Aquatic Resources Restoration Plan

1.0 Regulatory Considerations and Scope of the Mitigation Plan

The Corps and U.S. Environmental Protection Agency (EPA) regulations at 33 CFR 320-330 and 40 CFR 230 authorize the Corps to require compensatory mitigation for unavoidable impacts to waters of the U.S., including wetlands (WoUS). According to 40 CFR 230.10 (c)4):

> "Except as provided under section 404(b)(2), no discharge of dredged or fill material shall be permitted unless appropriate steps have been taken which will minimize potential adverse impacts of the discharge on the aquatic ecosystem. Subpart H identifies such possible steps.

Actions affecting plant and animal populations for activities that would be authorized pursuant to the proposed RMV permitting procedures are addressed in Section 8.8.2.3 of the draft EIS as are minimization measures involving avoiding changes in water current and circulation patterns. Minimization measures involving the avoidance of sites having unique vegetation or other value, including vegetation communities supporting threatened or endangered species, are addressed in Chapter 6 and in Section 8.5.3.3 of the draft EIS. This Aquatic Resources Restoration Plan (ARRP) addresses minimization and compensatory mitigation for activities ultimately authorized through LOPs pursuant to the proposed RMV long term individual permit under the following provisions of Section 230.75 (d):

> "Using planning and construction practices to institute habitat development and restoration to produce a new or modified environmental state of higher ecological values by displacement of some or all of the existing environmental characteristics. Habitat development and restoration techniques can be used to minimize adverse impacts and to compensate for destroyed habitat.

The evaluation of functions associated with compensatory mitigation sites relies on a function-based assessment tool such as the Corps' HGM Methodology.[1] Such an approach is set forth in a Regulatory Guidance Letter (RGL) published by the Corps on December 24, 2002[2] and in a Special Public Notice published by the Los Angeles District on January 27, 2003.[3]

[1]Smith, R.D., Ammann, A., Bartoldus, C., and Brinson, M.M. 1995. "An approach for assessing wetland functions using hydrogeomorphic classification, reference wetlands, and functional indices." Technical Report WRP-DE-9, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

The purpose of this ARRP is to identify the potential restoration sites and potential aquatic functions, the approximate acreage that could be restored at each site, the types of vegetation communities serving as habitat that could be incorporated into each site, the monitoring and maintenance procedures to be implemented, and the performance standards that will be used to determine success. It is expected that, to the extent feasible, restoration will be implemented in advance of impacts. An exact timetable has not yet been developed for implementation of all aquatic restoration actions designed to address future impacts to aquatic resources, but 18 acres of highly functioning marsh and riparian vegetation have already been established in GERA and are presently available to offset project impacts up to the extent of this acreage per the Special Conditions.

In accordance with the regulatory background referenced above, this document describes the Mitigation Plan for the creation, restoration and/or enhancement of wetlands as well as restoration of selected streams, including invasive species control, in the proposed SAMP Aquatic Resource Conservation Areas (ARCA).[4] This plan is also expected to serve as an element the aquatic resources restoration component of the Southern Subregion NCCP/HCP and Master Streambed Alteration Agreement (MSAA) currently under preparation because the proposed ARCA will be located within the boundary of the future Habitat Reserve (i.e., the NCCP Habitat Reserve will be larger than the ARCA because the Habitat Reserve will include upland vegetation communities). Assuming that the NCCP/MSAA/HCP is ultimately approved, ARCA restoration/enhancement actions would be undertaken within the joint management framework established for implementing SAMP and NCCP/MSAA/HCP mitigation actions. However, because the EIS for the proposed permitting procedures is proceeding in advance of the NCCP/MSAA/HCP, the ARRP enhancement/restoration measures would address mitigation requirements established in the final EIS for the proposed permitting procedures. Thus, the Mitigation Program reviewed in this document is intended to provide the mitigation framework for the mitigation measures established in the final EIS and the overall permit conditions defined in the 404(b)(1) guidelines review for the RMV permitting procedures. With regard to vegetation communities, this Mitigation Plan addresses impacts to Corps jurisdictional wetlands and non-wetlands WoUS[5],[6]. Riparian areas that do not exhibit characteristics consistent with Corps- -defined wetlands (e.g.,

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Brinson, M.M., Hauer, F.R., Lee, L.C., Nutter, W.L., Rheinhardt, R.D., and Whigham, D. 1995. "A guidebook for application of hydrogeomorphic assessments to riverine wetlands," Technical Report WRP-DE-11, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

[2] U.S. Army Corps of Engineers. 2002. *Regulatory Guidance Letter No. 02-2: Guidance on Compensatory Mitigation Projects for Aquatic Resource Impacts Under the Corps Regulatory Program Pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899.* December 24, 2002, 16pp.

[3] U.S. Army Corps of Engineers, Los Angeles District. 2003. *Special Public Notice: Mitigation and Monitoring Requirements*. January 27, 2003, 41pp.

[4] In California, Executive Order W-59-93 established the California Wetlands Conservation Policy to ensure no overall net loss in the quantity and quality of California's wetlands. In accordance with this policy CDFG similarly requires mitigation to compensate for impacts to streambeds and lakes and associated wetland resources pursuant to Section 1600 et seq. of the Fish and Game Code.

[5] Glenn Lukos Associates. 2004. *Jurisdictional Delineation of Areas Subject to the Jurisdiction of the U.S. Army Corps of Engineers.* Prepared for Rancho Mission Viejo.

CDFG-defined wetlands and areas of southern coast live oak riparian forest within CDFG jurisdiction[7]) will be addressed through the NCCP/MSAA/HCP Adaptive Management Plan (AMP) component of the Habitat Reserve Management Program (HRMP) where it is determined to be a priority by the Scientific Advisory Panel (SAP).

Finally, this plan also summarizes the translocation procedures and performance standards for special-status plants associated with wetland areas on RMV including southern tarplant (*Centromadia parryi* ssp. *australis*, CNPS List 1B), mud nama *(Nama stenocarpum*, CNPS List 2), and saltspring checkerbloom (*Sidalcea neomexicana*, CNPS List 2). Full details of the special-status plant translocation program are provided in Appendix J-1 to the GPA EIR.

The term "restoration" is inclusive in this Mitigation Plan as it addresses the spectrum of possible restoration activities within the ARCA, ranging from:

- creation of new vegetation communities that in some instances may require substantial grading;
- enhancement of existing degraded vegetation communities that could include limited grading; and
- other measures such as minor recontouring, removal of invasive species and/or some replanting that rely extensively on natural processes to enhance and restore aquatic values.

This Mitigation Plan is based upon substantial data collected on the aquatic ecosystems in support of the SAMP. These data, along with data collected during monitoring of approximately 125 acres of created and restored wetland and riparian areas on RMV, provide a robust data set that can be used to inform and guide the proposed restoration projects. In light of the importance of invasive species control in enhancing and restoring aquatic resources values and functions, this section includes a summary of the invasive exotic control program for San Juan and Trabuco creeks as set forth in greater detail in the Invasive Species Control Plan (*Appendix F4*).

Given that the SAMP is a planning area-wide comprehensive program, this section summarizes the restoration program for several sub-basins and explains how these actions, as part of the ARAMP, could contribute to enhancement and restoration of values and

[6] Glenn Lukos Associates. 2004. *Jurisdictional Delineation of Areas Subject to the California Department of Fish and Game.* Prepared for Rancho Mission Viejo.

[7] Coast live oak (*Quercus agrifolia*) has a wetland indicator status of Upland (UPL) as do most of the understory shrubs and herbs associated with this community. Therefore the no-net-loss policy does not apply to this community for purposes of determining compensatory mitigation.

functions of wetlands/riparian areas. The restoration plan has been developed to ensure no-net-loss of either acreage or function associated with waters of the United States subject to the jurisdiction of the Corps pursuant to Section 404 of the Clean Water Act. As noted above, the approach taken in this program is intended to be consistent with recent Regulatory Guidance Letter No. 02-2, dated December 24, 2002, issued by the Corps regarding mitigation, which emphasizes watershed-wide and function-based programs where feasible. This program is also intended to be consistent with the Los Angeles District's Special Public Notice *Final Mitigation Guidelines and Monitoring Requirements* issued on April 19, 2004. Finally, selection of restoration sites is consistent with the *Riparian Ecosystem Restoration Plan for San Juan and Western San Mateo Creek Watersheds: General Design Criteria and Site Selection,*[8] which was developed by the Corps to assist RMV in establishing priorities relative to potential mitigation/restoration sites.

The proposed program incorporates the Corps' functional assessment approach. As set forth in more detail below, the Hydrogeomorphic (HGM) Approach, which utilizes "variables" to define or describe each function associated with a particular wetland type can be used during the design and monitoring phases to ensure that hydrologic, biogeochemical and habitat functions are maximized in the restoration sites. RMV has successfully used this approach for approximately 65 acres of wetlands and riparian vegetation communities created in GERA, Chiquita Canyon and the Arroyo Trabuco.[9] The hydrologic and water quality measures associated with the Water Quality Management Plan (WQMP)[10] prepared for the project will be incorporated into the Corps' analysis of the mitigation ratios. Incorporation of the WQMP measures, in concert with the use of HGM variables (see below under performance standards), during site design will ensure that impacts to hydrology and water quality are minimized and mitigated consistent with the framework WQMP reviewed in the EIS.

As noted above, this Mitigation Plan addresses impacts associated with the proposed permitting procedures, including site selection, site design, site preparation and site construction. Proposed plant palettes, short-term and long-term monitoring and maintenance measures to be implemented in accordance with the program are also included. Specific mitigation sites, as well as amounts by wetland/riparian type, are defined in the final conditions for the permitting procedures.

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[8] Smith, Daniel and C.V. Climas. 2003. *Riparian Ecosystem Restoration Plan for San Juan and Western San Mateo Creek Watersheds: General Design Criteria and Site Selection*. Prepared for the U.S. Army Corps of Engineers, Los Angeles District, Regulatory Branch, October 2003 Draft.

[9] RMV has created and performed associated monitoring of approximately 125 acres of wetland and/or riparian habitat between 1989 and 2005. Of the 125 acres, approximately 65 acres were designed, implemented and monitored for a variety of variables/functions using the HGM approach. Performance standards have been achieved for all 125 acres.

[10] GeoSyntec Consultants, Inc. 2005. Draft *Rancho Mission Viejo Conceptual Water Quality Management Plan: Alternatives B-9 and B-10 Modified.* Prepared for Rancho Mission Viejo, May 20, 2005.

Under the proposed permitting procedures, at the time an LOP application is made for a particular development increment the Corps will apply the appropriate area-specific mitigation requirements set forth in the Special Conditions, summarized below and further detailed in Section 2.0 of this ARRP:

Mitigation for Unavoidable Impacts to USACE Jurisdictional Wetlands and Vegetated Waters of the U.S.

Mitigation for temporary wetlands impacts through:

- Habitat values and functions provided by 18 acres of already existing created/restored wetlands within GERA that is providing temporal gain
- Habitat value and function enhancement provided through implementation of the ARAMP, including invasive species control such as the eradication of about 90 acres of giant reed on the RMV Planning Area

Mitigation for permanent wetlands impacts through:

- 1:1 restored wetlands acreage provided by 18 acres of already existing created/restored wetlands within GERA
- Additional wetlands and vegetated waters acreage, if required, through the creation/restoration of wetlands at a 1:1 ratio pursuant to the Aquatic Resources Restoration Plan before impacts occur
- Assurances of funding for the ARAMP and implementation of the ARAMP help assure that values and functions will be maintained and thereby support the use of a 1:1 ratio

Mitigation for Impacts to Non-Wetlands Waters of the U.S.

Mitigation for temporary impacts:

- Not required for impacts to waters of the U.S. that is unvegetated or minimally vegetated by wetland species, or vegetated by upland species

Mitigation for permanent impacts:

- Control of invasive species, including the eradication of about 90 acres of giant reed on the RMV Planning Area
- Implementation of the ARAMP helps assure that values and functions will be maintained

With regard to temporal impacts and permanent wetlands impacts, this plan provides for low intensity monitoring and maintenance (as necessary) for approximately 18 acres of existing created alkali marsh, alkali meadow, and southern riparian scrub in the Gobernadora Ecological Restoration Area (GERA). These 18 acres of existing wetlands were created in 1998 and 1999 as part of the Ladera Ranch wetland restoration program that, according to conditions in the Section 404 and 1603 Authorizations from the Corps and CDFG,

included a sliding scale whereby excess creation areas (i.e., not specifically needed to offset impacts associated with Ladera Ranch) could be utilized for future projects within RMV. The 18 acres have achieved the five-year performance standards and would be subject to ongoing monitoring until such time as they are used to offset future impacts associated with permitting procedures authorizations and future MSAA authorizations in conjunction with the NCCP/MSAA/HCP.

1.1 Definition Of Terms

As indicated above, the term "restoration" is used in the broad sense to refer to the spectrum of restoration and enhancement activities that can be used to enhance and restore aquatic values and functions.. Where appropriate, several other terms are used throughout this section to refer to specific kinds of restoration activities. These other terms are defined here.

Wetland Functional Assessment: A methodology whereby various hydrologic, biogeochemical and typical wetland/aquatic functions are qualitatively or quantitatively scored or rated. The Corps has developed one approach, the Hydrogeomorphic (HGM) Approach, which utilizes "variables" to define or describe each function associated with a particular wetland type. The HGM approach has been designed for evaluating functional losses associated with specific projects and can be used for very small projects with minor impacts (e.g., impacts to fractions of an acre) or for projects that cover thousands of acres on the landscape that affect multiple areas of the aquatic ecosystem. The Corps has also developed a functional assessment tool for evaluating large areas at a coarser scale that is often utilized for evaluating large watershed areas.[11] In addition to using the functional assessment to evaluate impacts, the approach can be used to design wetland restoration sites to ensure that the target functions are achieved.[12]

Passive Restoration: Passive restoration generally refers to removing or controlling disturbance events resulting in conversion from native to non-native or disturbed vegetation communities. Passive restoration may involve some site preparation and maintenance such as weed control, and trash and debris removal, but generally the site would be allowed to revegetate naturally without extensive intervention. Where non-native cover is particularly high, weed removal may be more intensive. Some initial seeding or planting of cuttings or container stock may be used if the natural seed bank onsite is inadequate, particularly in areas where removal of substantial

[11] Smith, RD. 2000. *Assessment of Riparian Ecosystem Integrity In the San Juan and San Mateo Creek Watersheds, Orange County, California.* U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, MS, USA.

[12] RMV has created and performed associated monitoring of approximately 125 acres of wetland and/or riparian habitat between 1989 and 1993. Of the 125 acres, approximately 45 acres were designed, implemented and monitoring for a variety of variables/functions using the HGM approach. Performance standards have been achieved for all 125 acres.

weed cover has left areas somewhat unvegetated. Passive restoration sites would be monitored, and if the site is not meeting performance standards by a designated period, more intensive restoration approaches may be implemented.

Active Restoration: Active restoration broadly refers to the specific application of restoration techniques. On any scale (e.g., from less than 1 acre to 100 acres such as the GERA), active restoration may include site-intensive techniques such as grading, soil preparation, planting and/or seeding, irrigation, weed control, erosion control, etc. Active restoration implies a higher level of effort than passive restoration and typically is used on sites that would not regenerate naturally, or would only regenerate over an unacceptably long period of time without direct intervention. For example, a mitigation requirement that a site meet certain performance standards such as percent native plant cover or species occupation within five years probably would require active restoration to ensure that the performance standards were achieved. Two types of active restoration are "Enhancement" and "Revegetation."

A. Enhancement: Enhancement generally refers to restoration of sites that support degraded forms of the target native vegetation community. The level of effort needed to enhance a site typically is less than revegetating a site because the target native community is already present. For aquatic ecosystems, primary enhancement measures include the removal of invasive plant species. Seeding may be used to supplement the existing native vegetation, but planting of container plants and irrigation generally are not used on enhancement sites. Enhancement tends to be passive, letting nature take its course (e.g., elimination or control of giant reed in a stream course allowing native species such as willows to re-colonize the area and take advantage of increased water supplies resulting from the removal of giant reed), as contrasted with other types of active wetland/riparian restoration.

B. Revegetation: Revegetation involves active restoration of a site whereby container plants and/or seeds are used to create or restore vegetation communities. Typically the target native vegetation community is absent from the site; e.g., a site supporting ruderal vegetation revegetated with wet meadow vegetation or mulefat scrub. Depending on site conditions, some grading may be required to restore or enhance site hydrology. Irrigation, though not necessary, may be desirable to hasten establishment of the target species, which in turn reduces the amount of non-native species able to colonize the site. Generally, revegetation sites would have higher performance standards than passively restored sites and the monitoring and maintenance program is more specific.

In practice, there often is not a clear distinction between active and passive restoration, revegetation and enhancement because each site has its own distinct requirements for successful restoration. The ARCA Reserve Manager would have the flexibility to implement the appropriate restoration techniques in an adaptive fashion to produce the desired results in the most efficient manner. However, specific performance standards would be set for each restoration site relative to hydrologic, biogeochemical and vegetation community functions so that success can be objectively measured.

2.0 Project Impacts and Special Conditions Mitigation Requirements

The project includes nine planning areas subject to review under the proposed permitting procedures for RMV lands. The applicant's Proposed Project would result in development of Planning Areas 1, 2, 3, 4, 5, and 8 with limited potential development in Planning Area 7. Project impacts, according to vegetation community type are summarized in Tables 1 through 4 below.

TABLE 1
SUMMARY OF DEVELOPMENT AND INFRASTRUCTURE IMPACTS TO USACE JURISDICTIONAL AREAS FOR B-12 ALTERNATIVE

Alternative	Permanent Impacts							Temporary Impacts		
	Development			Infrastructure			Total Permanent Impacts	Infrastructure		
	Wetland	Non-wetland Waters	Subtotal	Wetland	Non-wetland Waters	Subtotal		Wetland	Non-wetland Waters	Subtotal
B-12[a]	9.39	31.39	40.78	8.52	6.13	14.68	**55.46**	15.82	21.07	36.89

a. As previously discussed this represents an overstated impact analysis and ultimate impacts will be less due to the limitations on development in Planning Areas 4 and 8, and orchards in Planning Areas 6 and 7. The overstated footprint for Planning Area 4 impacts 2.34 acres of Waters of the U.S. (none of which are wetland), for Planning Area6 impacts 0.41 acre of Waters of the U.S. (of which 0.03 acre is wetland), for Planning Area 7 impacts (0.36 acres (of which 0.001 acre is wetland) and for Planning Area 8 impacts 8.19 acres (of which 1.10 acre is wetland).

TABLE 2
SUMMARY OF IMPACTS TO USACE JURISDICTIONAL WETLANDS IN DEVELOPMENT AREAS BY HABITAT TYPE FOR THE B-12 ALTERNATIVE

Habitat Type	B-12 [a]
Alkali Meadow (5.2)	0.44
Seasonal Pond (5.3)	0.76
Coastal Freshwater Marsh (6.4)	1.18
Riparian Herb (7.1)	0.03
Southern Willow Scrub (7.2)	1.16
Mulefat Scrub (7.3)	0.34
Sycamore Riparian Woodland (7.4)	0.0
Arroyo Willow Forest (7.6)	5.48
Total	**9.39**
As previously discussed this represents an overstated impact analysis and ultimate impacts will be less due to the limitations on development in Planning Areas 4 and 8, and orchards in Planning Areas 6 and 7.	

TABLE 3
SUMMARY OF INFRASTRUCTURE IMPACTS TO USACE WETLANDS AND NON-WETLAND WATERS BY INFRASTRUCTURE TYPE FOR THE B-12[A]

USACE Jurisdictional Areas						
Alternative	Wetlands (acres)		Non-wetland Waters of the U.S. (acres)		Total USACE (acres)	
	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent
B-12 Alternative[b.]						
Trails	5.11	2.30	5.32	2.63	10.43	4.93
Drainage Facilities[c.]	0.65	2.03	0.20	0.42	0.85	2.45
Water-Sewer[d.]	0.57	1.19	0.20	0.92	0.77	2.11
Road/Bridge Construction [e]	4.02	3.00	6.36	2.16	10.38	5.16
Maintenance of Existing RMV Planning Area Facilities	5.47	0.00	8.99	0.00	14.46	0.00
Total	**15.82**	**8.52**	**21.07**	**6.13**	**36.89**	**14.68**

a. Jurisdictional areas falling outside of the GLA study area boundary are estimated using ERDC data.
b. As previously discussed this represents an overstated impact analysis and ultimate impacts will be less due to the limitations on development in Planning Areas 4 and 8, and orchards in Planning Areas 6 and 7
c. Includes culvert outfalls and Gobernadora Water Quality Basin
d. Includes non-domestic water, domestic water, and sewer.
e. Due to the lack of final design details on the location of road/bridge construction, a contingency of 50 percent of additional impact is assumed for both alternatives.

TABLE 4
SUMMARY OF INFRASTRUCTURE IMPACTS TO USACE JURISDICTIONAL WETLANDS BY HABITAT TYPE FOR ALTERNATIVE B-12

Habitat Type	Trails		Drainage Facilities		Sewer-Water		Roads/Bridges		Existing RMV Maintenance		Total	
	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.	Perm.	Temp.
Alkali Meadow (5.2)	–	–	–	–	0.03	0.04	–	0.13	–	0.01	0.03	0.17
Seasonal Pond (5.3)	–	–	–	–	–	–	–	–	–	–	–	–
Coastal Freshwater Marsh (6.4)	0.08	0.31	0.09	0.04	0.14	0.14	1.22	1.06	–	1.96	1.53	3.51
Riparian Herb (7.1)	–	–	–	–	–	–	–	–	–	–	–	–
Southern Willow Scrub (7.2)	0.34	0.78	1.30	0.02	0.01	0.01	0.41	0.28	–	0.32	2.06	1.41
Mulefat Scrub (7.3)	1.78	3.71	0.49	0.39	0.96	0.31	0.71	0.40	–	2.75	3.94	7.56
Sycamore Riparian Woodland (7.4)	–	–	–	–	–	–	–	–	–	–	–	–
Arroyo Willow Forest (7.6)	0.10	0.31	0.08	0.04	0.05	0.07	0.43	2.14	–	0.44	0.66	3.00
Spreading Grounds/Detention Basins (12.3)	–	–	0.07	0.16	–	–	–	–	–	–	0.07	0.16
Intermittent Rivers and Streams	–	–	–	–	–	–	0.24	0.01	–	–	0.24	0.01
Total	**2.30**	**5.11**	**2.03**	**0.65**	**1.19**	**0.57**	**3.00**	**4.02**	**0.00**	**5.47**	**8.53**	**15.82**

Corps Proposed Special Conditions Regarding Compensatory Mitigation

The following are the proposed Special Conditions regarding compensatory mitigation. Note that only those conditions related to the creation of habitat and mitigation of impacts on plant species are set forth here. For a full listing of all Special Conditions the reader is referred to the SAMP EIS.

- The permittee shall compensate for all impacts to aquatic resources ensuring no net loss of functions and acres of naturally-vegetated waters of the U.S., including wetlands.
    - The permittee shall compensate for all impacts to wetlands and naturally-vegetated non-wetland waters of the U.S. at a 1:1 ratio on an area basis.
        - The permittee may use the 18 acres of credit already established at the Gobernadora Ecological Restoration Area to compensate for future impacts to any waters of the U.S.
        - Compensatory mitigation for impacts to specified wetlands and naturally-vegetated non-wetland waters of the U.S. shall be initiated prior to impacts to the specified waters of the U.S. and achieve the success criteria prior to impacts to the specified waters of the U.S.
        - The permittee shall provide the Corps, Department of Fish and Game, and the U.S. Fish and Wildlife Service with a habitat mitigation and monitoring plan consistent with the LAD Mitigation and Monitoring Guidelines for review and approval prior to implementation of the compensatory mitigation. The compensatory mitigation sites should be prioritized in consideration of the "San Juan Creek Watershed Riparian Ecosystem Restoration Plan: Site Selection and General Design Criteria" by Engineering Research and Development Center (ERDC) dated August 2004 and the Aquatic Resources Restoration Plan. Additional considerations include the proximity of impact site and mitigation site, impacts to other sensitive habits due to the potential mitigation site, site ownership, and other factors. Restoration design shall follow the principles of the ERDC restoration plan.

    - The permittee shall compensate for all impacts to non-wetland waters that are vegetated by upland species or unvegetated through the eradication of all arundo on the RMV Planning Area (about 90 acres) consistent with the Invasive Species Control Plan.

    - Temporary impacts to wetlands or naturally vegetated non-wetland waters of the U.S. will be compensated through the existing habitat values and functions provided by 18 acres of already existing created/restored wetlands within GERA that is already providing temporal gain and the habitat value and functional enhancement provided through implementation of the ARAMP, including invasive species control such as the eradication of about 90 acres of giant reed on

the RMV Planning Area. Temporary impacts to waters of the U.S. unvegetated or vegetated by upland species does not require compensatory mitigation.

- The permittee shall compensate for impacts to depressional wetlands by creating in-kind depressional wetlands within the project area.
    - The permittee shall provide the Corps, Department of Fish and Game, and the U.S. Fish and Wildlife Service with a habitat mitigation and monitoring plan consistent with the LAD mitigation and monitoring guidelines for all anticipated impacts.
    - The creation of depressional wetlands shall be started three years before impacts occur to the depressional wetlands.
    - The depressional wetlands shall have similar native floral and faunal composition of impacted depressional wetlands.
    - The creation of the depressional wetlands shall use inoculum from the impacted wetlands.
- The permittee shall compensate for the loss of mud nama, southern tarplant, and salt spring checkerbloom at a 2:1 ratio based on acreage.
    - The permittee shall provide the Corps, Department of Fish and Game, and the U.S. Fish and Wildlife Service with a habitat mitigation and monitoring plan consistent with the LAD Mitigation and Monitoring Guidelines and the Plant Species Translocation, Propagation, and Management Plan (Appendix J-1 to the GPA EIR) for all anticipated impacts to these sensitive wetland plants.
    - The permittee may elect to initiate replacement of sensitive plant acreage before impacts occur. If final performance criteria are achieved prior to impacts occurring, the Corps shall reduce the mitigation ratio to 1:1. Applicant may apply excess mitigation credits towards future impacts.

3.1 Restoration Goals and Site Selection

The goal of this conceptual restoration plan is to provide a framework to guide restoration of the aquatic ecosystem (Corps wetlands and non-wetlands waters vegetated with aquatic plant species per the Corps Special Conditions) in a manner that would maintain or enhance hydrologic, biogeochemical and vegetation community functions that would be impacted by development allowed under the proposed permitting procedures. In fulfilling the mitigation ratios and other

measures specified in the Special Conditions, the restored aquatic ecosystem should exhibit hydrologic, biogeochemical and vegetation community functions and values that are equal to, or greater than, those exhibited by the aquatic ecosystem(s) prior to development. Thus, the ARRP is intended to provide replacement aquatic vegetation communities and/or enhanced aquatic functions within ARCAs that would compensate for loss of hydrologic, biogeochemical functions and vegetation community functions while also ensuring no-net-loss in the vegetation community acreage within the aquatic ecosystem for WoUS (including Corps-defined wetlands).

A major focus of the overall minimization program is to maintain hydrogeomorphic processes, which in turn is key for achieving other goals such as establishment of target vegetation communities and associated faunal components. As noted above, RMV has developed a separate WQMP that will minimize impacts to hydrologic and biogeochemical processes and where potential impacts would be expected, measures to offset or compensate for potential impacts. In addition to development of a detailed WQMP that will minimize potential impacts to hydrologic and biogeochemical processes, the restoration program will incorporate elements of the HGM approach, as outlined below under "performance standards" that will provide for creation/restoration/enhancement of both hydrologic and biogeochemical functions in addition to vegetation community functions.

Site selection is extremely important for the long-term success of a restoration program. Sites that are selected for restoration of wetlands must contribute to the long-term net aquatic resource values and functions of the Aquatic Resources Conservation Program (ARCP). The designation of potential restoration areas, as described below, is based upon detailed investigations of the aquatic resources within the SAMP study area.

The importance of site selection has already been demonstrated through significant restoration efforts within the GERA, Cañada Chiquita, Arroyo Trabuco, and Narrow Canyon (approximately 125 acres combined among the sites, of which approximately 18 acres in GERA have been "banked" for future projects).[13] In creating vegetation communities that would currently support a number of listed or other special-status species such as least Bell's vireo, southwestern willow flycatcher, yellow-breasted chat, yellow warbler, southwestern pond turtle, southern tarplant, and Coulter's saltbush, these efforts have demonstrated that, where suitable conditions exist, vegetation community creation or restoration can be very successful.

Finally, techniques for carrying out the control of invasive exotics have been refined through prior and ongoing efforts. Invasive species control (primarily giant reed and pampas grass) has been implemented and is ongoing within Trabuco Creek by the County of Orange and RMV.

[13] Department of the Army Permit 97-00342-ES and Streambed Alteration Agreement 5-081-98.

Invasives control has also been implemented in Cristianitos Creek by Northrop Grumman (formerly TRW), and this program would continue until the lease with RMV expires.

3.1.1 Relationship of Restoration Timing to Project Phasing

Timeframes for the establishment of wetland and/or riparian areas vary significantly according to the type of vegetation community subject to restoration/creation. For example, creation of emergent marsh vegetation communities requires little time, and it is possible to establish functioning marsh in as little as 1.5 to 2 years when sufficient hydrology is present. Similarly, creation of alkali or wet meadow vegetation can be achieved in approximately 2 to 3 years with irrigation to hasten establishment and early growth. Vegetation communities such as mulefat scrub, southern willow scrub, or willow forest require more time, with substantial function achieved at between four and seven years. Invasive species control may require extensive efforts over time with substantial long-term benefits resulting from larger scale, comprehensive watershed scale actions.

Phasing of development associated with the Proposed Project is expected to extend over a 15- to 25-year time period. Project phasing would provide opportunities to implement and, in many instances carry out compensatory mitigation in advance of impacts. The existing 18 acres of created vegetation communities in GERA that includes alkali marsh, alkali meadow, southern riparian scrub, and southern willow scrub, are proposed as compensation for impacts associated with the initial phases of development.

Use of a function-based mitigation design, coupled with the opportunity to implement and monitor the aquatic resource creation, restoration, and/or enhancement measures in advance of impacts, would provide high levels of certainty that all impacted functions are replaced without substantial temporal loss or any long-term loss of values and functions.

3.1.2 Preliminary Designation of Wetland, Stream and Riparian Restoration Areas

The main goal of the Mitigation Plan is to describe the methodologies for: **(**1**)** creation of wetlands to replace WoUS in accordance with the Special Conditions and; **(**2**)** enhancement or restoration of wetland that have been substantially degraded such that measurable losses of hydrologic, biogeochemical or vegetation community functions have occurred, and whereby the lost function(s) can be restored or reintroduced. As noted above per the Special Conditions, all compensatory mitigation will implemented in advance of impacts, providing a high level of certainty that there is no-net-loss of aquatic function or acreage. Furthermore, in all cases, vegetation community creation, restoration, and/or enhancement would occur in areas adjacent to

existing wetland and/or riparian resources optimizing the potential hydrologic, biogeochemical and vegetation community functions of both existing and restoration areas.

Areas evaluated and identified, as potential restoration sites are set forth below. Based on the detailed evaluations performed, all of these sites represent excellent candidate sites; however, it may not be necessary or desirable to use each site, or only portions of these sites may ultimately be utilized.

3.1.2.1 Potential Aquatic Vegetation Creation/Restoration Areas

Each of the sites addressed below is depicted on Figure 1, Sheets 1-7. The size of the potential restoration area is also provided on the appropriate figure. All of the potential restoration areas are under the ownership of RMV and will be placed within the ARCA no later than the occurrence of impacts for which the restoration area will be used as compensation. RMV will be responsible for all the proposed restoration efforts. Finally, all of the potential sites addressed below have been subject to extensive monitoring efforts that include (as appropriate for each site), groundwater monitoring, stream gage data, aerial photographic analysis, water chemistry measurements (e.g., electroconductivity data), botanical inventories, faunal inventories (focus on special-status avifauna including raptors), and general observations, extending back to the early 1990s.

- **GERA** currently includes approximately 18 acres of alkali marsh, alkali meadow and southern riparian scrub vegetation created for the Ladera Ranch Project that was not needed to compensate for project impacts and, as established in the Ladera Ranch 404 and 1603 Authorizations, is available to use as compensation for impacts associated with future RMV projects. All 18 acres meet the Corps definition of wetlands in accordance with the 1987 Manual. This existing creation area would be subject to ongoing monitoring and maintenance until it is "utilized" to offset impacts associated with the early phases of the development program. In addition, because the 18 acres are established and both the Corps and CDFG have provided concurrence that the 18 acres achieved the five-year performance standards, the 18 acres are also to be used to offset temporal losses for up to 18 acres of temporary impacts.

- **Gobernadora Canyon** immediately downstream of Coto de Caza, extending to below the confluence with Sulphur Canyon. This includes the proposed location of a multi-purpose basin that would cover an estimated 40 acres and would serve a number of functions including detention and harvesting of storm waters by the Santa Margarita Water District (SMWD), water quality treatment wetlands and possible creation of riparian areas along with re-establishment of a meander of the channel through the upper

reaches of Gobernadora Creek. The 40 acres extends south from Coto de Caza to where Gobernadora Creek crosses from the east to the west side of the valley bottom. While no design for this basin has been prepared it is anticipated that some vegetation community values could be created as part of the future design. It should be noted that areas of the basin designed for flood control and water quality treatment purposes would require periodic maintenance to maintain the capacity of the flood control function and the treatment capability of water quality treatment wetlands. Possible riparian areas created and/or enhanced adjacent to Gobernadora Creek would not require ongoing maintenance under achievement of performance standards. Currently, all 40 acres consist of upland vegetation communities dominated by non-native grasses and forbs including ripgut brome (*Bromus diandrus*, UPL), foxtail barley (*Hordeum murinum* ssp. *leporinum*, UPL), wild oats (*Avena fatua*, UPL), soft chess (*Bromus hordeaceus*, FACU-), wild radish (*Raphanus sativus*, UPL), and black mustard (*Brassica nigra*, UPL).

Below the area where the creek crosses the valley bottom, an additional 45.4 acres have been identified as candidate areas for creation of alkali marsh, alkali meadow, southern willow riparian and mulefat scrub vegetation. This area is also upland, dominated by the non-native grasses and forbs noted above. In addition to the 45.4 acres of marsh, meadow, willow and mulefat creation areas, additional areas have been identified as potential southern coast live oak riparian creation areas.

- **Gobernadora Canyon/"Fertile Crescent"** at the "mouth of Cañada Gobernadora. This area exhibits appropriate hydrology for restoration due to the presence of high groundwater and sheet flow from Gobernadora Creek. This area has been degraded by past agricultural practices. Some site grading and site preparation would be necessary to restore hydrology to a larger area and to provide for a mosaic of aquatic vegetation community types, including alkali meadow, alkali marsh and southern willow scrub/forest. Vegetation community creation/restoration in this area would, among other things, be targeted at habitat for the southwestern pond turtle, which recently colonized a pond created nearby in GERA in 1999/2000. Up to 2.7 acres have been identified as available for restoration or creation.

  The potential 2.7-acre area is located between existing wetlands and the southern willow riparian forest created in GERA. Restoration of up to eight acres would result in an expansion of GERA. The eight-acre area is a mosaic of upland area vegetated by non-native grasses and forbs and wetland that is also vegetated with mostly non-native hydrophytes. Upland species include Italian ryegrass (*Lolium multiflorum*, FAC*), (*Hordeum murinum* ssp. *leporinum*, UPL), soft chess (*Bromus hordeaceus*, FACU-), wild radish (*Raphanus sativus*, UPL), and black mustard (*Brassica nigra*, UPL). Wetland

areas are vegetated with herbaceous species including alkali weed (*Cressa truxillensis*, FACW) and alkali mallow (*Malvella leprosa*, FAC*), which are native and bristly ox-tongue (*Picris exhioides*, FAC*), whorled dock (*Rumex conglomerates*, FACW), curly dock (*Rumex crispus*, FACW-), rabbistsfoot grass (*Polypogon monspeliensis*, FACW) and Spanish sunflower (*Pulicaria paludosa*, FACW).

- **Sulphur Canyon** at the confluence with Gobernadora Creek. This area exhibits appropriate hydrology for restoration due to the presence of shallow subsurface water and sheet flow from Sulphur Canyon Creek which exhibits a three to eight foot wide ribbon of wetland vegetated with arroyo willow (*Salix lasiolepis*, FACW) and mulefat (*Baccharis salicifolia*, FACW) with an understory of Mexican rush (*Juncus mexicanus*, FACW), creeping spikerush (*Eleocharis macrostachya*, OBL), and California club-rush (*Scirpus cernuus*, OBL). The creek exhibits surface water due to shallow subsurface water year round; additionally there is one seep that exhibits groundwater discharge at the toe of slope approximately 70 feet west of the drainage. The seep is further evidence of the shallow subsurface water and supports water parsnip (*Berula erecta*, OBL) and Olney's bulrush (*Scirpus americanus*, OBL**).** This area has been degraded past agricultural practices. Some site grading and site preparation would be necessary to restore hydrology to a larger area capable of expanding the wetlands and to provide for a mosaic of aquatic vegetation types. Approximately 2.7 acres have been identified as available for potential restoration or creation.

- **Chiquita Creek between the "Narrows" and the SMWD Treatment Facility.** Approximately 8.8 acres have been identified in this area for creation of mulefat scrub, or transitional riparian areas immediately adjacent to Chiquita Creek. Hydrologically, these areas would be supported by groundwater and overbank flow from Chiquita Creek. Some grading would be required to locate the restoration areas closer to areas of shallow subsurface water and to allow for overbank discharge into the restored areas. A similar program was undertaken downstream in Chiquita Canyon, covering approximately ten acres that has proven highly successful in achieving five year performance standards. The 21 acres consist entirely of upland that supports non-native grasses and forbs including ripgut brome (*Bromus diandrus*, UPL), foxtail barley (*Hordeum murinum* ssp. *leporinum*, UPL), wild oats (*Avena fatua*, UPL), soft chess (*Bromus hordeaceus*, FACU-), wild radish (*Raphanus sativus*, UPL), and black mustard (*Brassica nigra*, UPL).

  Additional areas have been identified as candidate areas for southern coast live oak riparian vegetation. The areas proposed for southern coast live oak riparian forest would be immediately adjacent to existing or restored vegetation in Chiquita Creek or in

canyons tributary to Chiquita Creek. Potential areas for southern coast live oak riparian restoration or creation are generally dominated by non-native grasslands.

- **Chiquita Creek between SMWD Treatment Facility and New Ortega Highway.** Detailed investigations of the slope wetlands on both sides of lower Chiquita Canyon indicate subsurface flows to the creek, along with typically perennial flows (but intermittent flows during dry climatic cycles), would allow for expansion of the wetlands in this area with only minimal grading. Approximately 10.9 acres have been identified as available for alkali marsh, alkali meadow, or willow riparian creation. The 10.9 acres proposed for restoration currently support a predominance of non-native grasses and forbs including (*Lolium multiflorum*, FAC*), (*Hordeum murinum* ssp. *leporinum*, UPL), soft chess (*Bromus hordeaceus*, FACU-), wild radish (*Raphanus sativus*, UPL), and black mustard (*Brassica nigra*, UPL). Patches of saltgrass (*Distichlis spicata*, FACW), a facultative phreatophyte, suggest shallow subsurface water at depths of less than eight feet.

3.1.2.2 Stream Restoration

- **Gobernadora Creek at the knickpoint** located adjacent to GERA. Detailed investigations by Balance Hydrologics indicate that the knickpoint is a key area in preventing continuing headcutting and incision in the middle reach of Gobernadora Creek. Restoration of this area would ensure long-term functioning of the upper one-half of GERA which supports approximately 40 acres of wetland vegetation, including southern willow riparian forest, alkali marsh and alkali meadow, and mulefat scrub. This 40-acre portion of GERA supports least Bell's vireo, southwestern willow flycatcher, yellow-breasted chat, as well as southern tarplant.

- **Chiquita Creek between the "Narrows" and the SMWD Treatment Facility.** Studies indicate areas of localized headcuts affecting the channel at various points along Chiquita Creek, which supports a mosaic of southern arroyo willow riparian forest, alkali meadow, alkali marsh and freshwater marsh. Reversal of the incision effects would ensure long-term functioning of portions of Chiquita Creek. Reversal of the entrenchment would also provide for passive- or active-expansion of the wetland and riparian vegetation adjacent to the creek, specifically as described for this specific area above.

- **Restoration of Upper Reaches of Gabino Creek and Gabino Creek Tributary**, which exhibit areas of headcutting, entrenchment, and channel degradation resulting in excess generation of fine sediments. There are two approaches to restoration in this area, one

involving a passive approach and the other significantly more active. A passive approach would involve the stabilization of headcutting through low technology solutions such as straw wattles and limited planting. The active approach would entail substantial landform stabilization and would be conducted in coordination with potential restoration of nearby uplands with CSS/VGL that would serve to increase infiltration of stormwater runoff and reduce the excess generation of fine sediments that has contributed to the loss of aquatic function.

- **Upper Reaches of Cristianitos Creek –** which, like Gabino Creek noted above, exhibit areas of headcutting, entrenchment, and channel degradation resulting in excess generation of fine sediments. Portions of the upper reaches of the Cristianitos Creek watershed have been impacted by past clay mining activities that are now competed and subject to restoration activities in accordance with surfacing mining regulations. Mining in other areas was started prior to surface mining regulations and are not subject to reclamation/restoration requirements. Areas not covered under existing reclamation requirements would be subject to restoration by RMV that would include (but not be limited to) the following treatments: recontouring to restore historic or at a minimum "natural" contours, replanting with native valley needlegrass grassland and coastal sage scrub. Such restoration activities would be undertaken at the discretion/direction of the SAP.

3.2 Invasive Exotic Control

- **Removal of Giant Reed from San Juan Creek** has been identified as a "high priority" component of the Invasive Species Control Plan (Appendix F4). San Juan Creek supports populations of the arroyo toad and least Bell's vireo, along with other special-status species such as the yellow-breasted chat, yellow warbler, southwestern pond turtle, and two-striped garter snake. As set forth in the Invasive Species Control Plan, giant reed can have a number of adverse impacts on native riparian ecosystems including alteration of hydrologic regimes, alteration of fire regimes and elimination of native riparian vegetation (i.e., willow scrub and forest) by direct competition. Elimination of giant reed from approximately 87.7 acres would substantially enhance the ability of the reach of San Juan Creek associated with the RMV property to support the arroyo toad and least Bell's vireo, contributing significantly to recovery of these species within the subregion.

- **Removal of Giant Reed and Pampas Grass from Trabuco Creek between Crown Valley Parkway and Avery Parkway** has been identified as a "high priority" component of the Invasive Species Control Plan (Appendix F4). Trabuco Creek supports a *major population* in a *key location* of least Bell's vireo, along with other special-status species

such as the yellow-breasted chat, yellow warbler, and two-striped garter snake. Elimination of giant reed and pampas grass, from approximately 95.7 acres would substantially enhance the ability of this reach of Trabuco Creek to support least Bell's vireo, contributing significantly to recovery of this species within the subregion.

4.0 Success Criteria

The goal of the wetland/riparian restoration program is the establishment of self-sustaining vegetation communities that provide hydrologic, biogeochemical and vegetation community functions typical of the target geomorphic settings and associated wetland and/or riparian vegetation community types.

4.1.1 Rationale for Expecting Success

There are a number of reasons why wetland and/or riparian enhancement, restoration, or creation would be successful within the RMV portions of the ARCA.

A variety of investigations have been completed that address the aquatic resources within the RMV portion of the SAMP study area. These investigations include the following:

- PCR Services Corporation, PWA Ltd., and Balance Hydrologics, Inc. 2002. *Baseline Geomorphic and Hydrologic Conditions, Rancho Mission Viejo: Portions of the San Juan and Western San Mateo Watersheds.*

- PCR Services, Dudek & Associates. 2002. *Geomorphic and Hydrologic Needs of Aquatic and Riparian Endangered Species*.

- PCR Services. 2003. *Functional Evaluation of Slope Wetlands, Rancho Mission Viejo.*

- PCR Services. 2003. *Functional Evaluation of Vernal Pools, Rancho Mission Viejo.*

- Balance Hydrologics, 2005. *Geomorphologic Factors Affecting Sediment Generation and Transport under Pre- and Post-Urbanization Conditions at Rancho Mission Viejo and in the San Juan And San Mateo Watersheds, Orange County, California.*

- NCCP/SAMP Working Group. 2002. *Watershed and Sub-Basin Planning Principles*.

- Glenn Lukos Associates. 2002. *Ladera Ranch Wetland Mitigation Monitoring: Fourth Annual Report.* October 2002.

- Glenn Lukos Associates. 2003. *Ladera Ranch Wetland Mitigation Monitoring: Fourth Annual Report.* December 2003.

- Glenn Lukos Associates. 2003. *Fifth Annual Monitoring Report for 7.65-Acre Wetland Mitigation Site Associated with Tesoro High School Wetland Impacts, Chiquita Canyon, Orange County*. December 2003.

These studies provide sufficient data relative to surface water and groundwater conditions to provide detailed planning, including site design, for aquatic restoration at the candidate locations. All of the candidate restoration sites have been subject to detailed investigations and sufficient hydrology data have been collected for each of the sites to ensure successful implementation.

In addition to these detailed studies, as noted previously RMV has established a successful aquatic restoration track record by creating approximately 125 acres of wetland and or riparian vegetation within the GERA, Chiquita Canyon, and the Arroyo Trabuco. Wetland/riparian vegetation created in GERA within the last 13-14 years, has variously supported as many as six pairs of least Bell's vireo, one pair of southwestern willow flycatcher, southwestern pond turtle, yellow-breasted chat, and yellow warbler. In addition, both the GERA and Chiquita sites support over 10,000 individuals of southern tarplant, a CNPS List 1B taxon and an identified species that were targets of the restoration efforts.

4.1.2 Target Functions

Target functions to be enhanced, restored or created, vary from site to site based on site-specific conditions and associated site-specific goals. For example, there are two primary goals associated with restoration efforts in Upper Gobernadora: **(1)** management of excessive surface and subsurface water flows causing downstream erosion in the creek and reestablishment of sinuosity/meander to the creek; and **(2)** creation of a large block of wetland/riparian vegetation that would serve as replacement to compensate for losses of wetland/riparian vegetation communitiess in other portions of the SAMP study area. Controlling excess water flows through the construction and operation of the proposed multi-purpose basin and reestablishment of sinuosity/meander to the creek would result in restoration of a variety of hydrologic, biogeochemical and vegetation community functions that can be directly measured. Similarly, creation of a large block of wetland and riparian vegetation would result in establishment of a variety of hydrologic, biogeochemical and vegetation community functions that can be directly measured. After use of the 18 acres of GERA credits, specific target functions for vegetation restoration would be determined upon selection of the candidate sites. Selection of candidate sites would be determined by **(1)** mitigation needs for planned activities and **(2)** contribution of the candidate site to the overall function of the ARCA.

In a similar manner, removal of giant reed from San Juan Creek would result in enhanced hydrology because water usage by this species is approximately twice that of native riparian

areas (e.g.., southern willow riparian forest, mulefat scrub, etc.). Giant reed removal would also provide for restoration of sediment transport regimes and would allow for expansion of native riparian vegetation into the areas that are currently infested with giant reed. These changes are expected to provide a measurable benefit to two listed species, the arroyo toad and least Bell's vireo, both of which occur in San Juan Creek.

4.1.3 Performance Standards

Performance standards for each of these restoration program components would be markedly different because they would be developed to address the desired function. For example, creation of southern arroyo willow riparian forest in GERA has created vegetation communities used by nesting least Bell's vireo and southwestern willow flycatcher while areas of alkali meadow in Chiquita are occupied by self-sustaining populations of southern tarplant. Relative to invasives removal and as noted above, the primary purpose for removal of giant reed from San Juan Creek is to enhance/expand usable or potential willow-dominated vegetation communitiess for the arroyo toad, least Bell's vireo and other special-status and common species of wildlife. As such, performance standards would be developed that (1) measure the target hydrologic, biogeochemical and vegetation community functions for restored or created communities; (2) define monitoring requirements for areas subject to enhancement, including areas subject to invasives removal to assure that (for example) giant reed or tamarisk remain under control, and (3) define monitoring requirements for reviewing the status of natural regeneration in the context of overall stream dynamics.

As discussed above in *Section 3.1* (and summarized below), a representative number of wetland functions, as described in *A Guidebook for Application of Hydrogeomorphic Assessments to Riverine Wetlands*, would be evaluated as part of the overall quantitative monitoring program to ensure no-net-loss of wetland function through successful implementation of the mitigation program components. Because of the varying nature of the mitigation program components, they have been separated into two categories for purposes of establishing performance standards. The categories addressed below and/or in the next section include:

- Emergent Marsh, Wet Meadow, and/or Riparian Scrub/Forest Creation
- Translocation of Impacted Special-Status Plants

Performance standards for invasive exotics control are addressed in the Invasive Species Control Plan (*Appendix F4* of the SAMP EIS).

Vegetation Community Creation or Restoration: Emergent Marsh, Wet Meadow, and/or Riparian Scrub/Forest

The HGM variables to be evaluated for performance were determined based upon their use in mitigation programs that have already been completed in GERA, Chiquita Canyon, and the Arroyo Trabuco. Variables to be monitored include: Plant Roughness, Coarse Woody Debris (for woody riparian areas only), Aerial Net Primary Productivity, Surfaces Suitable for Microbial Activity, Percent Cover of Vegetation (in each strata), and Species Composition. The quantitative vegetation sampling would provide sufficient data to determine performance for the following variables: Plant Roughness, Aerial Net Primary Productivity, Surfaces Suitable for Microbial Activity, Percent Cover of Vegetation (in each strata), Species Composition, Recruitment of Natives, and Vegetation community Heterogeneity. Coarse Woody Debris would be evaluated using direct visual estimates.

In addition to the identified wetland functions that would be evaluated by measuring specific variables, a variety of hydrological indicators would be evaluated because the presence of such indicators provide valuable information regarding wetland functioning. Hydrological indicators that would be monitored include the presence of debris rack, sediment deposits, drainage patterns, water marks, ponding duration, ponding depth, and extent of ponding.

Standard Vegetation Monitoring procedures would be as follows:

- **First-Year Monitoring**. During the first year, monitoring would occur every month. One quantitative survey would be performed to determine planted species' growth performance. The following performance standards would be achieved at the end of the first year:

  -- 30 percent coverage of native species relative to reference standard (5 percent deviation allowed);

  -- percent cover of non-native species not exceeding 10 percent (includes tree and shrub layers only and does not include herb layer);

  -- recruitment of native hydrophytes ratio of seedlings to saplings would be at least 50 percent of that of reference site;.

  -- vegetation community heterogeneity would be 50 percent (or greater) of the reference site.

  Replanting would be performed, as necessary, during the appropriate planting period, with the appropriate-sized stock or by seeding to ensure that these performance standards are achieved. If substantial non-compliance with the

performance standards occurs, RMV would consult with the Corps to determine whether corrective measures and an extension of the five-year monitoring period would be necessary. At the end of the first year, a report summarizing the performance of the emergent marsh, and riparian areas would be submitted to the Responsible Parties for distribution to the Corps.

- **Second-Year Monitoring**. During the second year, monitoring would occur on a quarterly basis. One quantitative survey would be performed to determine planted species' growth performance. The following performance standards would be achieved at the end of the second year:

  -- at least 45 percent coverage of native species relative to reference standard (<5 percent deviation allowed);

  -- percent cover of non-native species not exceeding 10 percent (includes tree and shrub layers only and does not include herb layer);

  -- recruitment of native hydrophytes ratio of seedlings to saplings would be at least 75 percent of that of reference site;.

  -- vegetation community heterogeneity would be 75 percent (or greater) of the reference site.

  Replanting would be performed, as necessary, during the appropriate planting period, with the appropriate-sized stock to ensure that these performance standards are met. If substantial non-compliance with the performance standards listed above occurs, RMV would consult with the Corps to determine whether corrective measures and an extension of the five-year monitoring period would be necessary. At the end of the second year, a report summarizing the revegetation site performance would be submitted to the Responsible Parties for distribution to the Corps.

- **Third-Year Monitoring**. During the third year, monitoring would occur quarterly. One quantitative survey would be performed to determine planted species growth performance. The following performance standards would be achieved at the end of the year:

  -- at least 65 percent coverage of native species relative to reference standard (<5 percent deviation allowed);

-- percent cover of non-native species not exceeding 10 percent (includes tree and shrub layers only and does not include herb layer);
-- recruitment of native hydrophytes ratio of seedlings to saplings would be at least 75 percent of that of reference site;.

-- vegetation community heterogeneity would be 75 percent (or greater) of the reference site.

Replanting would be performed, as necessary with the appropriate-sized stock to ensure that these performance standards are achieved. If substantial non-compliance with the performance standards listed above occurs, RMV would consult with the Corps to determine whether corrective measures and an extension of the five-year monitoring period would be necessary. At the end of the third year, a report summarizing the revegetation site performance would be submitted to the Responsible Parties for distribution to the Corps.

- **Fourth-Year Monitoring**. During the fourth year, monitoring would occur quarterly. One quantitative survey would be performed to determine planted species' growth performance. The following performance standards would be achieved at the end of the year:

-- at least 75 percent coverage of native species relative to reference standard (<5 percent deviation allowed);

-- percent cover of non-native species not exceeding the reference site by more than 10 percent (includes tree and shrub layers only and does not include herb layer);

-- recruitment of native hydrophytes ratio of seedlings to saplings would be at least 75 percent of that of reference site;.

-- vegetation community heterogeneity would be 75 percent (or greater) of the reference site.

Replanting would be performed as necessary, during the appropriate planting period, with the appropriate-sized stock to ensure that these performance standards are achieved. If substantial non-compliance with the performance standards listed above occurs, RMV would consult with the Corps to determine whether corrective measures and an extension of the five-year monitoring period would be necessary. At the end of the fourth year, a report summarizing the revegetation site performance would be submitted to the Responsible Parties for distribution to the Corps.

- **Fifth Year Monitoring**. During the fifth year, monitoring would occur quarterly. One quantitative survey would be performed to determine planted species' growth performance. The following performance standards would be achieved at the end of the year:

  -- at least 85 percent coverage of native species relative to reference standard (<5 percent deviation allowed);

  -- percent cover of non-native species not exceeding 10 percent (includes tree and shrub layers only and does not include herb layer);

  -- recruitment of native hydrophytes ratio of seedlings to saplingss would be at least 75 percent of that of reference site;.

  -- vegetation community heterogeneity would be 75 percent (or greater) of the reference site;

  Replanting would be performed, as necessary, during the appropriate planting period, with the appropriate-sized stock to ensure that these performance standards are achieved. If substantial non-compliance with the performance standards listed above occurs, RMV would consult with the Corps to determine whether corrective measures and an extension of the five-year monitoring period would be necessary. At the end of the fifth year, a report summarizing the revegetation site performance would be submitted to the applicant for distribution to the Corps and CDFG.

Hydrological Indicators

- **First-Year Monitoring**. One quantitative survey would be performed, at the end of the first year to determine compliance with the following performance standards:[14]

  -- The presence of Debris Rack, Sediment Deposits, Water Marks and/or Drainage Patterns individually or in combination, within the created wetland would achieve between 25 percent and 75 percent of the reference standard based upon visual estimates.

  -- If the collective measure of hydrologic indicators does not achieve the performance standard, additional grading, planting, or configuration of the wetland would be performed to ensure hydrological functioning within the created wetlands.

[14] The performance standards are adapted from the Corps HGM Riverine Guidebook .

- **Second-Year Monitoring**. One quantitative survey would be performed, at the end of the second year to determine compliance of the referenced variables with the following performance standards:

  -- The presence of Debris Rack, Sediment Deposits, Water Marks and/or Drainage Patterns individually or in combination, within the created wetland would achieve between 25 percent and 75 percent of the reference standard based upon visual estimates.

  -- If the collective measure of hydrologic indicators does not achieve the performance standard, additional grading, planting, or configuration of the wetland would be performed to ensure hydrological functioning within the created wetlands.

- **Third-Year Monitoring**. One quantitative survey would be performed, at the end of the third year to determine compliance of the referenced variables with the following performance standards:

  -- The presence of Debris Rack, Sediment Deposits, Water Marks and/or Drainage Patterns individually or in combination, within the created wetland would achieve between 75 percent and 125 percent of the reference standard based upon visual estimates.

  -- If the collective measure of hydrologic indicators does not achieve the performance standard, additional grading, planting, or configuration of the wetland would be performed to ensure hydrological functioning within the created wetlands.

- **Fourth-Year Monitoring**. One quantitative survey would be performed, at the end of the fourth year to determine compliance of the referenced variables with the following performance standards:

  -- The presence of Debris Rack, Sediment Deposits, Water Marks and/or Drainage Patterns individually or in combination, within the created wetland would achieve between 75 percent and 125 percent of the reference standard based upon visual estimates.

  -- If the collective measure of hydrologic indicators does not achieve the performance standard, additional grading, planting, or configuration of the wetland would be performed to ensure hydrological functioning within the created wetlands.

- **Fifth-Year Monitoring**. One quantitative survey would be performed, at the end of the fifth year to determine compliance of the referenced variables with the following performance standards:

  -- The presence of Debris Rack, Sediment Deposits, Water Marks and/or Drainage Patterns individually or in combination, within the created wetland would achieve between 75 percent and 125 percent of the reference standard based upon visual estimates.

  -- If the collective measure of hydrologic indicators does not achieve the performance standard, additional grading, planting, or configuration of the wetland would be performed to ensure hydrological functioning within the created wetlands.

***Coarse Woody Debris* (For Woody Riparian Sites Only)**

- **First-Year Monitoring**. One quantitative survey would be performed, at the end of the first year to determine compliance with the following performance standard:

  -- The amount of coarse woody debris within the created wetland would achieve between 25 percent and 75 percent of the reference standard based upon visual estimates.

  -- If the measure of coarse woody debris in the created wetland does not achieve the performance standard, additional coarse woody debris would be added in the form of willow, sycamore, and/or oak snags.

- **Second-Year Monitoring**. One quantitative survey would be performed, at the end of the second year to determine compliance of the referenced variables with the following performance standard:

  -- The amount of coarse woody debris within the created wetland would achieve between 25 percent and 75 percent of the reference standard based upon visual estimates.

  -- If the measure of coarse woody debris in the created wetland does not achieve the performance standard, additional coarse woody debris would be added in the form of willow, sycamore, and/or oak snags.

- **Third-Year Monitoring**. One quantitative survey would be performed, at the end of the third year to determine compliance of the referenced variables with the following performance standard:

  -- The amount of coarse woody debris within the created wetland would achieve between 75 percent and 125 percent of the reference standard based upon visual estimates.

  -- If the measure of coarse woody debris in the created wetland does not achieve the performance standard, additional coarse woody debris would be added in the form of willow, sycamore, and/or oak snags.

- **Fourth-Year Monitoring**. One quantitative survey would be performed, at the end of the fourth year to determine compliance of the referenced variables with the following performance standard:

  -- The amount of coarse woody debris within the created wetland would achieve between 75 percent and 125 percent of the reference standard based upon visual estimates.

  -- If the measure of coarse woody debris in the created wetland does not achieve the performance standard, additional coarse woody debris would be added in the form of willow, sycamore, and/or oak snags.

- **Fifth-Year Monitoring**. One quantitative survey would be performed, at the end of the fifth year to determine compliance of the referenced variables with the following performance standard:

  -- The amount of coarse woody debris within the created wetland would achieve between 75 percent and 125 percent of the reference standard based upon visual estimates.

  -- If the measure of coarse woody debris in the created wetland does not achieve the performance standard, additional coarse woody debris would be added in the form of willow, sycamore, and/or oak snags.

Microtopographic Complexity

- **First-Year Monitoring**. One quantitative survey would be performed, at the end of the first year to determine compliance with the following performance standard:

-- The number of depressions and/or hummocks per unit area (e.g., 10 x 10 m) within the created wetland would achieve between 25 percent and 75 percent of the reference standard based upon visual estimates.

-- If the measure of microtopographic complexity does not achieve the performance standard, additional grading would be performed to increase the number of depressions and hummocks in the created wetlands.

- **Second-Year Monitoring**. One quantitative survey would be performed, at the end of the second year to determine compliance of the referenced variables with the following performance standard:

  -- The number of depressions and/or hummocks per unit area (e.g., 10 x 10 m) within the created wetland would achieve between 25 percent and 75 percent of the reference standard based upon visual estimates.

  -- If the measure of microtopographic complexity does not achieve the performance standard, additional grading would be performed to increase the number of depressions and hummocks in the created wetlands.

- **Third-Year Monitoring**. One quantitative survey would be performed, at the end of the third year to determine compliance of the referenced variables with the following performance standard:

  -- The number of depressions and/or hummocks per unit area (e.g., 10 x 10 m) within the created wetland would achieve between 75 percent and 125 percent of the reference standard based upon visual estimates.

  -- If the measure of microtopographic complexity does not achieve the performance standard, additional grading would be performed to increase the number of depressions and hummocks in the created wetlands.

- **Fourth-Year Monitoring**. One quantitative survey would be performed, at the end of the fourth year to determine compliance of the referenced variables with the following performance standard:

-- The number of depressions and/or hummocks per unit area (e.g., 10 x 10 m) within the created wetland would achieve between 75 percent and 125 percent of the reference standard based upon visual estimates.

-- If the measure of microtopographic complexity does not achieve the performance standard, additional grading would be performed to increase the number of depressions and hummocks in the created wetlands.

- **Fifth-Year Monitoring**. One quantitative survey would be performed, at the end of the fifth year to determine compliance of the referenced variables with the following performance standard:

  -- The number of depressions and/or hummocks per unit area (e.g., 10 by 10m) within the created wetland would achieve between 75 percent and 125 percent of the reference standard based upon visual estimates.

  -- If the measure of microtopographic complexity does not achieve the performance standard, additional grading would be performed to increase the number of depressions and hummocks in the created wetlands

5.0 Special-Status Plant Translocation

Three special-status plant species, commonly associated with wetlands, will be impacted by construction activities associated with the Ranch Plan. The three wetland special-status species include southern tarplant (*Centromadia parryi* ssp. *australis*, CNPS List 1B), mud nama *(Nama stenocarpum*, CNPS List 2), and saltspring checkerbloom (*Sidalcea neomexicana*, CNPS List 2). Full details of the special-status plant translocation program are provided in Appendix J-1 of the GPA EIR. The following summary addresses translocation of each of these species.

SOUTHERN TARPLANT

Background

Southern tarplant (*Centromadia parryi* ssp. *australis*) is designated by CNPS as a List 1B species. The tarplant is an annual herbaceous member of the sunflower family (Asteraceae) that blooms from June to November. Habitat of the southern tarplant on RMV includes alkali meadow, alkali marsh marshes (mostly margins), and mesic grasslands. The tarplant also establishes well in highly disturbed areas.

Restoration Program

The proposed restoration program for southern tarplant within the Habitat Reserve would consist of the following key components:

- Seed collection
- Selection of introduction sites
- Site preparation
- Direct seeding at introduction site
- Maintenance and Monitoring

Monitoring

Translocated southern tarplant will be monitored annually for the five-year monitoring period. As with most annuals, the number of germinating individuals can vary significantly from year to year based on rainfall and for this species, disturbance. Because population sizes can vary from year to year, the relative sizes of extant and translocated populations are expected to vary widely from year to year. Because of this, development of performance standards can be difficult. As such, the performance standards are intended to evaluate general trends relative to performance and include flexibility, recognizing the inherent variability of this species. Under average conditions, populations should increase to carrying capacity over time; however, in any given

year, southern tarplant may emerge in very low numbers if conditions are not appropriate. Therefore, if during any of the five-year period, the standard set forth for flowering individuals for year five is achieved, the program will be considered as having achieved the five-year performance standard. The performance standards set forth below are based on expected average conditions; however, there is a high likelihood that numbers will vary substantially from year to year.

- **First-Year Monitoring**. Southern tarplant typically flowers as early June and sometimes into October and with peak flowering varying according to seasonal rainfall patterns. Monitoring of translocated populations will begin in on or about July 1, and will be conducted every two weeks until peak flowering occurs. When peak flowering occurs, as determined by the Restoration Specialist/Plant Ecologist, quantitative measurements (i.e. counts of flowering individuals) will be obtained.

  Success Standard: translocated populations combined to achieve 30-percent of number of individuals impacted using the population data provided in the NCCP Guidelines (*Appendix B1 of the SAMP EIS*).

- **Second-Year Monitoring**. Success Standard: translocated populations combined to achieve 45-percent of number of individuals impacted using the population data provided in the NCCP Guidelines.

- **Third-Year Monitoring**. Success Standard: translocated populations combined to achieve 60-percent of number of individuals impacted using the population data provided in the NCCP Guidelines.

- **Fourth-Year Monitoring**. Success Standard: translocated populations combined to achieve 75-percent of number of individuals impacted using the population data provided in the NCCP Guidelines.

- **Fifth-Year Monitoring**. Success Standard: translocated populations combined to achieve 90-percent of number of individuals impacted using the population data provided in the NCCP Guidelines.

MUD NAMA

Background

Mud nama is an annual species designated by CNPS as a List 2 species (rare in California but more common elsewhere) that occurs in vernally wet areas including vernal pools, the drying

margins of lakes and ponds, and other intermittently wet areas. All occurrences of this species within the ARCA are associated with the margins of seasonal ponds including one vernal pool, two stockponds, and one sediment basin. In all cases, the plants germinate following dry-down of the ponds following their filling during winter and spring rains. The annual habitat of this species along with its diminutive stature and adaptability make it an easy species to relocate. The methods employed will follow methods used for relocation of vernal pool species that exhibit similar characteristics and life history. The relocation program will consist of the elements listed below.

- Pre-Translocation Monitoring
- Collection of Inoculum (topsoil and dried plants to obtain seed)
- Selection of Receptor Sites
- Intoduction of Inoculum to Receptor Sites
- Maintenance and Monitoring

Monitoring

A qualified biologist will monitor mud nama introduction sites for a period of five years to determine the success of the introduction efforts. As with most annuals, the number of germinating individuals can vary significantly from year to year based on rainfall for this species as well as ponding depth and duration. Because population sizes can vary from year to year, development of performance standards can be difficult. As such, the performance standards are intended to evaluate general trends relative to performance and include flexibility, recognizing the inherent variability of this species. Under average conditions, populations should increase to carrying capacity over time; however, in any given year, mud nama may not emerge or may only emerge in very low numbers if conditions are not appropriate. Therefore, if during any of the five-year period, the standard set forth for flowering individuals for year five is achieved, the program will be considered as having achieved the five-year performance standard. The performance standards set forth below are based on expected average conditions; however, there is a high likelihood that numbers will vary substantially from year to year.

- **First-Year Monitoring**. Mud nama typically flowers as early April and sometimes into July and with peak flowering varying according to seasonal rainfall patterns. Monitoring of translocated populations will begin in on or about April 1, and will be conducted every two weeks until peak flowering occurs. When peak flowering occurs, as determined by the Restoration Specialist/Plant Ecologist, quantitative measurements (i.e. counts of flowering individuals) will be obtained.

Success Standard: translocated populations combined to achieve 30-percent of number of individuals impacted using the population data provided in the NCCP Guidelines (*Appendix B1 of the SAMP EIS).*

- **Second-Year Monitoring**. Success Standard: translocated populations combined to achieve 45-percent of number of individuals impacted using the population data provided in the NCCP Guidelines.

- **Third-Year Monitoring**. Success Standard: translocated populations combined to achieve 60-percent of number of individuals impacted using the population data provided in the NCCP Guidelines.

- **Fourth-Year Monitoring**. Success Standard: translocated populations combined to achieve 75-percent of number of individuals impacted using the population data provided in the NCCP Guidelines.

- **Fifth-Year Monitoring**. Success Standard: translocated populations combined to achieve 90-percent of number of individuals impacted using the population data provided in the NCCP Guidelines.

SALTSPRING CHECKERBLOOM

Background

Saltspring Checkerbloom is a perennial herb designated by CNPS as a List 2 species (rare in California but more common elsewhere) that occurs in alkali seeps and springs as well as other intermittently wet areas. Saltspring checkerbloom stems are upright to nine dm tall with leaves in a basal rosette from a long fleshy fusiform root. The leaves vary from 1.5 to 4.5 cm in width, the lower leaves are 5-9 lobed and upper leaves entire to or lobed. The flower petals are rose, mostly 6-12 mm long. The perennial herb blooms from April to June (Munz 1974).

Restoration Program

All occurrences of this species within the Habitat Reserve are associated with slope wetlands with the exception of a small population that was identified in the upper reach of Gabino Creek, upstream of Jerome's Lake. In all cases, the plants flower from the rootstock flowing winter and spring rains. The tall flowering stalks and easily detected flowers make it an easy species to relocate. The methods employed will follow methods used for relocation of emergent wetland species that exhibit similar characteristics and life history. The relocation program will consist of the elements listed below.

- Pre-translocation monitoring
- Seed collection
- Selection of receptor sites
- Greenhouse propagation
- Site preparation
- Translocation of natural populations
- Direct seeding at translocation site
- Maintenance and Monitoring

Monitoring

Translocated checkerbloom will be monitored annually for the five-year monitoring period. As with most geophytes, the number of flowering checkerbloom individuals can vary significantly from year to year based primarily on site specific conditions. Because population sizes can vary from year to year, the relative sizes of extant and translocated populations are expected to vary from year to year. Because of this, development of performance standards can be difficult. As such, the performance standards are intended to evaluate general trends relative to performance and include flexibility, recognizing the inherent variability of this species. Under average conditions, populations should increase to carrying capacity over time; however, in any given year, checkerbloom may not exhibit optimal numbers if conditions are not appropriate. Therefore, if during any of the five-year period, the standard set forth for flowering individuals for year five is achieved, the program will be considered as having achieved the five-year performance standard. The performance standards set forth below are based on expected average conditions; however, there is a high likelihood that numbers will vary substantially from year to year.

- **First-Year Monitoring**. Saltspring checkerbloom typically flowers between April and June. Monitoring of translocated populations will begin in on or about April 15, and will be conducted every two weeks until peak flowering occurs. When peak flowering occurs, as determined by the Restoration Specialist/Plant Ecologist, quantitative measurements (i.e. counts of flowering individuals) will be obtained.

  Success Standard: translocated populations combined to achieve 20-percent of number of individuals impacted using the population data provided in the NCCP Guidelines.

- **Second-Year Monitoring**. Success Standard: translocated populations combined to achieve 35-percent of number of individuals impacted using the population data provided in the NCCP Guidelines.

- **Third-Year Monitoring**. Success Standard: translocated populations combined to achieve 50-percent of number of individuals impacted using the population data provided in the NCCP Guidelines.

- **Fourth-Year Monitoring**. Success Standard: translocated populations combined to achieve 60-percent of number of individuals impacted using the population data provided in the NCCP Guidelines.

- **Fifth-Year Monitoring**. Success Standard: translocated populations combined to achieve 75-percent of number of individuals impacted using the population data provided in the NCCP Guidelines.

6.0 Implementation Plan

Implementation of the Mitigation Plan would be comprised of several steps, including:

1. Assessment of site hydrology, including preparation of water budgets where appropriate (preparation of water budgets would typically be needed for wetland creation projects to ensure that sufficient hydrology is present to support the target community but would not be required for activities such as giant reed or pampas grass removal);

2. Assessment of the sites to determine the most effective restoration approach; i.e., passive restoration or active restoration, amount of grading where necessary, revegetation, or enhancement;

3. Appropriate planting techniques; and

4. Assessment of site-appropriate methods for invasives control (see Invasive Species Control Plan, *Appendix F4*).

6.1.1 Assessment of Restoration Approach

For the sites noted above, sufficient hydrological information has been collected to provide a high level of confidence that the sites exhibit sufficient hydrology. In some cases, additional data may be collected to ensure that the optimal plant palettes are developed relative to site-specific conditions and also to ensure that water is not "robbed" from existing vegetation communities downstream of the proposed site. For example, areas in Chiquita Canyon between the Narrows and the SMWD Treatment Facility exhibit potential for a variety of wetland or riparian types that would in part be determined by grading to ensure maximum hydrology. Marsh vegetation could be incorporated into this area; however, it is expected that slightly "drier" transitional riparian or alkali meadow vegetation communities (that use only about one half the water of marshes) would be incorporated into this area to ensure that potential downstream impacts are eliminated. Where grading is determined to be a necessary component of the program, grading plans would be developed that provide the restoration personnel with sufficient detail to properly implement the program. It is important to note that "in-the-field" adjustments are often necessary during final grading to ensure the highest level of function. Where substantial grading is required, it is expected that the majority of the non-native seed banks would have been removed and that "grow-and-kill" programs or other intensive site preparation would not be necessary.

For projects where significant grading is not required, it may be necessary to conduct grow-and-kill programs or other types of weed/invasive plant removal. A variety of approaches, including hand removal, mechanical removal, or herbicide use may be appropriate depending on site-specific conditions. It is also likely that some sites may receive a variety of treatments, including heavy grading in some areas, light grading in other areas, and no grading with only weed control in other areas.

For many restoration sites, it is often necessary to evaluate soil conditions and, as appropriate, augment or rehabilitate poor or damaged soils. Soils on the RMV portion of the Habitat Reserve are, however, generally well understood and past restoration projects have been conducted without the need for soil augmentation.

a. Passive Restoration

Passive restoration would typically follow invasive exotic species control. For example, as giant reed is removed from portions of San Juan Creek or Trabuco Creek, it is expected that native riparian vegetation communities such as southern arroyo willow or mulefat scrub would reestablish. The key concept of passive restoration, in the context of the aquatic ecosystem, is that the native vegetation would naturally reestablish if the removal sites are kept free of the target invasive species. For passive restoration to be effective, however, the site likely would need to be bounded by native vegetation (to facilitate colonization by native species) and/or have an adequate seed bank upstream to support the growth of native species.

b. Active Restoration

Active restoration would be implemented if passive restoration is considered to be inappropriate for the site; i.e., the native vegetation community is unlikely to naturally reestablish itself because of its large size, lack of immediately adjacent native vegetation , and/or lack of a native seed bank. Furthermore, if monitoring of restoration sites indicates that passive restoration is not working, active restoration would be implemented. The key difference between passive and active restoration is that focused restoration activities would be implemented.

6.1.2 Revegetation Efforts

The revegetation treatment for Alkali or Freshwater Marsh, Wet Meadow, Southern Willow Riparian Forest, and Transitional Riparian Scrub would rely upon the use of container plants, acorns/seedlings and a native seed mix to reintroduce the appropriate wetland/riparian species to revegetation sites. *Tables 6 through* 9 provide conceptual plant palettes for each of these vegetation communities.

Container plant installation would be an important component of the revegetation treatment at wetlands sites to facilitate more rapid plant establishment and area coverage; for coast live oak, the use of seedlings may prove more effective over time. Species with seed that is not readily available or that do not readily germinate would be introduced using nursery-grown container plants. Both container stock and seed would originate from the San Juan and San Mateo Creek watersheds. All of the target species are available within the GERA and/or Chiquita Canyon restoration areas, having been documented during extensive monitoring programs.

TABLE 6
CONCEPTUAL ALKALI OR FRESH WATER MARSH
RESTORATION CONTAINER PLANT PALETTE

Botanical Name	Common Name	Size	Typical Spacing (in feet)
Scirpus americanus	Olney's bulrush	liners	4
Scirpus californicus	California bulrush	1 gal.	4
Scirpus acutus	Hardstem bulrush	1 gal	4
Juncus xiphioides	Iris-leaved rush	liners	4
Scirpus pungens	Three-square	liners	4
Eleocharis macrostachya	Creeping spikerush	liners	3
Typha domingensis	Southern cattail	1 gal.	5
Scirpus maritimus	Alkali bulrush	Liners	4
Paspalum distichum	Knot grass	Liners	4
Berula erecta	Water parsnip	Liners	10
Polygonum lapathifolium	Willow smartweed	seed	scattered
Baccharis douglasii	Douglas baccharis	1 gal.	6
Cyperus eragrostis	Tall nutsedge	seed	scattered
Epilobium ciliatum	Willow herb	seed	scattered
Bidens laevis	Burr marigold	seed	scattered
Pluchea odorata	Marsh fleabane	seed	scattered
Anemopsis californica	Yerba mansa	liners	6

TABLE 7
CONCEPTUAL ALKALI MEADOW CONTAINER PLANT PALETTE

Botanical Name	Common Name	Size	Typical Spacing (in feet)
Distichlis spicata	Saltgrass	liners	4
Juncus Mexicanus	Mexican rush	liners	4
Juncus rugulosus	Wrinkled rush	liners	4
Muhlenbergia rigens	Deer grass	liners	4
Leymus triticoides	Alkali ryegrass	liners	5
Carex preagracilis	Clustered field sedge	liners	5
Centromadia parryi australis	Southern tarplant	seed	random
Anemopsis californica	Yerba mansa	liners	5
Eleocharis macrostachya	Creeping spikerush	liners	3
Juncus bufonius	Toad rush	seed	scattered
Spergularia marina	Marsh sand-spurry	seed	scattered
Atriplex coulteri	Coulter's saltbush	seed	site-specific

TABLE 8
CONCEPTUAL SOUTHERN WILLOW RIPARIAN FOREST

Botanical Name	Common Name	Size	Spacing
Salix lasiolepis	Arroyo willow	liners or gallon	10 to 20 ft
Salix laevigeta	Red willow	liners or gallon	10 to 20 ft
Salix gooddingii	Black willow	liners or gallon	10 to 20 ft
Salix exigua	Narrow-leaf willow	liners or gallon	10 to 20 ft
Populus trichocarpa balsamifera	Black cottonwood	liners or gallon	10 to 20 ft
Baccharis salicifolia	Mulefat	liners or gallon	10 to 20 ft
Baccharis emoryi	Emoryi baccharis	liners or gallon	10 to 20 ft
Baccharis douglasiana	Douglas baccharis	liners or gallon	10 to 20 ft
Eleocharis montevidensis	Slender creeping spikerush	liners	4 ft
Juncus mexicanus	Mexican rush	liners	4 ft
Juncus rugulosus	Wrinkled rush	liners	4 ft
Juncus macrophyllous	Large-leaved rush	liners	4 ft
Artemisia douglasiana	Mugwort	liners	6.0
Cyperus eragrostis	Tall nudsedge	liners	4 ft
Leymus triticoides	Alkali ryegrass	liners	4 ft

TABLE 9
CONCEPTUAL TRANSITIONAL RIPARIAN SCRUB
RESTORATION CONTAINER PLANT PALETTE

Botanical Name	Common Name	Size	Typical Spacing (in feet)
Baccharis salicifolia	Mulefat	liners	10
Baccharis emoryi	Emory baccharis	liners.	10
Sambucus mexicanus	Mexican elderberry	1 gal	20
Artemisia douglasiana	Mugwort	liners	20
Atriplex lentiformis breweri	Brewer's saltbush	1 gal	16
Baccharis pilularis	Coyote brush	liners	10
Leymus triticoides	Alkali ryegrass	1 gal.	6
Carex praegracilis	Clustered field sedge	liners	6
Muhlenbergia rigens	Deergrass	1 gal	6
Juncus patens	Spreading rush	liners	6
Baccharis douglasii	Douglas baccharis	1 gal.	8

6.1.3 Planting Techniques

All container plants and salvaged plants would be installed using industry standard techniques. A hole twice the diameter of the rootball would be excavated to the depth of the rootball. Each hole would be filled with water and allowed to drain prior to plant installation. Each container plant rootball would be scarified prior to installation if dead roots occur on the surface of the rootball. Salvaged plant rootballs do not need scarification. Planting backfill would be native soil.

Oak woodland species would receive a 2-inch thick layer of bark mulch 18 inches out from the base of each plant to reduce weed growth and water evaporation. After installation, each plant would be irrigated to the depth of the rootball.

6.1.3 Seed Application

A two-step hydroseed technique would be used to install all seed mixes. This technique involves an initial application of a hydroseed slurry composed of water, seed, fertilizer (if any), and a low volume of fiber mulch. The second hydroseed slurry application contains water and a heavier

volume of fiber mulch. The purpose of the two-step process is to achieve the greatest seed-soil contact. In any cases where seed applications are within small in-fill enhancement areas, installation would be performed using hand broadcast methods.

6.2 Irrigation System & Schedule

Where needed, temporary on-grade irrigation systems would be installed to enhance germination and establishment of native plantings. The systems would be controlled automatically by irrigation clocks, and may be designed to shut off during rains events. Areas of similar topography may be controlled by a single remote control valve. The precipitation rate of the system would be approximately 0.2 inch per hour for any given area of the system.

The frequency and duration of irrigation are critical to seed germination and container plant establishment. The application of water would be keyed to existing conditions and water requirements of each stage of seed germination and seedling establishment. Irrigation would be used to maximize container plant survival and deep root growth while minimizing non-native species growth and seed production.

During each inspection, holes would be dug with a hand shovel or using a soil probe to determine the depth and amount of soil moisture. Enough holes would be dug to establish a representative sample of the site, i.e., until soil conditions are the same in more than three holes dug across the site. The irrigation schedule would be modified as necessary based on this inspection. Irrigation heads would be adjusted or capped where wet areas occur next to dry areas to facilitate additional irrigation of the drier areas.

Irrigation system operation would be suspended in anticipation of rain events. The system would be shut-off at a master control valve three to five days prior to a predicted rain-storm or series of storms. System operation would be resumed immediately if a predicted storm does not materialize and if the site requires supplemental irrigation to maintain soil moisture conditions that are sufficient for seed germination and seedling establishment. System operation would be resumed after a rain event upon a site inspection to determine soil moisture levels.

6.3 Weed Control

In wetland and riparian restoration areas, weed seed bank build up can occur quickly if weeds are not controlled. The suite of weeds that colonize wetland and riparian sites on RMV and south Orange County vary with annual rainfall patterns, hydrologic characteristics of specific wetland sites, seasonality and types of disturbance that site receive (e.g., regular flood scour, sediment deposition, etc.). Weed abatement is most effective when time is given to repeated treatment of

resprouting weeds. The following species are those most likely to require some level of control during the establishment phase of restoration projects: bristly ox-tongue (*Picris echioides*), Spanish sunflower (*Pulicaria paludosa*), yellow sweet-clover (*Melilotus indica*), white sweet clover (*Melilotus albus*), burr clover (*Medicago polymorpha*), English plantain (*Plantago major*), prickly lettuce (*Lactuca serriola*), Bermuda grass (*Cynodon dactylon*), Italian ryegrass (*Lolium multiflorum*), bull-thistle (*Cirsium vulgare*), sugar beets (*Beta vulgaris*), and poison hemlock (*Conium maculatum*). Where they become established, other invasives such as giant reed, tamarisk, and African umbrella sedge (*Cyperus involucratus*), should also be removed immediately. Early treatment and regular follow-up treatment of these species would reduce the weed density in the restoration areas over the long-term. Herbicide treatment of non-native grasses and follow-up treatment to reduce seed production would be essential for establishing native vegetation cover.

7.0 Maintenance And Monitoring Plan

Maintenance and monitoring activities that are necessary to ensure successful revegetation and enhancement would be conducted in accordance with this plan. The Maintenance and Monitoring Plan provides direction to the Restoration Ecologist, Reserve Manager, and the Installation/Maintenance Contractor for routine maintenance of the restoration projects to be conducted throughout the initial plant establishment period and five-year monitoring period. This section is intended to provide a brief description of those activities.

7.1.1 Maintenance Activities

Maintenance activities would apply to all revegetation and enhancement areas. Immediately following implementation of the restoration program, a maintenance program would be initiated to ensure successful germination and growth of the installed native species.

Because mature vegetation communities effectively control non-native species, restored wetland and riparian areas likely would become self-sustaining over time, needing very little or no maintenance once established (unless invasive species such as giant reed re-establish]. Maintenance activities for wetland and restoration areas would thus focus on ensuring the establishment of self-sustaining vegetation during the five-year maintenance period. Maintenance activities would include weed control, supplemental irrigation (as appropriate), pest control (as appropriate), and site access restrictions.

7.1.2 Four-Month Maintenance and Monitoring Period

During the four-month period following completion of restoration activities, weed control measures, irrigation schedules, and special management needs would be determined. A replanting program would be initiated at the completion of the four-month maintenance period if 100 percent container plant survival is not attained (woody species only).[15] The plant establishment period would be included in the installation contract to be performed by the Installation/Maintenance Contractor. Successful completion of the contract would include 100 percent survival of all container plants at the end of the plant establishment period (woody species only). New replacement plants would be provided and installed for the Installation/Maintenance Contractor to obtain final contract sign-off and payment.

7.1.3 Five-Year Maintenance and Monitoring Program

[15] Up to ten percent loss of herbaceous container stock (e.g., *Scirpus* spp. *Juncus* spp. or *Carex* spp. is acceptable as these species reproduce vegetatively, often making it difficult to determine which individual represents the original planting. Where die-off greater than ten percent is evident in the first four months, other problems such as insufficient hydrology or soil chemistry may need to be evaluated to determine reasons for high mortality.

Following the four-month maintenance period, a long-term five-year maintenance program would be initiated. Long-term maintenance would be initiated following the end of the plant establishment period. Maintenance would occur on an as-needed basis throughout the five-year maintenance period. Maintenance personnel are expected to conduct maintenance activities on a timely basis by conducting work at a frequency and intensity that would result in the greatest potential for native vegetation to establish and become the dominant vegetation type within the restoration area. If necessary, corrective measures (such as re-seeding or container planting) would be promptly implemented to bring the restoration effort into compliance with the performance standards noted above in *Section 3.5.3.*

Supplemental irrigation of restoration sites would be conducted as necessary as determined by the Restoration Ecologist. Irrigation schedules would provide adequate water to maximize the survival of installed container plants and seedling establishment. Irrigation of the restoration sites would be closely monitored, and if necessary, the irrigation schedule and rates for each area would be modified to provide moisture and ensure successful germination and growth. The Restoration Ecologist would determine the need for changes in irrigation schedules in consultation with the Installation/Maintenance Contractor. An accurate record of these activities would be maintained by the Installation/Maintenance Contractor.

7.1.4 Weed Control

It would be the Installation/Maintenance Contractor's responsibility to control weeds within the restoration areas. Before initiating any weed control measures, the Installation/Maintenance Contractor would meet onsite with the Restoration Ecologist and Reserve Manager to determine the extent and methods of weed control. The Installation/Maintenance Contractor would notify the Reserve Manager at least three days prior to implementing approved weed control measures. Weed control would be conducted in all active restoration areas for the duration of the five-year maintenance period. No more than 10 percent non-native cover in any given year during the five-year maintenance period would be accepted within wetland or riparian restoration areas.

During the five-year maintenance program, the non-native species noted above in Implementation Section, would be removed with hand tools, by hand, or treated with appropriate herbicides. Hand tools such as "weed whips" would be used only where solid patches of non-native grasses are present and in the absence of native seedlings. Hand removal would be used where native herb, shrub or tree seedlings are present. Chemical treatment would be limited to large areas of non-native grass with no native species present.

The prime period for weed removal is in the spring during the months of March and April. Weed eradication at this time is ideal because soils are typically still moist enough for hand-pulling and therefore can be removed before their detrimental effects of robbing native plants of sunlight, moisture, and nutrients occur. Additionally, it is imperative that weeds are removed before they can successfully produce seeds and contribute to the weed seed bank. If weeds are not controlled during this period of time, successful establishment of target wetland vegetation would be extended in duration and potentially reduced in extent.

7.1.5 Clearing and Trash Removal

Pruning or clearing of native revegetation plantings would be prohibited. The revegetation areas would be allowed to develop naturally. Plant debris of native shrubs would not be removed from the restoration sites. Native plant debris provides valuable micro-habitats for invertebrates, reptiles, small mammals, and birds; all necessary elements of normally functioning wetland and/or riparian communities. The decomposition of the plant debris also is essential for the replenishment of the soil's nutrients and minerals.

Trash would be regularly removed from restoration areas by hand and appropriately disposed of offsite. Such trash would be removed as needed, but at no less than at 1-month intervals for the first year, and quarterly thereafter.

7.1.6 Pest Control

Pests, including insects, mites, snails, rabbits, and rodents, are expected to occur within the restoration areas. In accordance with an Integrated Pest Management Program, active control of pests with the use of chemical pesticides would be avoided in favor of allowing natural environmental controls to take effect or the use of directed controls (e.g., trapping). If destruction of the vegetation plantings by pests becomes a problem, the Installation/Maintenance Contractor would consult with the Reserve Manager responsible for mitigation within the ARCA and the Restoration Ecologist to determine remedial measures to be taken.

7.2 Monitoring Program

As noted above under the Performance Standards in *Section 3.5.3*, each of the three specific components of the Restoration Program (i.e., vegetation creation, stream restoration/rehabilitation, invasive exotic removal) each has its own set of performance standards and as such, each has a separate monitoring program relative to the methods used. The monitoring program set forth below is separated accordingly.

7.2.1 Vegetation Creation or Restoration: Emergent Marsh, Wet Meadow, Riparian Scrub/ Forest

Monitoring would be performed by an agency-approved biologist (or Restoration Ecologist) with appropriate credentials and experience in native vegetation restoration, restoration monitoring, wetland delineation, and the Corps' HGM approach. The performance of the mitigation would be evaluated by evaluating the target function variables described above in *Section 3.5.2*. Due to overlap among the variables, field data collected for Percent Vegetative Cover, Coarse Woody Debris (based upon direct visual estimates), Microtopographic Complexity, Species Composition, Seedling Recruitment, and Vegetation Community Heterogeneity would provide the information necessary to determine performance compliance for all variables. The Reserve Manager or designated Restoration Ecologist would be responsible for development of data sheets to be used in collection of the information associated with each variable (it should be noted that Appendix 3 of the Guidebook provides examples of data sheets that can be used or modified for use in the field during monitoring of the variables). The target function variables are described below.

Percent Vegetative Cover

The Percent Vegetative Cover would be determined using standard quantitative vegetation sampling methodologies, which utilize transects or quadrats that characterize each vegetation strata (canopy, shrub, and herbaceous) in terms of total cover. Included in this variable would be percent cover by non-native invasive species. Data regarding non-native invasive species would be used in determining the types of remedial measures needed to ensure that the mitigation area remains healthy.

Species Composition

Data regarding Species Composition would be collected during the quantitative vegetation sampling discussed above.

Recruitment of Native Hydrophytes

Beginning with year three of the five-year monitoring program, recruitment of native hydrophytes would be evaluated by comparison with the reference site. The measurement of recruitment of native hydrophytes would be conducted during performance of quantitative vegetation surveys (by transect or quadrat sampling method) and would be conducted for appropriate vegetation strata.[16] Comparison of the mitigation site with the reference site could be accomplished by measuring the

[16] For example, areas of willow riparian forest would include three strata - canopy, shrub, and herbaceous layers whereas, mulefat scrub would include only the shrub and herb layers.

ratio of seedlings/saplings/or clonal shoots to established shrub/trees or by absolute numbers as determined appropriate by the Restoration Ecologist.

Vegetation Heterogeneity (Vegetation Patchiness)

Beginning with year three of the five-year monitoring program, vegetation patchiness would be evaluated by comparison with the reference site. Characterization of vegetation community heterogeneity or patchiness greatly depends upon scale and would be based upon direct visual observations made during performance of quantitative sampling.

Coarse Woody Debris (Riparian Vegetation Only)

Coarse Woody Debris would be evaluated by direct visual observation, comparing the reference site with the GERA mitigation areas. For purposes of this mitigation program, Coarse Woody Debris is defined as woody vegetation deriving from trees and/or shrubs greater than 2.5 inches in diameter.

Microtopographic Complexity

Microtopographic Complexity would be evaluated by direct observation, comparing the restoration sites with reference sites. Microtopographic complexity would be measured during performance of vegetation transects, recording number of hummocks/mounds and depressions along with the change in topographic relief by class.[17]

Specific Conductance

Specific conductance would be measured using appropriate devices. Measurements obtained during monitoring of mitigation areas in Chiquita and GERA used and Oakton hand-held conductivity meter. Any similar device is appropriate/acceptable.

Hydrological Indicators

In addition to the variables referenced above, observations regarding field indicators for hydrology would be recorded during quantitative sampling for comparison with the reference site(s). Hydrological indicators to be recorded (as appropriate for each site), by direct observation, include Debris Rack, Sediment Deposits, Ponding Duration, Ponding Depth, Ponding Extent, Water Marks, and Drainage Patterns in the Wetland.

[17] The HGM Guidebook for Riverine Wetlands suggests microdepression size classes of 0.5, 1.0, and 1.5 meters with depths of 5, 10, and 15 centimeters.

Wetland Delineation

Determination that the mitigation wetlands, expected to meet Section 404 wetland criteria, exhibit wetland hydrology, soils, and vegetation would be made using the 1987 Corps Manual.

Selection of Reference Site(s)

A reference site (or sites) would be identified in Chiquita Canyon, Canada Gobernadora, or other appropriate canyons in the ACRA as determined appropriate by the Restoration Ecologist in coordination with the Corps. The reference sites would be located in areas that would be preserved in perpetuity and would correspond to wetlands to be impacted relative to the functions, and related variables, discussed throughout this mitigation program. The reference site(s) would be approved by the Corps prior to implementation of the mitigation program.

7.2.2 Record Keeping

Following each monitoring visit, the Restoration Ecologist would recommend actions, as needed, to the Reserve Manager that would promote survival and coverage criteria as described in the performance standards. The Restoration Ecologist, Reserve Manager, and Installation/Maintenance Contractor would work together to monitor, maintain, and replant restoration areas, if necessary.

Over the five-year period following restoration implementation, an annual report prepared by the Restoration Ecologist that discusses the results of the restoration monitoring and maintenance efforts for that year would be submitted to the Reserve Manager for incorporation into the overall report for the ARCA/Habitat Reserve. Vegetation cover by species, compliance with required performance standards, species heights, seedling recruitment, pest problems, weed control problems, pest control measures implemented, additional required maintenance procedures, and the general health of the revegetation plantings would be summarized in these reports. Photo-documentation of the sites would be included in the reports to provide a visual record of the restoration progress.

7.3 Completion Of Restoration

7.3.1 Notification of Completion

Upon completion of Year 5 of the monitoring period or when the restoration area(s) have achieved the Year 5 performance criteria, the Restoration Ecologist would prepare a final report for the Reserve Manager that describes the relative success of each restoration area.

7.3.2 Contingency Measures

Contingency measures would be implemented if restoration efforts fail to meet performance criteria at the end of the five-year monitoring period. Such measures would include additional container plant and/or seed installation, additional weed control efforts, an evaluation and appropriate modification of the irrigation system, and the extension of the maintenance and monitoring period until such time that the performance criteria are achieved.

7.3.3 Long-Term Management

Long-term management beyond the five-year mitigation performance standard monitoring program would be in accordance with the overall Aquatic Resources Adaptive Management Program (ARAMP). The Reserve Manager would determine whether a restoration site would be subject to long-term monitoring and management pursuant to the ARAMP**.**