management objectives directed toward helping maintain and increase net habitat value over the long term. Many of the management objectives focus on intrinsic and extrinsic stressors that have previously or may in the future affect net habitat value of the particular vegetation community or site-specific resource. Specific stressors likely to affect particular vegetation communities are identified and potential management actions are outlined. The understanding of stressors and potential management responses will be modified over time as a result of feedback information gained from monitoring and adaptive management actions. Important abiotic processes (e.g., fire, hydrology, terrains/geomorphology) affecting vegetation communities and associated habitats and processes are identified and are related to species needs in the context of the particular vegetation community associated with individual species. Special management considerations for vernal pools, sensitive plants and habitat linkages/wildlife movement corridors are also identified.

TABLE 2
LONG-TERM MANAGEMENT AND RESTORATION ACTIONS OF MAJOR VEGETATION COMMUNITIES

Habitat Type	Management Action	Restoration Acres/Location
Coastal Sage Scrub	Manage CSS fire regimes to maintain natural diversity of age-stands. Manage cattle grazing to sustain net habitat value and diversity of coastal sage scrub. Control exotic invasives within coastal sage scrub.	Case by case restoration of: Existing areas of degraded coastal sage scrub that are not naturally recovering through passive management; Areas that are degraded or disturbed by future natural events and that are unlikely to recover naturally (e.g., an area that has burned too frequently); Areas that have been temporarily disturbed either by authorized (e.g., an approved infrastructure project) or unauthorized (e.g., an illegal trail) activity; and Specific adaptive management research involving restoration treatments.
Chaparral	Manage chaparral fire regimes such that a natural diversity of age-stands and resprouters/obligate seeders is maintained and that existing chaparral stands do not irreversibly type-convert to grassland. Manage cattle grazing such that adverse impacts to chaparral are controlled to preserve net habitat value and that existing chaparral stands do not irreversibly type-convert to grassland. Control exotics invasions of chaparral.	Case by case restoration of: Areas that are degraded or disturbed by future natural events and that are unlikely to recover naturally (e.g., an area that has burned too frequently);
Grasslands	Manage native grassland fire regime to enhance germination of native grasses. Manage cattle grazing to facilitate restoration of existing areas of native grassland. Control invasions of herbaceous exotic species in both native and annual grasslands, including artichoke thistle, mustards and sweet fennel.	Case by case restoration of: Existing areas of degraded or low quality native grassland that are not naturally recovering through passive management; Areas that are degraded or disturbed by future natural events and it is determined that they will not, or are unlikely to, recover naturally (e.g., an area that has burned too frequently or is infested with exotic species); Areas that have been temporarily disturbed either by authorized (e.g., an approved infrastructure project) or unauthorized (e.g., an illegal trail) activity; and Specific adaptive management research involving restoration treatments.
Wetlands/riparian	Management of excessive surface and subsurface water flows and sediment in Gobernadora Creek. Management of potential increase in water supply to San Juan Creek. Control of invasive exotic plant species such as giant reed, tamarisk and pampas grass in riparian zones, particularly in San Juan Creek, Arroyo Trabuco and the San Mateo Watershed.	Case by case restoration of exotics hotspots determined by the individual reserve owners/managers based on overall vegetation communities monitoring program and targeted monitoring of potential hotspot locations.

Habitat Type	Management Action	Restoration Acres/Location
Woodlands	Maintain appropriate subsurface hydrology to avoid under- and over-watering. Manage fire regimes in oak woodlands to maintain a natural diversity and balance of age-stands. Manage cattle grazing such that adverse impacts to oak woodlands are controlled to preserve net habitat value. Control exotics invasions of oak woodlands.	Case by case restoration of: Areas that are degraded or disturbed by future natural events and it is determined that they will not, or are unlikely to, recover naturally (e.g., an area that has burned too frequently or is infested with exotic species);
Vernal Pools	Manage the hydrological regime of the pools by maintaining the existing local contributing hydrological sources (i.e., the local contributing watershed of the vernal pool). Eliminate or control any identified existing threats to existing vernal pools, including poorly timed grazing and invasion of pools and the surrounding hydrology source area by non-native species. Develop management tools to control the proliferation of non-native species, including grazing, prescribed burns, mowing and selective weeding. Manage water quality to emulate baselines conditions in the vernal pools in the RMV Open Space known to support the Riverside and San Diego fairy shrimp. Control public access to vernal pools	No restoration actions are identified at this time

The Role of Management Plans in Helping to Maintain and, Where Feasible, Increase Net Habitat Value within the Subregion over the Long Term

Appendix J provides a discussion of specific management plans that establish substantive management framework for carrying out long-term adaptive management. As reviewed previously, each of the stressors discussed has the potential to impact and reduce long-term habitat value within the RMV Open Space. Additionally, certain stressors have already impacted habitat values, and if addressed through management, enhancement and restoration actions, provide opportunities for the Adaptive Management Program to increase long-term habitat values. In effect, the management plans in Appendix J, serve as the operational tools for helping maintain and enhance net habitat value over time. Thus, given the stressor focus of the Adaptive Management Program, the management plans specifically address each of the stressors identified in Appendix J:

Stressor	**Associated Management Plan**
Fire	– Fire Management Plan
Grazing	- Grazing Management Plan
Exotics	- Invasive Species Control Plan
Altered Hydrology	- Water Quality Management Plan ("Conditions of Concern")
Altered Geomorphologic Processes	- Water Quality Management Plan ("Conditions of Concern" and Sediment Management)
Edge Effects / Disturbance	- Management of Public Access

Additionally, the Habitat Restoration Plan reviewed in Appendix J serves to integrate enhancement and restoration aspects of the above management plans that address existing impacts caused by stressors so that habitat values can be increased over both the near term and long-term (see discussions of the Habitat Restoration Plan above).

Each of the above management plans is reviewed in the following subsections with respect to the ways in which the particular management plan helps maintain and increase net habitat value. The final subsections will review how the various management plans interact with and support the Habitat Restoration Plan, including the Upland Habitat Restoration Plan and the Aquatic Resources Habitat Restoration Plan components.

The Role of the Fire Management Plan in Helping to Maintain and Increase Net Habitat Value

The Fire Management Plan helps maintain and increase net habitat value in three basic ways. First, the Fire Management Plan contains objectives and measures intended to further the management, enhancement and restoration of the major vegetation communities within the RMV Open Space. Second, the Fire Management Plan provides objectives and measures intended to reduce the incidence and severity of wildfires (e.g., the use of prescribed burns to reduce fuel

loads). Third, the Fire Management Plan includes a "Strategic Fire Suppression Plan" intended to guide fire suppression actions that protect sensitive habitat areas from repeated wildfires (e.g., by identifying high priority "aggressive" fire suppression areas) and that minimize physical impacts from fire protection activities (e.g., the use of heavy fire suppression equipment).

a. Habitat management and fire-reduction objectives and measures

The following are the Management Objectives for the Fire Management Plan:

- Identify appropriate spatial scales and patterns for the long-term management of fire;
- Develop active fire management prescriptions consisting of (1) Management Objectives, (2) preparing Management Plans and Models for shrublands (coastal sage scrub and chaparral) and (3) identifying uncertainties for valley needlegrass grasslands, focused on increasing diversity of native plants and promoting community structure and composition favored by target wildlife species;
- Utilize prescribed fire to reduce unplanned fire events from known ignition corridors;
- Define fire prescriptions that aid in the restoration of degraded shrublands and riparian areas;
- Identify active restoration techniques for application following fire treatments; and
- Develop a public understanding and support for active fire management.

Management goals related to vegetation communities include the following approaches:

- The reduction of unplanned fire events through the use of maintained firebreaks and strategic prescribed burns;
- Implementation of a seasonally and frequency-focused fire regime as part of a management/restoration strategy for valley needlegrass grassland;
- Careful experimentation using fire as part of a restoration and management program in currently degraded coastal sage scrub stands;
- Implementation of low to moderate intensity ground fires in the oak woodland habitats where undergrowth is too thick and dense for cattle in order to reduce the threat of a "stand replacement" fire that occurs when wildfires ladder through underbrush into the crown of oak trees (goats are an alternative to prescribed fire to reduce understory vegetation beneath the oaks); and
- Prevention of fire in riparian zones through periodic fuel load reduction, particularly ladder fuels, through the application of timed grazing techniques.

b. The Strategic Fire Protection Plan

As indicated in the introduction to this subsection, another major element of the Fire Management Plan is "The Strategic Fire Protection Plan." This plan identifies those specific natural resource areas that will require enhanced fire protection through fuel management and specific tactical fire suppression measures. The first step in formulating the Strategic Fire Protection Plan was to delineate Fire Management Compartment (FMC) boundaries based upon the most likely locations to make a stand against an approaching wildfire. FMC boundaries were determined by their potential to contain a wildland wildfire and included roads, ridge tops, watercourses, key vegetation changes, other natural or physical barriers to wildland fire or key changes in fuel continuity (see Table 3-1 in the Fire Management Plan). Each FMC was further divided into subunits called Fire Management Units (FMU) that are based on sub-basin boundaries (see Figure 3-1 in the Fire Management Plan).

The fire suppression tactical strategy is that all wildland fires occurring within a FMU should be contained to that specific FMU and should not be allowed to encroach upon another FMU if at all possible. It is fully understood that under severe wildland fire weather conditions (Santa Ana winds, or other periods of extreme hot, dry weather and strong winds) wildland fires may not be able to be contained to the FMU or even within the compartment of origin. However, this is a reasonable fire suppression guideline for all other average or above average fire weather conditions. Fire protection treatments (fuel management by mechanical means, hand-labor or prescribed fire, or a combination of all three) have been planned by specific FMUs. The role that fire will play in maintaining or enhancing target habitats will also be planned by individual FMUs.

One of the major elements of the fire suppression tactical strategy involves the preparation of the Short-Term Tactical Fire Suppression Plan. Suppression plans have been prepared for each FMC. One important element of the Tactical Fire Suppression Plan was to define fire management "compartments" that encompass major populations of Identified Species and the overall RMV Open Space, and prepare specific fire attack measures that would protect these areas as "refugia" in the event of a wildfire with the least impact on sensitive habitat in or near the refugia. Specific fire suppression policies have been defined for Biologically Sensitive Areas addressing the use of bulldozers or other land altering equipment, limitations on new fire roads, the use of natural features such as ridgelines and roads and pre-fire constructed firebreaks/fuelbreaks for containment lines, limiting the number of fire suppression vehicles off-road where practicable, and erosion control measures for disturbed areas following wildfire response. Further, the Fire Suppression Plan establishes two distinct Tactical Operations Modes/Fire Suppression Guidelines for application to all RMV Open Space lands, (1) "Aggressive" (immediate containment using all available resources) and (2) "Standard" (standard wildfire response with minimal disruption to natural resources).

The Role of the Grazing Management Plan in Helping to Maintain and Increase Net Habitat Value

The Grazing Management Plan helps maintain and increase net habitat value in three basic ways. First, the Grazing Management Plan contains objectives and measures intended to further the management, enhancement and restoration of the major vegetation communities within the Habitat Reserve, specifically the management and restoration of native grasslands and coastal sage scrub through the application of timed grazing techniques. Second, the Grazing Management

Plan provides objectives and measures intended to reduce the potential impacts to Identified Species, specifically those associated with aquatic habitats such as the arroyo toad and Riverside and San Diego fairy shrimp through seasonal and permanent habitat exclusions. Third, the Grazing Management Plan provides an alternative method of reducing fuel loads where prescribed burns are not an option, such as for lands proximate to developed areas, or in riparian zones.

a. Grazing management objectives and measures

The following are the Management Objectives for the Grazing Management Plan:

1. Establish a minimum RDM per acre for active and proposed pastures, and adjust as necessary to reflect changes developed as a result of objective/task 2 below.
2. Identify interim and long-term changes to existing and proposed pasture configurations and stocking levels to maximize use of available forage and facilitate the restoration of perennial grasses including native grasses.
3. Identify a timed rotational grazing scheme to maximize use of available forage and facilitate the restoration and/or long-term management of native grasses and coastal sage scrub.
4. Identify sensitive habitat areas where cattle grazing shall be excluded seasonally or permanently.
5. Identify additional facilities required to promote better distribution of cattle within pastures as a strategy to manage biotic and abiotic resources (e.g., water sources, shade, supplemental feed/ nutritional blocks).
6. Outline methods (i.e., cattle exclosures) for monitoring forage levels in order to assess range conditions and to provide guidance on the introduction and removal of cattle.
7. Identify pastures that may be subject to prescribed fire. Identify appropriate pasture rest periods following burns to promote habitat recovery.
8. Outline procedures for re-evaluating grazing management practices every 3 to 5 years to ensure that existing practices are achieving the desired results.

The Role of the Invasive Species Control Plan in Helping to Maintain and Increase Net Habitat Value

The management and control of invasive plant and animal species has become a major consideration in habitat management throughout California, whether it is aquatic species in the Bay Delta, pampas grass on the San Mateo coast or giant reed in southern California. In some cases, invasive plant species are associated with uses such as grazing (e.g., artichoke thistle) whereas in other cases invasive plant and animal species are present due to random, inadvertent acts (e.g., giant reed, bullfrogs). In the case of the Southern Subregion, artichoke thistle has been kept largely in check due to control activities undertaken as part RMV ranching operations. Significant efforts at controlling giant reed have been undertaken by the County of Orange in upper San Juan Creek and upper Arroyo Trabuco. Ongoing invasive species control has also been undertaken regularly in portions of lower Cristianitos Creek by TRW pursuant to Corps 404/CDFG 1603 permit requirements.

The failure to control invasive species in the RMV Open Space would have severe consequences for species and habitats both within the RMV Open Space and downstream of the study area (the latter in the San Mateo watershed). A severe giant reed infestation in San Juan Creek has displaced riparian habitat and consumes large quantities of water important both to riparian

vegetation and to arroyo toad breeding pools, thus impacting arroyo toad populations and reducing least Bell's vireo nesting habitat, as well as habitat for numerous other wildlife species. Although invasive plant species are less intrusive in the San Mateo watershed portion of the study area, they are fairly widespread and several invasive plant species are found in significant numbers below the confluence of lower Gabino and Cristianitos creeks; tamarisk is found in only a few locations in the San Mateo watershed but, if not eradicated, can result in type-conversion of riparian habitat in a manner comparable to giant reed. Similarly invasive animal species such as bullfrogs severely impact arroyo toad populations, while cowbird nest parasitism impacts California gnatcatcher and least Bell's vireo populations.

In order to maintain and increase net habitat value, the Invasive Species Control Plan proposes to specifically address the following invasive plants and introduced invertebrates in a comprehensive manner:

Plants

- Giant reed
- Pampas grass
- Castor bean
- Tamarisk
- Tree tobacco
- Spanish sunflower
- Artichoke thistle

Animals

- Bullfrog
- Crayfish
- Brown-headed cowbird
- European starling

With respect to riparian/wetlands habitats, the removal of giant reed is expected to increase the net amount of riparian habitat in two ways: (1) increase the area of streamcourses available for re-colonization by riparian plants such as willows; and (2) increase water supply both to nourish the growth of riparian plants and to help support arroyo toad breeding habitat. The removal of other invasive plant species such as pampas grass, castor bean and tree tobacco will also allow a greater area available for riparian plant species. The control of tamarisk is expected to remove the very considerable long-term threat, due to the plant's extensive seed proliferation. This threat is felt both within the study area and in downstream areas outside the subregion within the lower San Mateo watershed that support the tidewater goby and steelhead. Bullfrog and crayfish control will benefit arroyo toad populations both within the San Juan Creek and San Mateo Creek watersheds. Invasive plant control is also expected to help maintain and increase habitat value within vernal pools and slope wetlands.

With respect to uplands plant species, the control of pampas grass, tree tobacco and artichoke thistle are expected to help maintain and increase the habitat value of upland plants. Thread-leaved brodiaea populations are expected to benefit in a number of locations. Additionally, restoration programs for coastal sage scrub and native grasslands will have an enhanced likelihood of success.

Prior individual efforts to eradicate invasive plant species have helped maintain habitat value within portions of the subregion. However, absent coordination between RMV and adjacent

landowners, it is unlikely that net habitat value can be maintained within the RMV Open Space and in adjoining habitat areas. The re-emergence of giant reed in downstream areas of San Juan Creek following a localized control program attests to the inability to effectuate meaningful protection against invasive plant species without ongoing regular coordination. Similarly, the control of bullfrog and crayfish populations will benefit a wide array of riparian animal species, both listed and unlisted. As noted above, bullfrog control is particularly important to improving net habitat value for arroyo toads. Reductions in cowbird populations are expected to benefit gnatcatchers and least Bell's vireo – increases in California gnatcatcher and vireo populations over the past several years have been attributed in part to the beneficial effects of reducing cowbird populations.

With regard to long-term management of invasive species, the extensive vegetation and species-monitoring program reviewed in Appendix J will include a focus on invasive plant and animal "stressors." Since invasive species threats vary over time as new species are introduced or conditions change for existing species, the Adaptive Management Plan monitoring program will contribute directly to helping maintain and increase net habitat value in the RMV Open Space and throughout the planning area.

Summary of the Contributions of the Management Plans to the Ability of the Adaptive Management Program to Help Maintain and Increase Net Habitat Value over the Long-Term.

The foregoing subsections summarize the manner in which individual management plans that would be implemented within the RMV Open Space would be directed toward specific types of stressors. As conceptual models of stressors and their impacts on vegetation communities and species are developed and reformed over time, each of the management plans reviewed in the prior subsections provides a set of management tools that will be used to tactically and strategically address *extrinsic stressors* in relation to the natural dynamics of *intrinsic stressors.* Thus, threats to existing habitat value generated by extrinsic stressors can be addressed in the context of an increasing understanding of the effects of intrinsic stressors. In this way, the various management plans provide essential tools for helping maintain net habitat value.

Over time, as *extrinsic stressors* are addressed, management actions such as invasive species control, grazing management and prescribed fire can be used to increase net habitat value over the long term. For example, as reviewed in the prior section, actions taken in the San Mateo Watershed portion of the RMV Open Space to reduce the generation of fine sediments – including native grasslands restoration, remediation of the clay pits and the re-contouring of existing eroding areas in clay soils – would, in combination, reduce the present excessive generation of fine sediments that adversely impact arroyo toad breeding and streamcourse hydrologic/terrains processes within the planning area and other aquatic species downstream of the planning area.

The Role of the Water Quality Management Plan, in Conjunction with Aspects of the Upland and Aquatic Resources Habitat Restoration Plans, in Helping to Maintain and Increase Net Habitat Value

The proposed Water Quality Management Plan (WQMP) will be implemented in an "adaptive" manner complimentary to the Adaptive Management Program. The WQMP addresses three "stressors:"

- "Pollutants" generated by urban development with the potential to impact species and habitats;

- "Altered hydrology" due to urban development or public works projects with the potential to impact species and habitats, and

- "Altered geomorphic processes" with the potential to impact species and habitats

The SAMP Tenets and Watershed Planning Principles set forth in the "Watershed and Sub-Basin Planning Principles" provide the policy direction for addressing each of the above stressors. The SAMP Tenets policies include:

- Protect headwaters

- Maintain and/or restore floodplain connection

- Maintain and/or restore sediment sources and transport equilibrium

Similarly, the Baseline Conditions Watershed Planning Principles address the three sets of stressors (Altered Hydrology is sub-divided into Changes in Surface Water Hydrology and Changes in Groundwater Hydrology) under the following sets of principles, each of which is accompanied by specific policy direction intended to maintain net habitat value:

- ***Pollutants*** **–Watershed Planning Principles Section "v) Water Quality"** sets forth the following principle for water quality/pollutants:

  - Principle 9 - *Protect water quality by using a variety of strategies, with particular emphasis on natural treatment systems such as water quality wetlands, swales and infiltration areas and application of Best Management Practices within development areas to assure comprehensive water quality treatment prior to the discharge of urban runoff into the Habitat Reserve.*

- ***Changes in Surface Water Hydrology*** – **Watershed Planning Principles Section "ii) Hydrology"** sets forth the following principles for surface water hydrology:

  - Principle 2 – *Emulate, to the extent feasible, the existing runoff and infiltration patterns in consideration of specific terrains, soil types and ground cover*
  - Principle 3 – *Address potential effects of future land use changes on hydrology*
  - Principle 4 – *Minimize alterations of the timing of peak flows of each sub-basin relative to the mainstem creeks*
  - Principle 5 – *Maintain and/or restore the inherent geomorphic structure of major tributaries and their floodplains*

- ***Changes in Groundwater Hydrology*** – **Watershed Planning Principles Section " iv) Groundwater Hydrology"** sets forth the following principles:

  - Principle 7 – *Utilize infiltration properties of sandy terrains for groundwater recharge to offset potential increases in surface runoff and adverse effects to water quality*
  - Principle 8 – *Protect existing groundwater recharge areas supporting slope wetlands and riparian zones; and maximize groundwater recharge of alluvial aquifers to the extent consistent with aquifer capacity and habitat management goals*

- ***Changes in Geomorphic Processes*** – **Watershed Planning Principles Sections "i) Geomorphology/Terrains" and "iii) Sediment Sources, Storage and Transport"** set forth the following principles;

  - Principle 1 – Recognize and account for the hydrologic response of different terrains at the sub-basin and watershed scale
  - Principle 6 – Maintain coarse sediment yields, storage and transport processes

As noted previously each of the above Principles includes specific policies providing more specific guidance for maintaining net habitat value at a watershed scale (see Baseline Conditions Watershed Planning Principles Consistency Analysis, infra). The Water Quality Management Plan addresses the above principles within the water quality management framework established by the County of Orange and the San Diego Regional Water Quality Control Board. The County and SDRWQCB require that potential development impacts are to be analyzed under two broad headings: (1) "Pollutants of Concern" and (2) Hydrologic Conditions of Concern:

- "Pollutants of Concern" addressed in the WQMP include

  - Bacteria and viruses
  - Metals
  - Nutrients
  - Organic Compounds
  - Sediments
  - Trash and Debris
  - Oxygen-Demanding Substances
  - Oil and Grease

Appropriate regulatory standards, including special standards applicable to species pursuant to the California Toxics Rule, have been applied in formulating WQMP Best Management Practices and in addressing the Water Quality principles set forth in the Baseline Conditions Watershed Principles.

- "Hydrologic Conditions of Concern" are addressed in the WQMP in accordance with the following methodology established by the County/SDRWQCB;

  (1) Determine if the downstream channel is fully natural or partially improved with a significant potential for erosive conditions or alteration of habitat integrity to occur as a result of upstream development.

  (2) Evaluate the project's conditions of concern considering the project area's location (from the larger watershed perspective), topography, soil and vegetation conditions, percent impervious area, natural and infrastructure drainage features and other relevant hydrologic and environmental factors to be protected specific to the project area's watershed.

  (3) Review watershed plans; drainage area master plans or other planning documents to the extent available for identification of specific implementation requirements that address hydrologic conditions of concern.

  (4) Conduct a field reconnaissance to observe and report on representative downstream conditions, including undercutting erosion, slope stability,

vegetative stress (due to flooding, erosion, water quality degradation, or loss of water supplies) and the area's susceptibility to erosion or habitat alteration as a result of an altered flow regime or change in sediment transport.

(5) Compute rainfall runoff characteristics from the project area including peak flow rate, flow velocity, runoff volume, and time of concentration and retention volume. These characteristics shall be developed for the two-year and 10-year frequency, Type I storm, of six-hour or 24-hour duration (whichever is the closer approximation of the site's time of concentration) during critical hydrologic conditions for soil and vegetative cover.

(6) A drainage study report must be prepared identifying the project's conditions of concern based on the hydrologic and downstream conditions discussed above. Where downstream conditions of concern have been identified, the drainage study shall establish that pre-project hydrologic conditions affecting downstream conditions of concern would be maintained by the proposed project by incorporating site design, source control and treatment control requirements identified in the County/San Diego RWQCB Model Water Quality Management Plan. For conditions where a reduction in sediment transport from the project development and features would significantly impact downstream erosion, the Treatment Control BMPs proposed should be evaluated to determine if use of the BMPs would result in reducing sediment significantly belbw pre-development levels. Under such conditions alternative BMPs (such as watershed based approaches for erosional sediment control) may need to be considered.

The WQMP includes sections documenting the consistency of the WQMP both with the above County SDRWQCB requirements and with applicable principles of the Watershed Planning Principles. In particular, the WQMP analyses of Hydrologic Conditions of concern specifically analyze hydrologic conditions specified in the Watershed Planning Principles for the purpose of maintaining net habitat value with regard to: (1) potential increases in dry season streamflow and wet season baseflow between storms; (2) changes in the magnitude, frequency, and duration of annually expected flow events (1-2 year events); (3) changes in hydrologic response to major episodic storm events; (4) potential changes in sediment supply, with short term increases related to construction and longer term reductions related to impervious/landscaped ground cover; and (5) potential changes in the infiltration of surface/soil water to groundwater.

For the Gobernadora Creek sub-basin, the sub-basin exhibiting existing conditions stressors due to prior upstream development in Coto de Caza, specific performance criteria for implementation of the Gobernadora Multipurpose Basin have been prepared to complement Gobernadora sub-basin water management measures set forth in the WQMP and thereby increase net habitat value.

Potential changes in "Geomorphic Processes" are addressed in part through the above WQMP consistency review relating to Hydrologic Conditions of Concern (including sediment generation and sediment transport) and in part through specific restoration measures reviewed in above. In particular, habitat restoration and erosion control measures in clay soils will reduce the generation of fine sediments and improve stormwater infiltration/runoff, benefiting species and streamcourse processes. Specific restoration measures in clay soils reviewed *above* include: **(1)** coastal sage scrub/native grassland restoration in Sulphur Canyon; **(2)** grasslands restoration in the Upper Cristianitos sub-basin; **(3)** restoration in the former clay pits in Cristianitos Canyon; **(4)** landform restoration and coastal sage scrub/native grassland restoration in Upper Gabino.

Thus, the WQMP provides specific measures addressing three stressors – potential pollutants, changes in hydrologic processes and changes in geomorphic processes – in helping assure that these three stressors do not significantly impact net habitat value. The WQMP, in conjunction with specific restoration/enhancement measures reviewed above, helps increase net habitat value in **(1)** Gobernadora Creek; **(2)** the Upper Cristianitos sub-basin; and **(3)** Upper Gabino. To the extent that restoration and management measures in the San Mateo Watershed reduce the generation of fine sediments, habitat conditions will be improved for the arroyo toad within the subregion and for other aquatic species downstream in San Mateo Creek.

The Role of Management of the Urban/Wildlands Interface in Contributing to Net Habitat Value within the Southern Subregion

General Policy 5 of the Southern NCCP/HCP Guidelines calls for the creation of an "urban/wildlands interface zone" that would be located outside the RMV Open Space and provide a physical separation between the RMV Open Space and non-reserve/urbanized areas. In addition to establishing barriers (fences, walls, etc.) and signs to direct and control unwanted access to the RMV Open Space by people and pets, and shielding the RMV Open Space from harmful light sources, the urban/wildlands interface zone would be adaptively managed to:

- Provide for native plantings combining irrigated and non-irrigated species;
- Control invasive species of pest plants and animals;
- Manage pesticide, herbicide and fertilizer use adjacent to the RMV Open Space in conjunction with the WQMP; and

Implement fuel management measures designed to protect upland and aquatic resources within the Habitat Reserve.