US Army Corps of Engineers®

SAN FRANCISCO and SACRAMENTO DISTRICTS

SPECIAL PUBLIC NOTICE

MITIGATION AND MONITORING PROPOSAL GUIDELINES

Date: December 31, 2003 | Response Required by: January 31, 2004

Location

These Mitigation and Monitoring Proposal Guidelines will be applied throughout the U.S. Army Corps of Engineers' (Corps) San Francisco District, which encompasses the coastal portions of California from northern San Luis Obispo County to the Oregon border; and the Sacramento District, which covers Central Valley of California, Nevada, Utah and western Colorado (see attached drawing). Both the San Francisco and Sacramento Districts shall here in be referred to as the "Districts" within this document. If modifications occur to the Districts' boundaries in the future, these Mitigation and Monitoring Proposal Guidelines will apply to all areas within the revised boundaries.

Overview

U.S. Army Corps of Engineers and U.S. Environmental Protection Agency (EPA) regulations (33 CFR 320-330 and 40 CFR 230) authorize the Corps to require compensatory mitigation for unavoidable impacts to wetlands and other jurisdictional "waters of the U.S." The Corps has commenced several initiatives in response to recommendations contained in the recent National Academy of Science / National Research Council publication "Compensating for Wetland Losses under the Clean Water Act," (2001) and is committed to improving the success of future compensatory mitigation projects.

These Mitigation and Monitoring Proposal Guidelines are designed to assist the regulated public with all aspects of the mitigation process and to provide information to ensure future compensatory mitigation sites successfully replace all lost functions and values associated with regulated impacts to waters of the U.S.

With this Public Notice, the Corps is soliciting comments on proposed revisions to existing Habitat Mitigation and Monitoring Guidelines published October 25, 1996 in the Sacramento District and October of 1991 in the San Francisco District. These Mitigation and Monitoring Proposal Guidelines would be applied to the regulatory program as administered within the Districts. These Mitigation and Monitoring Proposal Guidelines are being updated based upon experience, field investigations, and public input, and provide the next step in improving the success of compensatory mitigation projects within the Districts.

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Send comments on this Public Notice to:

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Persons to Contact with Project Specific Questions:

For answers to questions regarding the interpretation of these Mitigation and Monitoring Proposal Guidelines or acceptable compensatory mitigation for a specific project, contact the Corps Project Manager responsible for your area of interest:

San Francisco District Office general line	415-977-8436
Eureka Field Office general line	707-443-0855
Sacramento District Office general line	916-557-5250
Redding Office	530-223-9534
Reno Office	775-784-5304
Bountiful Office	801-295-8380
Colorado/Gunnison Basin Office	970-243-1199
Durango Office	970-375-9506
Frisco Office	970-668-9676
St. George Office	435-986-3979

Information Available on the Internet:

The Corps Regulatory websites also provide important information regarding Corps jurisdiction, processing of permit applications, mitigation design, vernal pools, riparian mitigation guidelines, conservation easements, operation and maintenance plans, dredging, etc.:

San Francisco District's site: www.spn.usace.army.mil/regulatory/
Sacramento District's site: www.spk.usace.army.mil/cespk-co/regulatory/

MITIGATION AND MONITORING PROPOSAL GUIDELINES

I. MITIGATION PRINCIPLES

In its comprehensive report entitled *"Compensating for Wetland Losses Under the Clean Water Act,"* the National Research Council (NRC) provided ten guidelines to aid in planning and implementing successful mitigation projects ("Operational Guidelines for Creating or Restoring Wetlands that are Ecologically Self-Sustaining"; NRC, 2001). Based upon these recommendations, the Corps and the Environmental Protection Agency (EPA) jointly produced a document to aid both the public and Corps field employees with preparation of mitigation proposals and plans to compensate for impacts to waters of the U.S. Based upon this document, the Districts have revised its mitigation guidelines. Please note that these guidelines pertain to creation, restoration and enhancement of aquatic resource systems. The content of the Corps-EPA document is included in this section entitled "Mitigation Principles" with this Public Notice to provide the basis for the Districts' proposal. Each of the ten guidelines can generally be described as A) basic requirement for mitigation success, or B) guide for mitigation site selection. The following sections include both the original text of the NRC guidelines, in italics, as well as a discussion of how applicants and field staff can incorporate these guidelines into the development and review of mitigation projects.

A. Basic Requirements for Success

When considering mitigation sites it is important to note that wetland mitigation is not an exact science and predictable results are not always obtainable. Having an adaptive management attitude is a necessity. One should incorporate experimentation into the mitigation plan when possible. This may mean using experimental plots within a mitigation site with different controls, replication, different treatments, inputs, etc., to determine if specific mitigation efforts are effectively meeting the desired goals. This requires detailed planning, effective implementation of the mitigation project, close monitoring (both short and long term) of the implemented plans and finally adjusting to intermediate results with an adaptive attitude and additional modifications to obtain long range wetland and watershed goals. In addition, researchers have found that restoration is the most likely type of mitigation to result in successful and sustainable aquatic resource replacement. Moreover, numerous studies in a variety of landscapes and watershed types have shown that of all factors contributing to mitigation success, attaining and maintaining appropriate hydrological conditions is the most important. The following NRC guidelines should be considered basic requirements for mitigation success.

1. Whenever Possible, Choose Wetland Restoration over Creation.

Select sites where wetlands previously existed or where nearby wetlands still exist. Restoration of wetlands has been observed to be more feasible and sustainable than creation of wetlands. In restored sites the proper substrate may be present, seed sources may be on-site or nearby, and the appropriate hydrological conditions may exist or may be more easily restored.

The U.S. Army Corps of Engineers (Corps) and Environmental Protection Agency (EPA) Mitigation Memorandum of Agreement states that, "because the likelihood of success is greater and the impacts to potentially valuable uplands are reduced, restoration should be the first option considered" (Fed. Regist. 60(Nov. 28):58605). The Florida Department of Environmental Regulation (FDER 1991a) recommends an emphasis on restoration first, then enhancement, and, finally, creation as a last resort. Morgan and Roberts (1999) recommend encouraging the use of more restoration and less creation.

The applicant proposes the type of mitigation. However, the Corps and other agencies will evaluate proposals based on the ease of completion and the likelihood of success. Therefore, pure wetland creation will be evaluated using very stringent criteria before being approved for use as compensatory mitigation for project impacts. Some projects may include creation as part of an overall mitigation effort that involves restoration, enhancement, and/or preservation (e.g., as in a proposed mitigation bank). In these cases, evaluation will be based on the entire proposal and its location in the watershed.

2. Avoid Over-Engineered Structures in the Wetland's Design

> *Design the system for minimal maintenance. Set initial conditions and let the system develop. Natural systems should be planned to accommodate biological systems. The system of plants, animals, microbes, substrate, and water flows should be developed for self-maintenance and self-design. Whenever possible, avoid manipulating wetland processes using approaches that require continual maintenance. Avoid hydraulic control structures and other engineered structures that are vulnerable to chronic failure and require maintenance and replacement. If necessary to design in structures, such as to prevent erosion until the wetland has developed soil stability, do so using natural features, such as large woody debris. Be aware that more specific habitat designs and planting will be required where rare and endangered species are among the specific restoration targets.*
>
> *Whenever feasible, use natural recruitment sources for more resilient vegetation establishment. Some systems, especially estuarine wetlands, are rapidly colonized, and natural recruitment is often equivalent or superior to plantings (Dawe et al. 2000). Try to take advantage of native seed banks, and use soil and plant material salvage whenever possible. Consider planting mature plants as supplemental rather than required, with the decision depending on early results from natural recruitment and invasive species occurrence. Evaluate on-site and nearby seed banks to ascertain their viability and response to hydrological conditions. When plant introduction is necessary to promote soil stability and prevent invasive species, the vegetation selected must be appropriate to the site rather than forced to fit external pressures for an ancillary purpose (e.g., preferred wildlife food source or habitat).*

The use of over-engineered structures and maintenance intensive plans for mitigation is not recommended and will be evaluated using very stringent criteria. If these types of plans are ultimately approved, they must include a comprehensive remedial plan and financial assurances [note that all mitigation projects should have remedial plans and financial assurances], along with a non-wasting endowment to insure that proper maintenance occurs.

It should also be noted that aggressive soil and planting plans using introduced plants and soil from outside sources must be closely monitored to prevent invasive plant takeovers and monotypic plant communities. Such failures can be minimized by undertaking both short-term and long-term monitoring, and having contingency plans in place.

3. Restore or Develop Naturally Variable Hydrological Conditions.

> *Promote naturally variable hydrology, with emphasis on enabling fluctuations in water flow and level, and duration and frequency of change, representative of other comparable wetlands in the same landscape setting. Preferably, natural hydrology should be allowed to become reestablished rather than finessed through active engineering devices to mimic a*

natural hydroperiod. When restoration is not an option, favor the use of passive devices that have a higher likelihood to sustain the desired hydroperiod over long term. Try to avoid designing a system dependent on water-control structures or other artificial infrastructure that must be maintained in perpetuity in order for wetland hydrology to meet the specified design. In situations where direct (in-kind) replacement is desired, candidate mitigation sites should have the same basic hydrological attributes as the impacted site.

Hydrology should be inspected during flood seasons and heavy rains, and the annual and extreme-event flooding histories of the site should be reviewed as closely as possible. For larger mitigation projects, a detailed hydrological study of the site should be undertaken, including a determination of the potential interaction of groundwater with the proposed wetland. Without flooding or saturated soils, for at least part of the growing season, a wetland will not develop. Similarly, a site that is too wet will not support the desired biodiversity. The tidal cycle and stages are important to the hydrology of coastal wetlands.

Natural hydrology is the most important factor in the development of successful mitigation. Wetlands and other waters are very dynamic, and dependent on natural seasonal and yearly variations that are unlikely to be sustainable in a controlled hydrologic environment. Artificial structures and mechanisms should be used only temporarily. Complex engineering and solely artificial mechanisms to maintain water flow normally will not be acceptable in a mitigation proposal. In those sites where an artificial water source (irrigation) has been used to attempt to simulate natural hydrology there are several problems that lead to reduced likelihood of success. First, artificial irrigation does not provide the dynamic and variable nature of water flow normally found in wetlands or riparian systems. Second, the lack of seasonal flows limits the transport of organic matter into and out of the wetland or riparian system. Without any inflow, the net result of artificial irrigation is transport of organic material out of the system. Third, depending on the timing, the use of flood or sprinkler systems on newly created or restoration sites often promotes the germination and growth of exotic plant species.

If artificial irrigation is permitted at all in a mitigation design, substantial financial assurances and a higher mitigation ratio will be required to offset the risk of failure. Applicants must weigh the potential investment costs of acquiring land suitable for restoration versus creation projects in upland environments that will likely involve higher long-term costs and greater risks of mitigation site failure.

The Corps may approve exceptions dealing with hydrologic manipulations, on a case-by-case basis in highly unusual circumstances. It should be noted, however, that even minor engineering or hydraulic manipulation requiring long-term maintenance will only be approved after the applicant posts a non-wasting endowment, performance bond, or other financial assurance.

4. Consider Complications Associated with Creation or Restoration in Seriously Degraded or Disturbed Sites

A seriously degraded wetland, surrounded by an extensively developed landscape, may achieve its maximal function only as an impaired system that requires active management to support natural processes and native species (NRC 1992). It should be recognized, however, that the functional performance of some degraded sites may be optimized by mitigation, and these considerations should be included if the goal of the mitigation is water- or sediment-quality improvement, promotion of rare or endangered species, or other objectives best served by locating a wetland in a disturbed landscape position. Disturbance that is intense,

unnatural, or rare can promote extensive invasion by exotic species or at least delay the natural rates of redevelopment. Reintroducing natural hydrology with minimal excavation of soils often promotes alternative pathways of wetland development. It is often advantageous to preserve the integrity of native soils and to avoid deep grading of substrates that may destroy natural belowground processes and facilitate exotic species colonization (Zedler 1996).

When considering restoration options it is necessary to determine the spatial and temporal scale of the damage: is the damage limited to the water body itself, or is it a predominant characteristic of the watershed or the surrounding landscape? On-site damage may be restorable, whereas regional-scale damage may be more difficult, or impossible, to reverse or obtain historic conditions. Alternate goals may be necessary in order to determine specific goals of the restoration project. Those desired wetland mitigation goals will depend on the resources needed, the level of degradation and realistic mitigation targets as reflected by the watershed and surrounding landscape. This issue points to the importance of evaluating mitigation plans from a broader watershed perspective.

5. Conduct Early Monitoring as Part of Adaptive Management

Develop a thorough monitoring plan as part of an adaptive management program that provides early indication of potential problems and direction for correction actions. The monitoring of wetland structure, processes, and function from the onset of wetland restoration or creation can indicate potential problems. Process monitoring (e.g., water-level fluctuations, sediment accretion and erosion, plant flowering, and bird nesting) is particularly important because it will likely identify the source of a problem and how it can be remedied. Monitoring and control of non-indigenous species should be a part of any effective adaptive management program. Assessment of wetland performance must be integrated with adaptive management. Both require understanding the processes that drive the structure and characteristics of a developing wetland. Simply documenting the structure (vegetation, sediments, fauna, and nutrients) will not provide the knowledge and guidance required to make adaptive "corrections" when adverse conditions are discovered. Although wetland development may take years to decades, process-based monitoring might provide more sensitive early indicators of whether a mitigation site is proceeding along an appropriate trajectory.

There are many factors that may positively or negatively influence aquatic resources and the functions they provide, such as urbanization, farming or grazing. Wetlands and other aquatic resources are often subject to a wide range and frequency of events such as floods, fires and ice storms. As with all natural systems, some things are beyond control. Well-crafted mitigation plans, however, recognize the likelihood of these events and attempt to plan for them, primarily through monitoring and adaptive management. In addition, it is important to realize the mobile nature of wetlands and streams. They change over time and over the landscape in response to internal and external forces.

Monitoring and adaptive management should be used to evaluate and adjust maintenance (e.g., predator control, irrigation), and design remedial actions. Adaptive management should consider changes in ecological patterns and processes, including biodiversity of the mitigation project as it evolves or goes through successional stages. Trends in the surrounding area must also be taken into account (i.e., landscape/watershed context). Being proactive helps ensure the ultimate success of the mitigation, and improvement of the greater landscape. One proactive methodology is incorporation of experimentation into the mitigation plan when possible, such as using

experimental plots within a mitigation site with different controls, replication, different treatments, inputs, etc., to determine if specific mitigation efforts are meeting the desired goals.

B. Mitigation Site Selection

The selection of an appropriate site to construct a mitigation project is one of the most important, yet often under-evaluated, aspects of mitigation planning. In many instances, the choice of the mitigation site has been completed by the applicant based solely on economic considerations with minimal concern for the underlying physical and ecological characteristics of the site. While economic factors are important in determining the practicability of site selection, current technology and the following NRC guidelines should also factor into the selection of a mitigation site.

1. Consider the Hydrogeomorphic and Ecological Landscape and Climate

Whenever possible, locate the mitigation site in a setting of comparable landscape position and hydrogeomorphic class. Do not generate atypical "hydrogeomorphic hybrids"; instead, duplicate the features of reference wetlands or enhance connectivity with natural upland landscape elements (Gwin et al. 1999).

Regulatory agency personnel should provide a landscape setting characterization of both the wetland to be developed and, using comparable descriptors, the proposed mitigation site. Consider conducting a cumulative impact analysis at the landscape level based on templates for wetland development (Bedford 1999). Landscapes have natural patterns that maximize the value and function of individual habitats. For example, isolated wetlands function in ways that are quite different from wetlands adjacent to rivers. A forested wetland island, created in an otherwise grassy or agricultural landscape, will support species that are different from those in a forested wetland in a large forest tract. For wildlife and fisheries enhancement, determine if the wetland site is along ecological corridors such as migratory flyways or spawning runs. Constraints also include landscape factors. Shoreline and coastal wetlands adjacent to heavy wave action have historically high erosion rates or highly erodible soils, and often-heavy boat wakes. Placement of wetlands in these locations may require shoreline armoring and other protective engineered structures that are contrary to the mitigation goals and at cross-purposes to the desired functions

Even though catastrophic events cannot be prevented, a fundamental factor in mitigation plan design should be how well the site will respond to natural disturbances that are likely to occur. Floods, droughts, muskrats, geese, and storms are expected natural disturbances and should be accommodated in mitigation designs rather than feared. Natural ecosystems generally recover rapidly from natural disturbances to which they are adapted. The design should aim to restore a series of natural processes at the mitigation sites to ensure that resilience will have been achieved.

Watershed management requires thinking in terms of multiple spatial scales: the specific wetland or stream itself, the watershed that influences the wetland/stream, and the greater landscape. The landscape in which a wetland or water exists, defines its hydrogeologic setting. The hydrogeologic setting in turn controls surface and sub-surface flows of water, while a variety of hydrogeologic settings results in biological and functional diversity of aquatic resources.

There are three aspects of watershed management that the applicant must address in a mitigation plan: hydrogeomorphic considerations, the ecological landscape, and climate. It should be noted that the overall goal of compensatory mitigation is to replace the functions being lost (functional equivalency) due to a permitted Section 404 activity. By evaluating the hydrogeomorphic setting, ecological landscape and climate, one can determine which attributes can be manipulated (i.e. hydrology, topography, soil, vegetation or fauna) to restore, create or enhance viable aquatic functions.

Hydrogeomorphic considerations refers to the source of water and the geomorphic setting of the area. For example, a riverine wetland receives water from upstream sources in a linear manner, whereas vernal pools exist as relatively closed depressions underlain by an impermeable layer that allows rainfall runoff from a small watershed to fill the pool during specific times of year. Applicants should strive to replicate the hydrogeomorphic regime of the impacted water to increase the potential that the mitigation site mimics the functions lost. Only as a last resort, should applicants prepare plans for constructing wetlands using artificial water sources or placing wetlands into non-appropriate areas of the landscape. In such cases, there should be a contingency plan to prepare for unanticipated events or failures.

Ecological landscape describes the location and setting of the wetland/water in the surrounding landscape. For example, attempting to place mitigation in a dissimilar ecological complex than that of the impacted water is expected to result in a wetland/water unlikely to replicate the functions of the wetland/water that was lost. In all cases, the applicant should evaluate the historical ecological landscape of the mitigation site; for example, if there had been large areas of forested wetland in an agricultural area, then replacement of a forested wetland may be appropriate given other factors that should be considered. In most cases, applicants should plan for a mitigation area that fits best within the ecological landscape of the watershed or region of the mitigation site. Applicants should also consider constructing mitigation sites with more than one type of wetland/water regime, if appropriate, to provide for landscape diversity.

Climate also affects mitigation and is clearly beyond the control of the applicant. Therefore, the mitigation site should be sited in an area supported by the normal rainfall, subsurface and/or groundwater in the region. Climate considerations also can impact other hydrologic issues, sediment transport factors and other factors affecting attainment of desired functions. While climate cannot be manipulated, applicants need to account for it in mitigation plans, including local and regional variability and extremes.

2. Adopt a Dynamic Landscape Perspective

> *Consider both current and future watershed hydrology and wetland location. Take into account surrounding land use and future plans for the land. Select sites that are, and will continue to be, resistant to disturbance from the surrounding landscape, such as preserving large buffers and connectivity to other wetlands. Build on existing wetland and upland systems. If possible, locate the mitigation site to take advantage of refuges, buffers, green spaces, and other preserved elements of the landscape. Design a system that utilizes natural processes and energies, such as the potential energy of streams as natural subsidies to the system. Flooding rivers and tides transport great quantities of water, nutrients, and organic matter in relatively short time periods, subsidizing the wetlands open to these flows as well as the adjacent rivers, lakes, and estuaries.*

Applicants should consider both current and expected future hydrology (including effects of any proposed manipulations), sediment transport, locations of water resources, and overall watershed

functional goals before choosing a mitigation site. This is extremely critical in watersheds that are rapidly urbanizing; changing infiltration rates can modify runoff profiles substantially, with associated changes in sediment transport, flooding frequency, and water quality. More importantly, this factor encourages applicants to plan for long-term survival by placing mitigation in areas that will remain as open space and not be severely impacted by clearly predictable development. Consideration of the landscape perspective requires evaluation of buffers and connectivity (both hydrologic- and habitat-related). Buffers are particularly important to insure that changing conditions are ameliorated, especially in watersheds that have been, or are in the process of being, heavily developed. In addition, because wetlands are so dynamic, adequate buffers and open space upland areas are vital to allowing for wetlands to "breath" (expand and/or decrease in size and function) and migrate within the landscape, particularly in watersheds under natural and/or man-made pressures.

3. Pay Attention to Subsurface Conditions, Including Soil and Sediment Geochemistry and Physics, Groundwater Quantity and Quality, and Infaunal Communities.

> *Inspect and characterize the soils in some detail to determine their permeability, texture, and stratigraphy. Highly permeable soils are not likely to support a wetland unless water inflow rates or water tables are high. Characterize the general chemical structure and variability of soils, surface water, groundwater, and tides. Even if the wetland is being created or restored primarily for wildlife enhancement, chemicals in the soil and water may be significant, either for wetland productivity or bioaccumulation of toxic materials. At a minimum, these should include chemical attributes that control critical geochemical or biological processes, such as pH, redox, nutrients (nitrogen and phosphorus species), organic content and suspended matter.*

Knowledge of the physical and chemical properties of the soil and water at the mitigation site is also critical to choice of location. For example, to mitigate for a saline wetland, without knowing the properties of the soil and water sources at the mitigation site, it is unlikely that such a wetland is restorable or creatable. Certain plants are capable of tolerating some chemicals and actually thrive in those environments, while others plants have low tolerances and quickly diminish when subjected to water containing certain chemicals, promoting monotypic plant communities. Planning for outside influences that may negatively affect the mitigation project can make a big difference as to the success of the mitigation efforts and meeting watershed objectives.

4. Pay Particular Attention to Appropriate Planting Elevation, Depth, Soil Type, and Seasonal Timing

> *When the introduction of species is necessary, select appropriate genotypes. Genetic differences within species can affect wetland restoration outcomes, as found by Seliskar (1995), who planted cordgrass (Spartina alterniflora) from Georgia, Delaware, and Massachusetts into a tidal wetland restoration site in Delaware. Different genotypes displayed differences in stem density, stem height, belowground biomass, rooting depth, decomposition rate, and carbohydrate allocation. Beneath the plantings, there were differences in edaphic chlorophyll and invertebrates.*
>
> *Many sites are deemed compliant once the vegetation community becomes established. If a site is still being irrigated or recently stopped being irrigated, the vegetation might not survive. In other cases, plants that are dependent on surface-water input might not have developed deep root systems. When the surface-water input is stopped, the plants decline and eventually die, leaving the mitigation site in poor condition after the Corps has certified*

the project as compliant.

A successful mitigation plan needs to consider soil type and source, base elevation and water depth, plant adaptability and tolerances, and the timing of water input. When possible: a) use local plant stock already genetically adapted to the local environment; b) use stock known to be generally free from invasive or non-native species; c) use soil banks predetermined to have desirable seed sources; d) choose soil with desirable characteristics (e.g., high clay composition and low silt and sand

composition for compaction purposes); e) determine \final bottom elevations to insure that targeted water regimes are met and the planned plant community can tolerate the water depth, frequency of inundation and quality of water sources.

It is particularly helpful to examine reference wetlands and/or waters near the mitigation area, in order to identify typical characteristics of sustainable waters in a particular watershed or region. This allows one to determine the likelihood of certain attributes developing in a proposed mitigation site. It should be emphasized that wetland restoration is much more likely to achieve desired results than wetland creation, as evidence of a previously existing wetland or other aquatic resource is a strong indicator of what will return, given the proper circumstances Historical data for a particular site, if available, can also help establish management goals and monitoring objectives. Creating wetlands from uplands has proven to be difficult and often requires extensive maintenance.

5. Provide Appropriately Heterogeneous Topography

> *The need to promote specific hydroperiods to support specific wetland plants and animals means that appropriate elevations and topographic variations must be present in restoration and creation sites. Slight differences in topography (e.g., micro- and meso-scale variations and presence and absence of drainage connections) can alter the timing, frequency, amplitude, and duration of inundation. In the case of some less-studied, restored wetland types, there is little scientific or technical information on natural microtopography (e.g., what causes strings and flarks in patterned fens or how hummocks in fens control local nutrient dynamics and species assemblages and subsurface hydrology are poorly known). In all cases, but especially those with minimal scientific and technical background, the proposed development wetland or appropriate example(s) of the target wetland type should provide a model template for incorporating microtopography.*
>
> *Plan for elevations that are appropriate to plant and animal communities that are reflected in adjacent or close-by natural systems. In tidal systems, be aware of local variations in tidal flooding regime (e.g., due to freshwater flow and local controls on circulation) that might affect flooding duration and frequency.*

While manipulations of natural water supply may not be possible or desirable, changes in topography are possible and should be incorporated in the design of a restored or created wetland/water when needed. Varying the depths of the substrate of the mitigation area ensures a heterogeneous topography, decreasing the likelihood of homogenous plant communities. Rather than plan on one water level or one elevation of the substrate, in hopes of establishing a specific plant community, it is best to vary the depth of the bottom stratum. This will increase the likelihood of success for a more diverse targeted plant community and desired functions.

II. MITIGATION DEVELOPMENT GUIDELINES

After the applicant has demonstrated maximum avoidance and minimization of project impacts to waters of the U.S., the Corps Districts will likely require compensatory mitigation for the unavoidable impacts. There are often many options for providing compensatory mitigation, but the applicant should investigate and consider Corps-approved mitigation banks and in-lieu fee programs serving the area where the proposed impacts would occur. On-site compensatory mitigation could be impracticable, if the established, restored, enhanced, and/or preserved habitat would be isolated, of small acreage, or experience substantial changes in hydrologic condition over the long term. With many Corps-approved mitigation banks and in-lieu fee mitigation programs, the responsible entity (e.g., conservancy) has analyzed the type(s) of habitat and location(s) that would benefit the region or watershed(s) within the bank or program's service area. In these cases, the purchase of mitigation credits in existing banks or the payment of in-lieu fees could provide a more practicable option, which could also enhance the regional or watershed's aquatic resources. However, the Corps will make the final decision whether to accept purchase of credits from a Corps-approved mitigation bank or in-lieu fee mitigation program, after examination of all relevant habitat considerations, including landscape-level issues, such as wildlife corridors and water quality.

The compensatory mitigation will proceed through several stages, if satisfying the requirement involves the construction of a compensatory mitigation project. In these cases, there are specific issues the applicant must address at each stage in the process, to increase the probability of a successful compensatory mitigation project. The key stages in the development of a compensatory mitigation project are (A) Project Site Impact Assessment, (B) Compensatory Mitigation Site Selection, (C) Compensatory Mitigation Site Design, (D) Compensatory Mitigation Site Construction and (E) Long-Term Compensatory Mitigation Site Maintenance and Monitoring.

Within each of these areas, the Corps has identified specific concerns that the applicant needs to consider in developing an adequate compensatory mitigation and monitoring plan. The Corps strongly recommends that all applicants follow the outline and guidelines provided in Appendix A and B when preparing draft and final compensatory mitigation and monitoring plans.

A. Project Site Impact Assessment

1. An important aspect of any permit application is the assessment of the project site before impacts occur. An adequate assessment of the current functions and values before the construction of the project is important for determining the relative importance of the aquatic resources to the site and to the region or watershed. Assessment results can provide a basis for modifying pre-construction plans to avoid and/or minimize impacts to these resources. This assessment should be completed before the proposed project is designed or the proposed compensatory mitigation site is selected.

B. Compensatory Mitigation Site Selection

1. The selection of an appropriate site upon which to construct a compensatory mitigation project has been one of the most neglected aspects of compensatory mitigation planning. In the past, many applicants have relied on project economics to choose compensatory mitigation sites, without considering the underlying physical characteristics. In all wetland/waters compensatory mitigation projects, hydrology is the most important consideration.

The National Research Council's *Compensating for Wetland Losses Under the Clean Water Act* (2001) stated that hydrological conditions, including variability in water levels and flow rates, are the primary driving force influencing wetland development, structure, functioning, and persistence. Without a

naturally variable source of water (e.g., stream, lake, tidal action), many of the hydrologic functions or processes will occur at low levels. Lack of a natural water source has been the number one physical factor leading to the low rate of success of past compensatory mitigation projects. Therefore mitigation projects that rely on artificial hydrology are generally unacceptable.

2. Site selection should include and prioritize the following criteria, which relate to aspects of the physical environment:

a. *Natural Hydrology*. Natural hydrology can be exceedingly difficult to establish. The successful determination of proper hydrology will require analysis of existing conditions in reference sites and hydrologic surveys of the possible compensatory mitigation sites. This testing should include an examination of the groundwater availability, frequency of flooding, depth/duration/timing of flooding, and/or determination of tidal ranges in estuarine and marine areas. Modification of hydrologic characteristics should be kept to a minimum with the stated goal to have the site be hydrologically and hydraulically self-sustaining and require little or no long-term maintenance.

b. *Wildlife Corridors*. Where possible develop compensatory mitigation projects adjacent to existing high-quality habitats. Even more desirable would be the construction of a compensatory mitigation site that links two or more habitats, which had been previously separated.

c. *Soil Characteristics*. Many past compensatory mitigation projects did not address the development of suitable soils. Examination of existing reference sites will provide important information on the target habitat. Thorough assessments of mitigation site soils should be conducted to determine the site's suitability for supporting the target habitat. In the case of in-kind compensatory mitigation for wetlands, soils from the impacted aquatic habitat can be and is sometimes encouraged to be collected and used at the compensatory mitigation site.

3. Generally, the physical characteristics of the sites considered determine whether establishment (i.e., creation), restoration, enhancement, or, more rarely, preservation are viable compensatory mitigation options. The categories of compensatory mitigation are:

Restoration:	Returning historic functions to a former or degraded jurisdictional area.
Creation (Establishment):	Conversion of an upland into wetland or other aquatic habitat.
Enhancement:	Manipulation of a degraded aquatic habitat to heighten, intensify or improve specific functions.
Preservation:	Permanent removal of land, including jurisdictional areas, from potential future development or other ecologically incompatible activity. This term includes the purchase of land or easements. Preservation does not result in a gain of jurisdictional acreage and therefore will only be accepted in exceptional circumstances.

C. Compensatory Mitigation Site Design

1. Design of the compensatory mitigation project is highly dependent on the site selected. As discussed in the previous section, interaction with a natural source of hydrology is essential to the development of a high-functioning, sustainable compensatory mitigation site. Therefore, the design should focus on ensuring this interaction emulates what is occurring at a reference site for the target habitat type(s). A reference site is a functioning aquatic system containing habitat that functions equal to or preferably better than the impact site and should be used to guide both the mitigation design and the success criteria of the final compensatory mitigation plan. The reference site may be the impact site or a similar site near the proposed mitigation site that supports the target habitat.

2. There are several important features to any successful compensatory mitigation design or plan. Each aspect of the plan must be identified in detail and explained clearly. Although there may be variation in the number of items required for a particular plan, those identified below should be assumed to be the minimum. When preparing a draft or final compensatory mitigation and monitoring plan, the Corps strongly recommends that the regulated public follow the format provided at end of Section C., which is an updated version of the annotated outline provided in the 1993 Habitat Mitigation and Monitoring Guidelines. This format has proven to be useful to the regulated public and to the Corps during the past decade.

a. *Clearly define the purpose of the compensatory mitigation project.* The purpose of the compensatory mitigation project shall be **clearly** identified and include specific statements about the type(s) of habitat (and associated functions and values) impacted by constructing the proposed project, the functions and values that would be replaced at the proposed compensatory mitigation site, and any other functions and/or values that are desired (e.g., endangered species habitat, water quality functions, etc.).

b. *Develop a comprehensive hydrology component.* Project success depends on having sufficient knowledge about the depth, duration, and timing of water delivery to the compensatory mitigation site. This section should include information about any existing channels, historic flow rates, surface and groundwater level fluctuations, tidal regimes (if relevant), and topography of the compensatory mitigation site (i.e., before and after any proposed grading). Provide information about the amount and the variability of water available to the site in an average rain year (October 1 – May 30). If available, include information on the depth of the water table variability throughout the year, water rights availability, and/or use of storm water as the hydrologic source.

c. *Develop a complete grading plan making use of the hydrology data.* Elevations are critical to design success; grading plans should depict no coarser than 0.5-foot contours. Topographic variation should often be incorporated into the design to maximize habitat diversity. Examine adjacent or nearby viable habitats as a reference.

d. *Determine the Adequacy of the Soils to Support the Target Habitat Types.* Identify existing soil type(s) before and after grading. It is important to consider whether the soils are of the appropriate texture to support the target habitat. Determine whether other soil amendments will be necessary for long-term habitat development (e.g., organic matter, nitrogen, etc.).

e. *Develop a draft plant palette based on the compensatory mitigation project purpose,*

soil types, and hydrology. Identify tree, shrub, and herbaceous species to be planted, the source of the material, and the number and size of individual plants. Plant stock should be obtained from areas as near to the compensatory mitigation site as possible, to preserve the genetic integrity of the area.

f. *Propose realistic success criteria based on the purpose of the compensatory mitigation, design of the site, and functional assessment criteria.* Develop measurable success criteria, consistent with the purpose and goals of the compensatory mitigation project, that are achievable by the end of the maintenance and monitoring period (generally five years to ten years). Success criteria in compensatory mitigation projects have included percent canopy cover, percent plant survival, percent of native species, percent canopy cover, period of inundation, development of hydric soil indicators, stability of designed hydrologic features, wildlife usage and plant heights.

g. *Develop a Specific Maintenance and Monitoring Program Including Contingency Measures.* Detail how often, when and who will monitor the compensatory mitigation site. Propose dates that monitoring reports will be provided to the Corps. Also provide specifics regarding the type, timing and responsible parties of maintenance. Describe the conditions that would necessitate the responsible parties to undertake contingency measures, and what sources of funding and alternate compensatory mitigation sites are available to ensure the required compensatory mitigation occurs successfully.

3. In general, the Corps prefers that the compensatory mitigation site be constructed prior to or concurrently with the project construction. If compensatory mitigation will not be constructed until after project impacts, the Corps will likely increase the replacement ratio, to minimize temporal losses of functions and values associated with project impacts.

D. Compensatory Mitigation Site Construction

1. The applicant will not begin construction until the Corps approves the final compensatory mitigation and monitoring plan. The implementation process will normally require on-site management of construction personnel by one or more of the applicant's representatives, who have complete knowledge of the compensatory mitigation and monitoring plan and some understanding of soil science, hydrology, and botany, horticulture, or plant ecology. Sensitive areas should be staked or flagged to preclude unauthorized construction impacts. The use of orange (or other highly visable color) construction fencing is recommended. The applicant is responsible for the successful implementation of the compensatory mitigation. Any significant deviations identified during construction must be approved by the Corps. Additionally, consideration should be given to exotic species control during site preparation to minimize future maintenance and insure successful mitigation. Personnel should consider removal of exotic species prior to grading and take invasive plant material from the site; in some circumstances, it may be necessary to remove the exotic seed banks by scraping and disposing the top few inches of soil.

2. Provide as-built drawings to the Corps and other interested resource agencies within **45** days after completion of construction. On these drawings, identify the date the compensatory mitigation site construction was completed and if there were any deviations from the approved compensatory mitigation plan.

E. Long-Term Compensatory Mitigation Site Maintenance and Monitoring

1. After the site has been graded and planted, the maintenance and monitoring phase of the compensatory mitigation project begins immediately. There are many invasive, non-native plant species that will readily colonize a recently disturbed site. A proactive program to remove invasive, exotic plants upon discovery is usually advisable to allow establishment of desirable native vegetation. As the native vegetation becomes established, the need for invasive plant species removal will likely lessen.

2. An important aspect of the maintenance and monitoring phase of nearly all compensatory mitigation projects is ensuring the appropriate depth, duration, and timing of onsite water. It is recommended that the applicant compare hydrologic information at the compensatory mitigation site to reference (i.e., high-functioning) sites in the region.

3. Note that contingency measures should be considered in mitigation site design. If performance standards are not met for all or any portion of the compensatory mitigation project in any year, or if the approved success criteria are not met, the permittee will be required to prepare an analysis of the cause(s) of failure(s) and propose remedial actions for approval. Contingency measures could include selection of an alternative location.

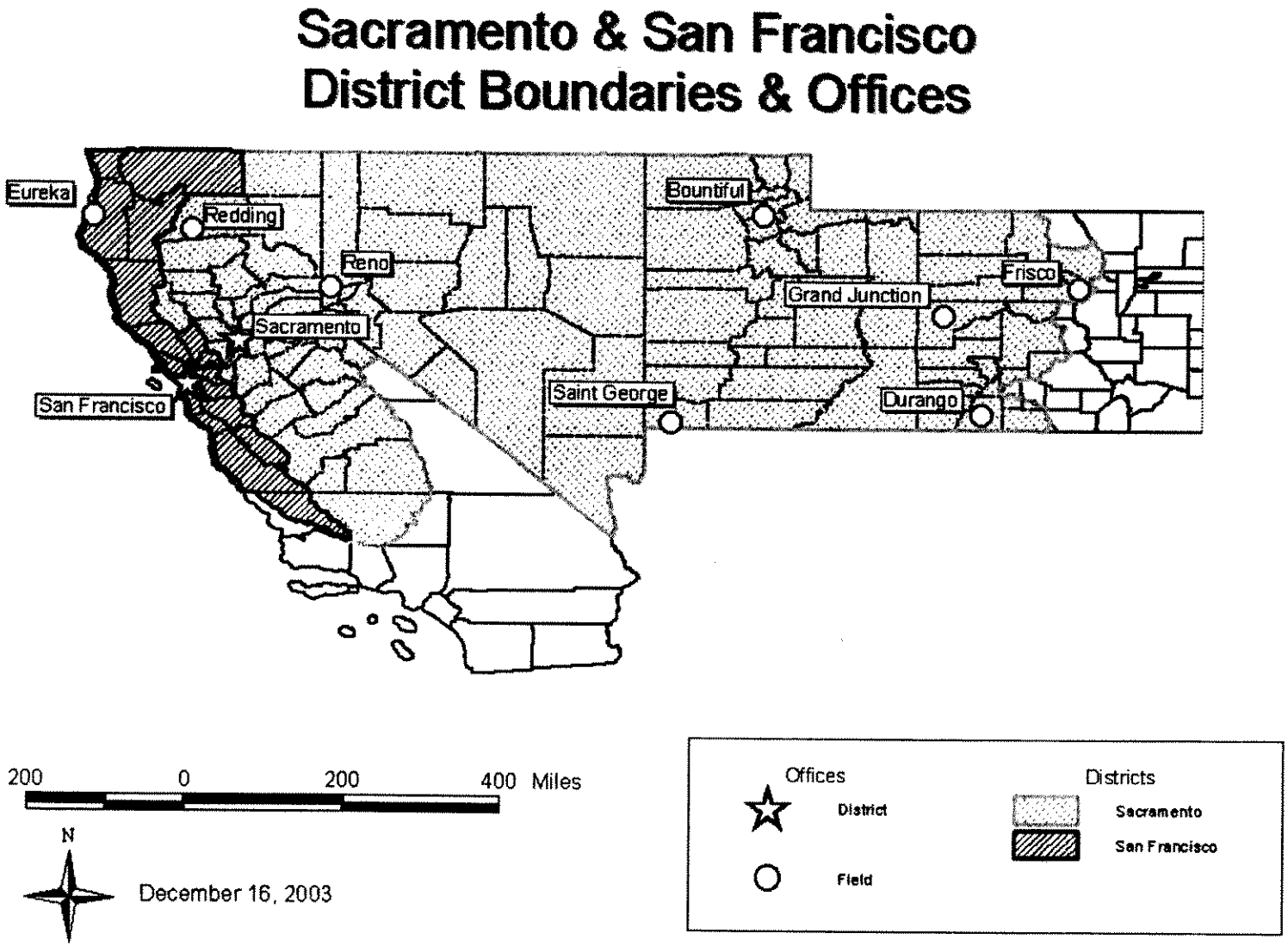
4. Monitoring reports are required for all mitigation sites. The Corps strongly recommends that the required monitoring reports be a minimum of six pages and a maximum of eight pages. Appendix C provides an outline of what content should be provided in the specific pages of the monitoring report. The Corps recognizes there may be cases where this outline would not be practical (for very small, large, or complex compensatory mitigation projects). However, in the majority of cases, this outline should be followed. Failure to submit complete and timely monitoring reports could result in suspension of the permit or requirements for additional compensatory mitigation. Non-compliance with Corps permit conditions, which can result in additional compensatory mitigation requirements, may be subject to the Corps' Enforcement Procedures (33 CFR 326).

F. Long-Term Site Management

1. Protection of mitigation sites is usually required "in perpetuity" in keeping with the mitigation goals. The Habitat Mitigation and Monitoring Plan should include the identification of a long-term manager / owner (usually a non-profit or a governmental agency), a conservation easement or other documentation of long-term protection and a well designed Long Term Management Plan.

2. The permittee is usually required to provide a realistic endowment to cover long-term maintenance activities.

Figure 1: Sacramento and San Francisco Districts



APPENDIX A1: HABITAT AND MONITORING PROPOSAL GUIDELINES - RECOMMENDED TABLE OF CONTENTS, OUTLINE FORM

I. Summary

II. Responsible Parties
   - A. Applicant / permittee
   - B. Entity(ies) having financial responsibility for mitigation
   - C. Applicant's designated agent (if any)
   - D. Preparer(s) of the proposal/plan

III. Project Requiring Mitigation
   - A. Location
   - B. Brief summary of overall project
   - C. Jurisdictional area(s) affected by project:
     - i. Size and location maps
     - ii. Hydrology / topography
     - iii. Soils
     - iv. Vegetation
     - v. Wildlife habitat / use
     - vi. Threatened / endangered species

IV. Mitigation Design
   - A. Basis for design
   - B. Characteristics of design reference site (if different from impact site)
     - i. Location
     - ii. Hydrology / topography
     - iii. Soils
     - iv. Vegetation
     - v. Wildlife habitat/use
   - C. Proposed mitigation site
     - i. Location
     - ii. Ownership status
       - 1. Present
       - 2. Future
     - iii. Jurisdictional areas (if any)
     - iv. Hydrology / topography
     - v. Soils
     - vi. Vegetation
     - vii. Wildlife habitat / use
     - viii. Present and historical uses of mitigation area
     - ix. Present and proposed uses of all adjacent areas
   - D. Habitat(s) to be created/restored
     - i. Compensation ratios
     - ii. Long-term goal(s)
     - iii. Hydrology / topography
     - iv. Vegetation
     - v. Wildlife habitat
   - E. Performance criteria and monitoring
     - i. Performance criteria
     - ii. Monitoring

1. Methods
2. Monitoring schedule
3. Photo-documentation

V. Implementation Plan
- A. Site preparation
  - i. Grading implementation
  - ii. Soil disposal
  - iii. Soil treatment
  - iv. Pest plant removal
  - v. Construction monitor
- B. Planting / seeding
  - i. Planting plan
  - ii. Nature and source of propagules
  - iii. Planting/seeding methods
- C. Irrigation
- D. Implementation schedule

VI. Maintenance During Monitoring Period
- A. Maintenance activities
  - i. Overall
  - ii. Pest species control
- B. Maintenance schedule
- C. Responsibility for maintenance

VII. Reports
- A. As-builts
- B. Annual reports
  - i. File number
  - ii. Content
    1. Years of full monitoring
    2. Years of partial monitoring, where appropriate
    3. Due date

VIII. Potential Contingency Measures
- A. Initiating procedures
- B. Contingency funding mechanism

IX. Completion of Mitigation Responsibilities
- A. Notification
- B. Corps confirmation

APPENDIX A2: HABITAT AND MONITORING PROPOSAL GUIDELINES - RECOMMENDED TABLE OF CONTENTS, DETAILED FORM

I. Summary

Provide a brief (one page or so) summary of the project and mitigation proposal.

II. Responsible Parties

Provide name(s), title(s), adrdress(es), and phone number(s) of responsible party(ies) including contact person(s).

a. Applicant/Permittee: (Note: the project proponent , not consultant, is to be identified here.
b. Entity(ies) having financial responsibility for mitigation: (i.e. for implementation of compensatory mitigation and attainment of success criteria, if different from "A,")
c. Applicant's designated agent (if any)
d. Preparer(s) of the proposal/plan

III. Project Requiring Mitigation

a. Location: Describe location and provide: 1) road map with site location clearly shown, and 2) USGS quad map with project site outlined. Entire watershed for impact site should be shown.
b. Brief summary of overall project: In a few paragraphs, describe the overall project for which a permit or authorization is required. Include type of development (or other work), project size, and a brief projected schedule of project construction.
c. Jurisdictional area(s) affected by project:
    i. Size and location maps – Identify those jurisdictional areas to be directly or indirectly affected by the project. Provide an appropriately sized topo base map with jurisdictional areas and impacts clearly shown. Indicate on the map whether the jurisdictional areas are "wetlands" and/or "other waters." Also provide a table indicating acreage of wetland impacts by habitat type/zone and linear feet of impacts to streams and/or tributaries.
    ii. Hydrology/Topography – Describe hydrology and topography, including slope ratios of wetlands and stream banks, and identify the source(s) of water for the site. Indicate groundwater level(s) if known and significant pollutants.
    iii. Soils – Describe texture (sand, silt, clay, loam), organic content, structure (e.g. granular, compacted) and permeability.
    iv. Vegetation – Describe plant communities on impact site.
    v. Wildlife Habitat / Use – Describe observed/expected animal use and/or habitat values of site.
    vi. Threatened/Endangered Species – Identify any federally-listed (including proposed) species found on site for which suitable habitat is present, including whether the site is within designated critical habitat.

IV. Mitigation Design

a. Basis for design: Provide a brief summary of the rationale for choosing the proposed type(s) of mitigation and the proposed locations(s)
b. Characteristics of design reference site (if different from impact site): A design reference site is a site on which the mitigation plan is based
    i. Location – Describe location and provide: a) road map with site location clearly shown, and b) USGS quad map with project site outlined. Entire watershed supplying impact site should be shown (major rivers, tidal sites, etc. excluded). Clear photocopies are acceptable.
    ii. Hydrology/Topography – Describe hydrology and topography, including slope ratios,

and identify the source(s) of water for the site. Indicate groundwater level(s) if known.

iii. Soils – Describe texture (sand, silt, clay, loam), organic content, structure (e.g. granular, compacted) and permeability.

iv. Vegetation – Describe plant communities on site, including all information pertinent to the design of the mitigation plan.

v. Wildlife habitat/use – Describe observed/expected animal use and/or habitat values of site, including endangered species.

c. Proposed Mitigation Site

i. Location – Describe location, indicating distance from project site, if any. Provide the following maps: a) site location on a road map, b) original or copy of USGS quad map with mitigation location outlined (see Appendix B for format information).

ii. Ownership status –

1. Present - Indicate who owns the proposed mitigation site. If different from permit applicant(s), what is the availability of the property?

2. Future – Indicate expected ownership of the mitigation area following completion of mitigation project. If an entity other than the applicant will assume management responsibilities following completion of the mitigation project, arrangements must be made to ensure that the area will be managed in an appropriate manner. A conservation easement is usually required. It may also be necessary to produce a signed acknowledgement by which a subsequent manager would indicate familiarity with the mitigation plan and make a commitment to manage the area in conformance with the goals of that plan should be submitted for review. (A signed document, evidence of entry of a deed restriction, or other means of protection may be required prior to permit issuance.)

iii. Jurisdictional areas (if any) - If jurisdictional areas are present on the mitigation site, describe, and provide, as appropriate, a Corps approved[1] jurisdictional map of the site. Indicate what portions of the jurisdictional areas, if any, are to be filled and/or altered under the mitigation proposal. Using designations from Appendix D (Habitat Types) and Cowardin descriptors, provide a table showing acreage of each habitat type lost at the impact site.

iv. Hydrology/Topography - Describe existing hydrology and topography, including slope rations, and identify the source(s) of water for the site. Indicate groundwater level(s) if known.

v. Soils - Describe texture (sand, silt, clay, loam), organic matter, structure (e.g. granular, compacted), and permeability.

vi. Vegetation - Describe plant communities on site, including all information pertinent to the design of the mitigation plan.

vii. Wildlife habitat/use - Describe observed/expected animal use and/or habitat values of site, including endangered species.

viii. Present and historical uses of mitigation area - Briefly describe all known present and historical uses of mitigation area. Include any pipelines, powerlines, roads, encroachments, or easements. Also show distance and location of nearest structures, if any, on the mitigation property or on any properties adjoining the mitigation project, in relation to the proposed mitigation location. Give all present and proposed zoning designations for mitigation site, including city, county.

ix. Present and proposed uses of all adjacent areas - Briefly describe all known present and proposed uses and zoning designations of all property sharing a common border with the proposed mitigation site.

d. Habitat(s) to be Created/Restored

i. Compensation ratios – Indicate the ratio(s) of impact wetland acreage and linear feet of

channel to compensation acreage and linear feet of channel, both overall, and by habitat type.

ii. Long-term goal(s) – Describe the target habitat to be created/restored. Most mitigation designs are aimed at a habitat with certain characteristics that will not exist at the site until long after the monitoring period has ended. Please describe the projected state of the mitigation area in 10 to 30 years following implementation.

iii. Hydrology/Topography – Describe design hydrology and topography, including slope ratios, and identify the source(s) of water for the site.

iv. Vegetation – Describe target plant communities and species.

v. Wildlife Habitat – Describe expected animal use and/or habitat values of site, including endangered species.

e. Success Criteria and Monitoring

[Format Note: Criteria and monitoring methods should be presented in both text and table formats. See Appendix B for more information.]

i. Performance Criteria – Performance criteria are used to determine completion of a permittee's mitigation responsibilities and are proposed by the applicant for Corps approval. Fulfillment of these criteria should indicate that the mitigation area is progressing well toward the habitat characteristics, functions, and values that constitute the long-term goals of the mitigation.The criteria should address each major aspect of the project, including hydrological performance, establishment of appropriate vegetation, and/or faunal use/habitat establishment. In some cases, a "final" criterion may be related to trends in development rather than a single "snapshot" assessment during the last year of monitoring.

ii. Monitoring

1. Methods – Explain why each method has been chosen to evaluate progress in relation to each performance criterion. The appropriateness of a method will depend on the objective it is addressing and the characteristics of the feature being surveyed. If using sampling methods, describe. Include size of sample unit, number of samples. If using transects for assessment of vegetation, provide a map of the mitigation area(s) showing intended transect lines. (Note that it may be more appropriate to align vegetation sampling transects along/within habitat zones rather than across them.)

2. Monitoring Schedule – Because planting and/or site modification may not occur when planned, monitoring should be tied to growing (vegetation), rainy (hydrology), and active (wildlife) seasons rather than the point at which implementation happens to occur. Monitoring will generally not be considered to be "first year" monitoring until one full growing season (for vegetation) or target activity period (for hydrology/geomorphology and faunal use) has passes following completion of installation. Also, although in many situations it is crucial to monitor all project components during the first five years or so, this is not necessarily true for every project. In some cases, it is not appropriate to begin quantitatively monitoring one or another component until a few years after implementation. In other cases it may be necessary to do annual monitoring for the first four to six years, and then monitor every other year for the remainder of the monitoring period. (However, in every case a project should be at least walked through, and a letter-report prepared, at least once a year during the overall monitoring period.)

3. Photo-documentation

Ground and/or aerial photos can be used to illustrate year-to-year progress of the overall project. Ground photos should generally be panoramic, and taken from a high point relative to the mitigation site such that photos taken in later

years will not be obscured by developing vegetation. All such photos should be taken from the same point every year to allow for interannual comparison. If aerial photos are being used for measurements, they should be directly vertical and have identifiable ground-references to provide a reasonably accurate scale. In any case, the point is to have informative photos.

V. Implementation Plan

a. Site Preparation

i. Grading implementation – Describe equipment and procedures to be used, access paths, etc., as applicable.

ii. Soil disposal – Indicate storage location, if any, and ultimate destination of any excavated materials.

iii. Soil treatment – Indicate any soil modification(s) planned for the mitigation site, including spreading of inoculum. Also indicate source, storage location, storage duration, and intended placement of any offsite topsoil to be used.

iv. Pest plant removal – Describe method(s) to be used to remove any pest plants from the implementation site.

v. Construction monitor – As applicable, provide a statement that a person/firm familiar with the mitigation/monitoring plan will supervise site preparation. This person should have authority to direct equipment operators, and should submit a brief report to the Corps following completion of construction.

b. Planting/Seeding

i. Planting plan – Provide a table of species to be planted and indicate geographic source of plants (should be as local as possible), type of propagules to be used, of planting, and season in which seeding/planting/transplanting is to be done.

ii. Nature and source of propagules – Indicate types, sizes, and sources of propagules. Seeds, seedlings, canes, young plants and transplants should be from as local a stock as possible. For transplant propagules, describe method, location of harvest site, and duration of storage, if applicable.

iii. Planting/seeding methods – Briefly describe methods to be used. Include size and quantity of propagules and/or intended spacing.

c. Irrigation-Most mitigation projects are intended to become self-sustaining. The function of irrigation in the early years of a project is to give new vegetation a head start at becoming established. For this reason, irrigation is usually confined to the first 2-3 years after plant installation and performance criteria are not considered met until at least two years have passed since irrigation was terminated. Describe any proposed irrigation methods, including estimated frequency, and indicate month(s) in which it is to occur. Also indicate water source(s) for irrigation.

d. Implementation Schedule- Provide a schedule in the form of a legible flow chart showing intended timing of site preparation, any seed/topsoil storage, seed/topsoil application, and plantings (by month).

VI. Maintenance During Monitoring Period

a. Maintenance Activities

i. Overall – Describe planned maintenance activities (e.g. inspection of irrigation system, inspection of water structure(s), erosion control, weeding, etc.). Note that irrigation-system failure is a common source of difficulties in the early years of a project. Many of these problems can be avoided by relatively frequent inspections of the system during the dry season in the first couple of years.

ii. Pest species control-identify and pest species (plant and/or animal) that might cause problems on the site, and provide a control plan for these species if appropriate.

Indicate the critical threshold of disturbance that will trigger the implementation of control methods. Provide title and organization (if any) of entity(ies) responsible for conducting maintenance activities.

b. Maintenance Schedule – Provide a table showing proposed schedule of frequency of maintenance inspections over the life of the project.
c. Responsibility for Maintenance, if different from the project proponent should be listed.

VII. Reports

[For additional format information, see Appendix B.]

a. As-builts - If any significant deviations from the approved mitigation plan occur during project implementation (including any changes in site topography or the design or location of water control structures, the plant species mix, or planting locations), an as-built report describing these changes should be submitted to the Corps within 6 weeks of completion of site preparation and planting. If no significant changes have been made, no as-built report will usually be necessary unless specifically requested by the Corps. However, the permittee must submit a statement that the project has been implemented as planned or describing any minor adjustments made.
b. Annual Reports
    i. File Number - Because our records are organized by number, not project name, the Corps permit/file number should be on the cover and title page of All reports and correspondence.
    ii. Content
        1. Years of full monitoring – An analysis of all quantitative and qualitative monitoring data, with appropriate figures, graphs, and/or tables. Copies of all field data sheets should be available for Corps review, but not submitted unless specifically requested. Maps identifying monitoring areas, sampling/transect locations, planting zones, etc., as appropriate. It is not necessary to re-submit full-size maps if there are no changes from the previous submittal, however, any relevant previously submitted maps should be referenced. (8 1/2x11 or 11x17 versions would probably be helpful.) Prints or color reproductions of all included monitoring photographs. A list of names, titles, and companies of all persons who prepared the content of the annual report and/or participated in monitoring activities for that year.
        2. Years of partial monitoring, where appropriate -Occasionally, due to project-specific factors, it is appropriate to perform a reduced monitoring program for one or more monitoring years. The nature and extent of this monitoring would be described in permit documents, and the reporting is usually in the form of a letter.
        3. Due date - The applicant/permittee must identify an annual due date for reports (i.e. month & day).

VIII. Potential Contingency Measures

a. Initiating Procedures – If an annual performance goal is not met for all or any portion of the mitigation project in any year, or if the final success criteria are not met, the permittee should prepare an analysis of the cause(s) of failure and propose remedial action for Corps approval. Remedial actions could range from replanting, to relocating the mitigation site.
b. Contingency Funding Mechanism-Indicate what funds will be available to pay for planning, implementation, and monitoring of any contingency procedures that may be required and present all necessary assurances that the funds will remain available until performance criteria have been achieved.

IX. Completion of Mitigation Responsibilities

a. Notification-When the initial monitoring period is complete, and if the permittee believes that the final performance criteria have been met, the permittee shall notify the Corps when submitting the annual report that documents this completion. For mitigation plantings, final performance criteria will not be considered met until a minimum of two years after all human support (e.g. irrigation, replanting, rodent control, fertilization) has ceased.

b. Corps Confirmation-Following receipt of notification that the permittee believes the mitigation responsibilities have been fulfilled, the Corps may require a site visit confirm the completion of the mitigation effort. The permittee is not released from any mitigation obligation until written notice of completion is received from the Corps.

APPENDIX B: FORMAT INFORMATION

I. Reports/Proposals

A. Headings
ALL cover, title page, or letter headings must contain the **CORPS FILE NUMBER** and the **DATE** of the document.

B. Contributor Page
List all persons who prepared plan, did monitoring, and/or wrote or edited the text.

C. Distribution Page
List names, titles, and companies/agencies of all persons receiving a copy of the report.

D. Binding
Generally speaking, a mitigation proposal should be a single, stand-alone, separately bound document. Except for full-size drawings, all materials submitted should be, or be folded to, 8 ½" x 11." Three-ring binders, unfortunately do not fit on our filing shelves, so please bind your final submittal with this in mind.

II. Figure Format

All maps and plans submitted should be legible, complete, clear, and at the appropriate scale. Each should include the following:

1. Title block.

2. Date of preparation.

3. Date(s) of any modifications.

4. 1" margin at top of sheet.

5. North arrow (plan views).
The orientation of the map on the page (as it is read) should be the **same** for **all** maps submitted. By convention, North will normally be toward the top of the page.

6. Scale.
Base topo maps should be full-sized (1 inch = 100 feet or less, 1 inch = 200 feet for very large projects).

7. Datum.
Reference elevation datum **must** be indicated on both plan and section views.

8. Jurisdictional boundaries
Tidal waters – MLLW, MHW, HTL
Non-tidal waters (stream channels) – OHW
Wetlands - boundaries

9. Legend
   Identify all symbols, patterns or screens used. If colors are used to indicate areas on the original map, color copies (or the original) should be included in the Corps submittal.

III. List of Tables, Schedules, and Maps to Be Submitted.

(This is an overall list. It is only necessary to submit the items that apply to your project.)

A. Tables
   1. Impact acreage
   2. Impact vs. Mitigation acreage
   3. Plant species
   4. Performance criteria/monitoring methods

B. Schedules
   1. Implementation
   2. Monitoring/Reporting
   3. Maintenance

C. Maps
   1. Overall Project
      a. Road map
      b. USGS map
      c. Jurisdictional area topo map
   2. Mitigation Site (if different from project site)
      a. Road map
      b. USGS map
      c. Topo map
      d. Jurisdictional map (if applicable)
   3. Mitigation Design
      a. Grading plan (including cross-sections and water control structures, if any).
      b. Planting plan
   4. As-builts (if different from plan)
      a. Grading
      b. Planting

APPENDIX C: OUTLINE FOR MONITORING REPORTS

Pages 1-2:

A. Project Information
   1. Project name
   2. Applicant name, address, and phone number
   3. Consultant name, address, and phone number (if appropriate)
   4. Corps permit file number
   5. Acres of impact and type(s) of habitat impacted
   6. Date project construction commenced
   7. Indication of mitigation monitoring year (i.e. first, second, third, etc.)
   8. Amount and information on any required performance bond or surety, if any.

B. Compensatory Mitigation Site Information
   1. Location of the site (regional map may be appropriate)
   2. Specific purpose/goals for the compensatory mitigation site
   3. Date mitigation site construction and planting completed
   4. Dates summary of previous maintenance and monitoring visits
   5. Name, address, and contact number of responsible parties for the site
   6. Summary of remedial action

Page 2 or 3:

A. Map of the compensatory mitigation site
   1. Diagram of the site (no larger than 11 x 17) including:
      a. Habitat types (as constructed)
      b. Locations of any photographic record stations
      c. Landmarks

Page 3 or 4:

A. List of Corps-approved success criteria
B. Tabulated results of the monitoring visits versus performance standards.

Page 4, 5, and/or 6:

A. Photographic record of the site during most recent monitoring visit at record stations (at least four photos per page, no more than two pages of photos)

Page 5, 6, or 7:

A. Summary of field data taken to determine compliance with performance standards and success criteria (at least one page, no more than two pages)

Page 6, 7, or 8 (if needed):

A. Problems noted and proposed remedial measures.
B. Original data sheets and technical appendices should not be submitted with this report; however they should be retained with the applicant and/or consultant until the Corps has signed off the mitigation. The permittee may need to make data sheets and technical appendices available to the Corps upon request.

APPENDIX D: SACRAMENTO AND SAN FRANCISCO COWARDIN HABITAT TYPES

Common Name	Cowardin Name	Cowardin Code
1. Seep	Palustrine Emergent Permanent(H)	PEMH
2. Seasonal wetland	Seasonal (C)	PEMC
a. Alpine Meadow	Seasonal (C)	PEMC
3. Vernal Pool/Swale	Seasonal (C)	PEMC
4. Bog / Fen	Palustrine Emergent	PEM1
5. Saline flat	Palustrine Flat	PFLC
6. Pond		
a. Salt	Palust. Unconsolidated Bottom Artificial(K), Hypersaline(l)	PUBK1
b. Freshwater	Palust. Uncon. Bottom Permanent, Freshwater(0)	PUBH0
7. Lake/Reservoir/Pond Edge	Lacustrine Littoral(2)	L2
8. Channel water		
a. Seasonal	Riverine Intermittent(4) StreamBed	R4SB
b. Permanent (steep gradient)	Riv. Permanent/High Grade(3) Steambed	R3SB
(low gradient)	Riv. Permanent/Low Grade(2) Steambed	R2SB
c. Tidal	Estuarine Intertidal(2) Steambed	E2SB
d. Muted tidal	Estu. Inter. Strembd Diked/Impounded(h)	E2SBh

Common Name	*Cowardin Name*	*Cowardin Code*
9. Channel-Side Habitat		
a. Trees	Palust. Forested(O)	PFO
b. Shrubs	Palust. Scrub/Shrub	PSS
c. Grassland	Palust. Emergent	PEM
10. Marsh		
a. Tidal Salt	Estu. Intertid. Emerg. Persistent(1), Euhaline(2)	E2EM12
b. Tidal Brackish	Mixohaline(3)	E2EM13
c. Muted Tidal Salt	Euhal. Diked/Impounded	E23M12h
d. Muted Tidal Brackish	Mixohal.Diked/Impounded	E2EM13h
e. Freshwater	Palust. Emerg. Persist. Fresh	PEM1H
11. Dune Swale	Palust. Emerg. Non-Persist.(2)	PEM2
12. Intertidal Zone		
a.Estuarine	Estuarine Intertidal(2)	E2
b.Marine	Marine Inter.	M2
13. Eelgrass Bed	Estu Inter. Aquatic Bed Submergent Vascular(2)	E2AB2
14. Mudflat	Estu. Inter. Flat Mud(3)	E2FL3
15. Open Water		
a. Ocean	Marine Subtidal(1) Open Water	M1OW
b. Bay	Estuarine Subtid. Open Water	E1OW
c. Lake/Reservoir	Lacustrine Limnetic (1)	L1