APPENDIX D
Re-establishment and Establishment Guidelines

1 INTRODUCTION

The United States Army Corps of Engineers (USACE) and the US Environmental Protection Agency (EPA) define restoration as, "the manipulation of the physical, chemical, or biological characteristics of a site with the goal of returning natural/ historic functions to a former or degraded aquatic resource" (USACE and EPA 2008). Restoration includes both rehabilitation, which repairs natural/historic functions to a degraded aquatic resource, and re-establishment, which returns natural/historic functions to a former aquatic resource. Establishment (i.e., creation) is defined as, "the manipulation of the physical, chemical, or biological characteristics present to develop an aquatic resource that did not previously exist at an upland site." Re-establishing is always preferable to establishment because the likelihood of success is far greater where some aquatic resource characteristics are already present or were historically present. Additionally, because the establishment of wetland and other waters on upland and/or deepwater sites will result in a net decrease in upland and/or deepwater habitat, this should only occur when there are no existing or available sites with re-establishment opportunities. Even highly degraded and disturbed re-establishment sites are preferable to establishment sites. Nevertheless, it is expected that a portion of mitigation acreage under the South Sacramento Habitat Conservation Plan (SSHCP) will occur as wetland and other waters establishment due to a lack of available restoration sites outside the Urban Development Area (UDA).

This appendix explains the SSHCP protocols for establishment and restoration of wetlands and other water ecosystems. These protocols are based on the USACE's Mitigation Guidelines for the Clean Water Act (CWA) 404 Program and the United States Environmental Protection Agency's (EPA) *Principles for Ecological Restoration of Aquatic Resources* (EPA 2000). They are meant to provide applicants with a basic outline for planning, designing, implementing, and managing restoration or establishment projects. In so doing, the protocols are meant to ensure that wetland projects will be viable in perpetuity, and will adequately compensate for impacted habitat. This section will also provide standards that are specific to each of the 10 aquatic resources land cover types, including restoration and establishment methods, monitoring requirements, criteria against which success will be measured, and remedial steps for projects that do not meet the basic success criteria. It is recognized that ecosystem restoration and establishment is an evolving science, and that this document represents current understandings and expectations in the field. Therefore, the application of these protocols will allow adjustments in an adaptive manner to reflect the best available science of wetland and stream establishment and re-establishment, monitoring, and performance standards that can improve the long-term viability of restoration and establishment projects.

The following methodology describes the process by which determinations were made regarding the potential for establishment and re-establishment acreage amounts to occur within the Plan Area.

Assumptions

Irrigated pasture and croplands are considered the only habitats where removal of the current land use and re-establishment of topography may result in re-established wetlands. Irrigated pasture is considered particularly suitable for re-establishment of wetlands because the hardpan is likely intact. Croplands, depending on the crop, may also retain the hardpan. Both land uses occur where wetlands may have historically occurred.

Orchards and vineyards are not suitable for wetland restoration because the lands have been deep-ripped to support the agricultural uses.

Valley grasslands may be suitable for establishment of wetlands, but only outside of 250 feet of an existing wetland feature so as not to create any indirect effects to the wetland per U.S. Fish and Wildlife Service (USFWS) protocol.

Only land in the Plan Area is considered for re-establishment or establishment.

It is assumed that parcels 20 acres in size or less will be too expensive to acquire and too small to support successful re-establishment or establishment.

It is assumed that existing preserves will not be suitable for re-establishment or establishment as this may risk damaging protected resources and easements may prohibit re-establishment or establishment.

Based on California Department of Fish and Wildlife recommendations, it is assumed that between 15% and 30% of land that is assumed to be suitable habitat will be available for acquisition.

Up to 8% of a site can be re-established or established with wetlands. This is based on the density of wetlands found in Valley Grassland cover type throughout the Plan Area. Wetlands include vernal pools, swales, seasonal wetlands, freshwater marsh, streams and open water. Wetland density within the Plan Area was derived from the acreage of wetlands within the Valley Grassland cover type as this is the only upland cover type that is reflective of historic natural conditions. All other upland cover types have been heavily modified.

Methodology

Identify all Cropland, Irrigated Pasture, and Valley Grassland cover types in the SSHCP Plan Area. This forms the “base map.”

Using the parcel layer, remove all parcels from the base map that are less than 20 acres in size.

Using the existing preserve layer, remove all parcels from the base map that are already protected.

Using a buffer file, remove all lands from the base map that are within 250 feet of a vernal pool, swale, and stream/creek (VPIH) land cover type.

Calculate range of how many Cropland, Irrigated Pasture, and Valley Grassland acres are available for potential re-establishment or establishment, assuming 15% to 30% of the base map can be acquired.

Calculate range of how many wetland acres can be re-established or established based on 8% density.

Conclusions

The base map sums to 210,509 acres.

After removing lots smaller than 20 acres in size and already preserved lands, the map sums to approximately 135,455 acres.

After removing areas within 250 feet of existing VPIH land covers, the map sums to approximately 85,690 acres.

It is estimated that further investigation into the historical agricultural practices on some of the potential re-establishment or establishment sites will reveal past deep-ripping. Sites that have been deep-ripped will not have an intact perched aquafer, which is necessary to support most wetland cover types. There are some questions as to whether or not the perched aquifer in soils that have been deep-ripped can be repaired. Orchards and vineyards are not considered suitable candidates for re-establishment or establishment because deep-ripping has typically occurred where they were established. It is also understood that acquiring potential re-establishment or establishment sites is dependent on a willing buyer and willing seller agreement. Therefore, it is not probable that all identified potential wetland re-establishment or establishment sites can be acquired for re-establishment or establishment. It is estimated that between 15% and 30% of potential re-establishment or establishment sites will be successfully negotiated for acquisition and will be capable of supporting re-establishment or establishment efforts. Therefore, it is assumed that between 12,854 and 25,707 acres may be available for wetland re-establishment or establishment.

Wetland re-establishment and establishment guidelines set forth in this study limit the percent of land that can be re-established and established to 8% of the site. The remaining 92% is required as upland

habitat, which supports the hydrology of the wetland. Therefore, it is estimated that between 1,028 and 2,057 acres of wetlands can be re-established or established within the Plan Area.

The SSHCP impacts analysis forecasts that approximately 1,200 acres of wetlands will be impacted. Because we assume that the Plan Area can provide between 1,028 and 2,057 acres of wetland re-establishment and establishment, the re-establishment/establishment ratio under the SSHCP is set at 1:1.

2 GUIDELINES

The restoration and establishment process has several stages: site selection, site evaluation, project design, project implementation, project monitoring, and project management. General protocols for each of these stages are as follows:

2.1 Site Selection

The National Resource Council (NRC) stipulates that "site selection for wetland conservation and mitigation should be conducted on a watershed scale in order to maintain wetland diversity, connectivity, and appropriate proportions of upland and wetland systems needed to enhance the long-term stability of the wetland and riparian systems" (NRC 2001). Protected upstream and upland areas provide a safeguard against the negative edge effects of future development. Therefore, restoration and establishment sites that are contiguous to existing preserves or lands protected by conservation easements will have priority over wetland restoration or establishment sites outside of a comprehensive preserve system. All restoration and establishment sites must be under permanent conservation easement or have preserve status.

Consideration will be given to a site's position within the watershed, its function within the watershed, and the potential impacts of restoration or establishment on existing proximate wetland and other aquatic resource habitats within the same watershed. Restoration or establishment sites that can benefit the watershed in which they are situated will have priority over those with little to no impact; sites with no potential impact on the watershed in which they are situated will have priority over those with potential negative impacts. Sites with potential negative impacts to the watershed or nearby habitat will be avoided.

Wetlands and other waters that have retained functional hydrodynamics or degraded and former wetlands whose hydrodynamics can be re-established through passive restoration tend to be more fiscally and environmentally sustainable than those where functional hydrodynamics must be engineered or created. Active hydrodynamic restoration methods, like grading and excavation can severely damage the substrate and encourage the spread of invasive plant species. "Hard" engineering solutions, such as irrigation and pumping systems, are costly and cannot readily adapt to seasonal and annual fluctuations in rainfall and water level. Hence, restoration and establishment sites that do not require active intervention to remediate wetland or other waters hydrodynamics will have priority over other sites. No restoration or establishment projects that use irrigation as a primary or long-term water source are permitted.

Soil type and permeability are also important considerations, as they dictate a site's ability to retain water and support vegetation. Highly permeable soils are not likely to retain enough water to function as a wetland or other water ecosystem, except where water tables or water inflow

rates are high. Factors such as soils pH, nutrient content, climate, parent material, relief, organisms, and the overriding influence hydrologic regime, will influence whether wetland-appropriate vegetation struggles or thrives. Therefore, restoration and establishment sites with soil types known to support wetland hydrology and vegetation will have priority over other sites.

Additionally, restoration and establishment site selection will consider the potential effects of habitat restoration on nearby County airport operations. Pursuant to Title 33 of the Code of Federal Regulations (CFR) Section 332.3, compensatory mitigation projects should not be located where they will increase risks to aviation by attracting wildlife to areas where aircraft–wildlife strikes may occur (e.g., near airports). Thus, those sites that are less likely to increase wildlife hazard attractants within a County airport's approach and departure airspace will be given priority over other sites.

Lastly, because a central goal of mitigation is to offset unavoidable adverse impacts to wetlands, streams, and other aquatic resources to maintain a diverse assortment of wetland types, functions, landscape settings, and geomorphic settings, sites that have unique or rare topographical, geomorphic, vegetative, biotic, or functional characteristics will have priority over other sites.

In summary, the Implementing Entity will prioritize restoration and establishment sites that:

- Are contiguous to existing preserves or lands under conservation easements;
- Can withstand re-establishment or establishment projects without adverse impacts to the watershed or habitat in which they are situated;
- Do not require active intervention to remediate wetland or other waters' hydrodynamics;
- Have appropriate soil types, composition, and permeability;
- Do not attract wildlife within the approach and departure airspace of County airports, and
- Have unique or rare characteristics.

Once a restoration or establishment site is selected, a reference site will be identified. Reference sites should be in-kind and as proximate to the restoration or restoration site as possible. The site being mitigated for can be used as the reference site if it is reasonably proximate and similar to the restoration or establishment site, and if it has not been destroyed prior to the start of the restoration or establishment project. Reference sites should not be chosen randomly, but rather so that collectively they represent the diversity of species and plant communities that exist on the sites that are going to be destroyed.

2.2 Site Evaluation

Once the restoration or establishment site and the reference site are selected, an interdisciplinary team of experts will survey the site. This team will include the Implementing Entity and at least one Monitoring Biologist (MB). The MB will be a professional botanist, biologist, or restoration ecologist familiar with California flora and fauna, and experienced with wetland or other waters re-establishment or establishment projects; alternatively, the MB can be a firm specializing in the re-establishment or establishment of wetlands and other waters. This person or firm will be contracted to perform the baseline evaluation (in addition to the monitoring responsibilities detailed in Section 2.5).

The baseline evaluation will actually consist of two surveys: one in wet season (January to February) and one in the flowering period (March through May). Each survey should note the following, using either metrics on or descriptions of:

- Topography and slope;
- Water quality (turbidity, nutrient levels, presence of toxins, etc.);
- Subsurface water flow rate, direction, depth, and duration;
- Surface water flow rate, direction, depth, and duration;
- Soil/substrate type, permeability, moisture levels, and erosion;
- Dominant vegetation type, location, density, and elevation;
- Presence and location of invasive species;
- Presence and location of listed species;
- Aquatic function (if any);
- Historical and current uses of the site; and
- Historical and current uses of neighboring land that may affect the project outcome.

Surveys of plant and animal species specific to particular wetland or other water types may need to occur within a more specific time frame or multiple times over the course of the survey period for the results to be accurate and reliable. These particular survey requirements will be detailed within the restoration and establishment guidelines of each wetland and other water type.

The reference site should be surveyed at the same time and using the same methods and metrics as the restoration or establishment site.

2.3 Project Design

Project design depends upon the desired outcome of each project. The overarching goal for all mitigation projects under the SSHCP is an ecosystem strategy approach to re-establish or establish sustainable and functioning ecosystems that match the characteristics and functions of the ecosystems they replace within a system of conservation areas and reserves so that species dispersal mechanisms remain functional. However, depending on project-specific constraints and opportunities, this may be too broad or constraining. Therefore, the Implementing Entity and MB will use the baseline evaluation findings to set project-specific goals and to design the project with the aim of meeting those goals. As part of the project design, the team will also generate an implementation plan that describes how the design will be implemented. Lastly, the team will generate a monitoring and management plan, which will include project-specific outcomes, criteria against which progress toward meeting those objectives can be measured, and the monitoring methods that will be used to measure those criteria.

In general, passive restoration design is preferable to active restoration, as it is less invasive and the result is self-sustaining. Passive restoration involves removing the source of degradation (e.g., cattle grazing, culverts, etc.) and allowing natural process to gradually return the site to a functioning wetland or other water ecosystem. However, passive restoration design will not meet the goals of every restoration project, especially on severely degraded sites, and passive designs cannot be used for establishment projects. Therefore, it is expected that some projects will utilize active restoration and establishment project designs.

The USACE South Pacific Division's *Final 2015 Regional Compensatory Mitigation and Monitoring Guidelines* (USACE 2015) recommend the following considerations for mitigation planning: A mitigation plan for wetland compensatory mitigation projects should consider the NRC's operational guidelines for restoring ecologically self-sustaining wetlands (NRC 2001). This succinct document provides some useful guidelines on factors to consider in planning wetland compensatory mitigation. In addition, examination of existing compensatory mitigation sites has provided information that can be used to ensure the success of proposed compensatory mitigation sites. In general, compensatory mitigation sites should be designed with the following in mind.

General Design Recommendations for Compensatory Mitigation

- Ensure an adequate buffer subject to minimal or no human disturbance is established and protected adjacent to any aquatic resources in the compensatory mitigation site.
- Integrate macro- and micro-topographic features to create a diversity of hydrologic and geomorphic conditions, plant communities, and animal habitat.

- Design the compensatory mitigation project to mimic a local reference site of similar class and landscape position that provides the desired habitat features and functionality.
- Incorporate mitigation plantings of species native to the local area.
- Avoid or minimize impacts to special-status species and other biological resources.

Design Recommendations for Wetland Compensatory Mitigation

- Select compensatory mitigation sites with natural, self-sustaining sources of hydrology (surface water, groundwater, and precipitation). The use of engineered structures such as pumps, water control structures, or diversions is strongly discouraged. Securing water rights and/or understanding the risks of existing or future water diversions are critical elements.

Design Recommendations for Stream Compensatory Mitigation

- Ensure the main channel through the compensatory mitigation site is free to migrate laterally over its active and terrace floodplain.
- Ensure channel geometry (plan, profile, and cross-section) of the compensatory mitigation site is appropriate for the watershed location and physical/hydrological condition.
- Use local, native materials as fill material to the extent practicable.
- Use bioengineering techniques to the extent practicable.
- Establish/restore and protect riparian areas next to the stream channel.

Additionally, project designs must address the three fundamental components of wetland ecosystems: hydrology, substrate, and vegetation. According to the NRC's Committee on the Characterization of Wetlands (NRC 1995):

> The states of the three factors that characterize wetlands are… recurrent, sustained saturation (the hydrological criterion), physical and chemical conditions in the substrate that reflect recurrent, sustained saturation (the substrate criterion), and the presence of organisms that are specifically adapted to recurrent and sustained saturation of the substrate (the biologic criterion).

2.3.1 Hydrology

The project design should describe how topography and hydrology of the site will be altered (if at all) to re-establish or establish the appropriate hydrodynamics and hydroperiod for the wetland or other water ecosystem. The design should also explain what aquatic function is expected to result from this change.

This component of the project design should utilize natural hydrologic patterns whenever possible, and avoid depending on hard engineering to achieve the desired hydrology. Soft engineering is always preferable to hard engineering, as it is more natural and self-sustaining, requires minimal maintenance, and is more cost-effective. As explained in Section 2.1, grading, excavation, pumping, and irrigation are undesirable and should be avoided. Irrigation is never acceptable as a primary or long-term water source.

2.3.2 Substrate

The project design should describe how (if at all) the soil or substrate will be amended or translocated to re-establish or establish the appropriate level of saturation and nutrient/organic matter content for the wetland or other water ecosystem. The project design should utilize existing soil and substrate whenever appropriate for the wetland or other water type being re-established or established. To avoid the spread of invasive species, soil and/or substrate translocated from off site should be sourced from sites free of invasive species.

2.3.3 Vegetation

The project design should describe how (if at all) the site will be vegetated or revegetated. Substrate, plants, and seeds collected from the site can be used to revegetate and repopulate the site after hydrology is re-established or established. When no native seed bank exists, site-suitable plant species should be procured from as local a source as possible. Off-site plant, seed, and substrate collection should come from local sites free of invasive species. Commercial seeds for native plants can be substituted if no local seed banks are available. Project designs, especially active designs, should use variation to allow for adaptive management. When designs include excavation or grading, they should provide appropriately heterogeneous topography. When designs include revegetation, they should create varying plant elevations and emergence levels. Such variations enable flexibility in case of extreme weather events and other unpredictable factors that can affect the project.

In summary, the Implementing Entity will design restoration and establishment projects that:

- Are based on foreseeable constraints and information derived from the baseline evaluation;
- Strive to meet project-specific goals, outcomes, and success criteria;
- Specify monitoring frequency and management protocols;
- Are passive, whenever possible;
- Address the water, substrate, and biota that compose the wetland or other water type;

- Utilize existing hydrological patterns, topography, soil, substrate, native vegetation, and/or local seed banks, whenever possible; and
- Create variation to allow for experimentation and adaptive management.

2.4 Implementation

The implementation plan must provide a timeline for the project implementation, and must describe all avoidance and minimization measures that the Implementing Entity will take during implementation of the project. These measures are described in detail in Chapter 7 Conservation Strategy of the SSHCP.

2.4.1 Timing

Implementation will occur either before or after the breeding and aestivation seasons of species present at the restoration or establishment site. The Implementing Entity will also time the implementation so that revegetation occurs during the appropriate growing season. If the planned implementation season arrives with unexpectedly poor conditions (e.g., drought, flood, etc.) the Implementing Entity will postpone project implementation until better conditions emerge, up to one calendar year or 18 months.

2.4.2 Avoidance and Minimization

Prior to entering the restoration or establishment site all boots, tools, truck tires, truck beds, and any other equipment should be washed and disinfected to limit the spread of invasive species and disease. If invasive species are already present at the re-establishment or establishment site prior to implementation, and the project design involves eradicating such species, the Implementing Entity will use mowing, hand weeding, and other natural methods to do so. Herbicides and pesticides will be avoided.

When the project design involves excavation or grading, the Implementing Entity will salvage appropriate native soils, substrate, and plant materials from the re-establishment or establishment site, whenever possible. Seeds with viable embryos should be collected by hand, with scissors, or with clippers, and stored under cool and dry conditions. Substrate should be harvested using a hammer or backhoe to loosen blocks that are at least 6 inches deep, and stored on greenhouse flats wrapped in damp fabric.

All tools should be removed from the site after implementation, except those needed for monitoring purposes.

2.5 Monitoring

A monitoring schedule will be developed as part of the project design process (see Section 2.3). Monitoring should occur with the highest frequency during and immediately after implementation. These surveys should include the same metrics and descriptions as the baseline evaluation.

Long-term monitoring should include an annual Biological Inspection, and more detailed quantitative and qualitative surveys every 5 years. The Biological Inspection will consist of one or more walk-through surveys that note:

- Hydrology;
- Vegetation composition;
- Presence and location of invasive species;
- Wildlife presence; and
- Condition of habitat features, including changes and/or pending needs.

Surveys should include photo documentation where useful. Summary reports of monitoring results should be submitted to the Implementing Agency by the end of each monitoring year.

The Monitoring Biologist (MB) is responsible for all near- and long-term monitoring of the re-establishment or establishment site. Ideally, the same MB will perform both the baseline evaluation (detailed in Section 2.2) and project monitoring for the duration of the monitoring period. However, a change of the MB can be made in consultation with the Implementing Agency, and with the Implementing Entity's approval at the time of change. The exiting MB will give a tour and introduction of the site to the entering MB.

Duties of the MB include, but are not limited to:

- Monitoring site function, hydrology, and erosion control;
- Monitoring water quality;
- An annual Biological Inspection of the site; collecting data and preparing reports based on this Inspection;
- Monitoring presence, vigor, location, and density of vegetation and biota;
- Evaluating the accumulation of thatch and recommending removal, when necessary;
- Evaluating the presence of newly introduced, non-native, or exotic plant species, and recommending removal, when necessary;

- Recommending allowable activities on the site, e.g. educational activities, tours, grazing, etc.; and
- Recommending remedial or corrective actions, to be implemented by the Implementing Entity.

2.6 Management

The Implementing Entity is responsible for the near- and long-term management and maintenance of the restoration or establishment site. Long-term management is necessary to ensure that the restoration or establishment project is viable as a wetland or other water habitat in perpetuity. The Implementing Entity's management duties will include, but not be limited to:

- Maintaining fencing and signage;
- Coordinating trash removal;
- Removing thatch and dead vegetative matter to reduce fire hazard;
- Removing and/or managing exotic and invasive plant species, when necessary;
- Coordinating grazing schedules, when applicable;
- Coordinating the annual Biological Inspection by the MB;
- Reviewing monitoring data and performing general inspections; and
- Implementing remedial or corrective action when necessary.

The Implementing Entity will coordinate with the MB to determine when and where remedial or corrective action is necessary and feasible.

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3 LITERATURE CITED

EPA (Environmental Protection Agency), 2000. *Principles for the Ecological Restoration of Aquatic Resources.* EPA841-F-00-003. Washington D.C.: Office of Water (4501F), EPA. http://www.epa.gov/owow/wetlands/restore/.

NRC (National Research Council). 2001. *Compensating for Wetland Losses under the Clean Water Act*. Washington D.C.: National Academy of Sciences.

NRC. 2005. *Wetlands: Characteristics and Boundaries*. Washington D.C.: National Academy of Sciences.

USACE and US EPA (U.S. Army Corps of Engineers and US Environmental Protection Agency). 2008. 33 CFR Parts 325 and 332 and 40 CFR Part 230 Compensatory Mitigation for Losses of Aquatic Resources; Final Rule. April 10, 2008.

USACE. 2015. *Final 2015 Regional Compensatory Mitigation and Monitoring Guidelines.* USACE, South Pacific Division.

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