Staff Report

Mitigation

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SAN FRANCISCO BAY CONSERVATION AND DEVELOPMENT COMMISSION

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ADOPTED REVISIONS TO THE *SAN FRANCISCO BAY PLAN* MITIGATION FINDINGS AND POLICIES

The following amended findings and policies were adopted by the San Francisco Bay Conservation and Development Commission on October 17, 2002 and are the culmination of the *San Francisco Bay Plan* amendment process for revision of the mitigation policies and addition of mitigation findings. The staff background report, *Mitigation*, initially sent to the Commission and the public on August 19, 2002, provided the information foundation from which the following updated findings and policies emerged. The background report with staff's proposed recommendations was considered by the Commission at a public hearing on September 19, 2002.

Findings

a. Mitigation for direct or indirect adverse effects on the environment, including to land, air, water, minerals, flora, fauna, and objects of historic or aesthetic significance, includes the following actions, taken in sequence: (1) avoiding the impact; (2) minimizing the impact; (3) repairing, rehabilitating, or restoring the impacted environment, and finally; (4) compensating for the impact by replacing or providing substitute resources, thus providing compensatory mitigation.

b. Compensatory mitigation consists of measures to offset unavoidable adverse impacts to the environment and may include: (1) restoring a resource where formerly located (e.g., restoration of tidal marsh from a diked former tidal marsh area); (2) creating a new resource in an area that does not currently or did not historically support that type of resource (e.g., the creation of a tidal marsh from an upland area); (3) enhancing the functions of an existing resource that is degraded in comparison to historic conditions (e.g., establishing native vegetation in an existing tidal marsh); and in some cases (4) preserving a resource through a legally enforceable mechanism (e.g., a deed restriction). Enhancement and preservation as sole mitigation measures do not compensate for lost area of a resource.

c. A compensatory mitigation program will increase the likelihood of mitigation success when the program includes project goals, performance standards, a monitoring plan based on the goals and performance standards to measure the success of the project, a contingency plan in the event of project failure, and provisions for the long-term (i.e., for the duration of the impacts of the project) maintenance, management and protection of the mitigation site. Success is also increased by the use of performance standards that include measures of both composition (e.g., percentage of vegetation cover, diversity of wildlife species) and function (e.g., wildlife nesting, nutrient retention, hydrologic functions). Reference sites (i.e., minimally impaired sites that are representative of the expected ecological conditions of a habitat of a particular type and region) can provide an important basis for comparison with mitigation sites.

d. Resource restoration provides, generally, an improved probability of greater ecological success than resource creation, since the proper substrate may still be present in an area that once supported a desired habitat type, seed sources may be on-site or nearby, and appropriate hydrological conditions may still exist or may be more easily restored. The potential for success of restoration and creation projects can be increased with the inclusion of transition zones (areas between two bordering habitats where plants and animals from both habitats are found) and buffers (areas established adjacent to a habitat to reduce the adverse impacts of surrounding land use and activities).

e. Decisions regarding the type and location of compensatory mitigation involve tradeoffs that require a case-by-case analysis. A broad scientific approach to compensatory mitigation involves the location and design of mitigation sites based on a Bay-wide assessment

to compensate for the adverse impacts of an authorized project while also contributing to the long-term ecological functioning of the entire Bay system. Appropriately sited and designed mitigation projects increase the likelihood of successful long-term habitat function of a site and its integration with adjacent habitats. The *Baylands Ecosystem Habitat Goals* report provides a regional vision of the types, amounts, and distribution of wetlands and related habitats that are needed to restore and sustain a healthy Bay ecosystem, and thus provides a tool in assessing the suitability of a proposed mitigation project.

f. Natural resource areas provide various benefits to human welfare, including climate regulation, flood protection, erosion control, and recreational and aesthetic benefits. Therefore, there may be social and economic effects on nearby communities as a result of impacts on existing resource areas and the siting and design of compensatory mitigation projects.

g. The required area and type of compensatory mitigation may vary depending on factors such as: the expected time delay between the impact and the functioning of the mitigation project; the relative quality of the mitigation and the impacted site; the type of mitigation (e.g., restoration, creation, enhancement); and the probability of success of the mitigation project.

h. Mitigation banking involves restoring or creating natural resources to produce mitigation "credits" which can be used to offset unavoidable adverse impacts to existing resources. A mitigation bank is a site where resources are restored, created, or enhanced expressly for the purpose of providing compensatory mitigation in advance of impacts associated with authorized projects. Mitigation banks may be established by individuals who anticipate needing to mitigate for future impacts, or by third parties who develop banks as a commercial venture to sell credits to permittees needing to provide compensatory mitigation. Among other benefits, mitigation banks provide the unique opportunity to address the cumulative effects of small fill projects that are too small to be mitigated individually. Provided mechanisms are in place to assure success, mitigation banking can provide a timely, convenient, cost effective and ecologically successful mitigation option.

i. Fee-based mitigation involves the submittal of a fee by the permittee in-lieu of requiring the permittee to undertake the creation, restoration, or enhancement of a specific mitigation site, or purchasing credits from a mitigation bank. The fee is generally submitted to a third party for implementation of an ongoing or future restoration-creation project. Provided mechanisms are in place to assure success, fee-based mitigation can also provide a timely, convenient, cost effective and ecologically successful mitigation option.

Policies

1. Projects should be designed to avoid adverse environmental impacts to Bay natural resources such as to water surface area, volume, or circulation and to plants, fish, other aquatic organisms and wildlife habitat, subtidal areas, or tidal marshes or tidal flats. Whenever adverse impacts cannot be avoided, they should be minimized to the greatest extent practicable. Finally, measures to compensate for unavoidable adverse impacts to the natural resources of the Bay should be required. Mitigation is not a substitute for meeting the other requirements of the McAteer-Petris Act.

2. Individual compensatory mitigation projects should be sited and designed within a Bay-wide ecological context, as close to the impact site as practicable, to: (1) compensate for the adverse impacts; (2) ensure a high likelihood of long-term ecological success; and (3) support the improved health of the Bay ecological system. Determination of the suitability of proposed mitigation locations should be guided in part by the information provided in the *Baylands Ecosystem Habitat Goals* report.

3. When determining the appropriate location and design of compensatory mitigation, the Commission should also consider potential effects on benefits provided to humans from

Bay natural resources, including economic (e.g., flood protection, erosion control) and social (e.g., aesthetic benefits, recreational opportunities).

4. The amount and type of compensatory mitigation should be determined for each mitigation project based on a clearly identified rationale that includes an analysis of: the probability of success of the mitigation project; the expected time delay between the impact and the functioning of the mitigation site; and the type and quality of the ecological functions of the proposed mitigation site as compared to the impacted site.

5. To increase the potential for the ecological success and long-term sustainability of compensatory mitigation projects, resource restoration should be selected over creation where practicable, and transition zones and buffers should be included in mitigation projects where feasible and appropriate. In addition, mitigation site selection should consider site specific factors that will increase the likelihood of long-term ecological success, such as existing hydrological conditions, soil type, adjacent land uses, and connections to other habitats.

6. Mitigation should, to the extent practicable, be provided prior to, or concurrently with those parts of the project causing adverse impacts.

7. When compensatory mitigation is necessary, a mitigation program should be reviewed and approved by or on behalf of the Commission as part of the project. Where appropriate, the mitigation program should describe the proposed design, construction and management of mitigation areas and include:

   (a) Clear mitigation project goals;

   (b) Clear and measurable performance standards for evaluating the success of the mitigation project, based on measures of both composition and function, and including the use of reference sites;

   (c) A monitoring plan designed to identify potential problems early and determine appropriate remedial actions. Monitoring and reporting should be of adequate frequency and duration to measure specific performance standards and to assure long-term success of the stated goals of the mitigation project;

   (d) A contingency plan to ensure the success of the mitigation project, or provide means to ensure alternative appropriate measures are implemented if the identified mitigation cannot be modified to achieve success. The Commission may require financial assurances, such as performance bonds or letters of credit, to cover the cost of mitigation actions based on the nature, extent and duration of the impact and/or the risk of the mitigation plan not achieving the mitigation goals; and

   (e) Provisions for the long-term maintenance, management and protection of the mitigation site, such as a conservation easement, cash endowment, and transfer of title.

8. Mitigation programs should be coordinated with all affected local, state, and federal agencies having jurisdiction or mitigation expertise to ensure, to the maximum practicable extent, a single mitigation program that satisfies the policies of all the affected agencies.

9. If more than one mitigation program is proposed, the Commission should consider the cost of the alternatives in determining the appropriate program.

10. To encourage cost effective compensatory mitigation programs, especially to provide mitigation for small fill projects, the Commission may extend credit for certain fill removal and allow mitigation banking provided that any credit or resource bank is recognized pursuant to written agreement executed by the Commission. Mitigation bank agreements should include: (a) financial mechanisms to ensure success of the bank; (b) assignment of responsibility for the ecological success of the bank; (c) scientifically defensible methods

for determining the timing and amount of credit withdrawals; and (d) provisions for long-term maintenance, management and protection of the bank site. Mitigation banking should only be considered when no mitigation is practicable on or proximate to the project site.

11. The Commission may allow fee-based mitigation when other compensatory mitigation measures are infeasible. Fee-based mitigation agreements should include: (a) identification of a specific project that the fees will be used for within a specified time frame; (b) provisions for accurate tracking of the use of funds; (c) assignment of responsibility for the ecological success of the mitigation project; (d) determination of fair and adequate fee rates that account for all financial aspects of the mitigation project, including costs of securing sites, construction costs, maintenance costs, and administrative costs; (e) compensation for time lags between the adverse impact and the mitigation; and (f) provisions for long-term maintenance, management and protection of the mitigation site.

SUMMARY CONCLUSIONS AND RECOMMENDATIONS

The Commission has required compensatory mitigation for unavoidable adverse environmental impacts of projects as a condition of some permits since the early 1970s. In 1985, the Commission revised the *San Francisco Bay Plan* (Bay Plan) to include policies on compensatory mitigation. The policies were adopted in an effort to reflect the Commission's past decisions regarding compensatory mitigation and to provide general guidelines for determining mitigation requirements.

Since the adoption of the Bay Plan mitigation polices in 1985, scientific knowledge regarding habitat creation and restoration has evolved. In addition, public and private interest and investment in habitat restoration in the San Francisco Bay Area has resulted in an increasing focus on regional restoration efforts, and regional visions for the types, amounts and distribution of wetlands and related habitats that are needed to restore and sustain a healthy Bay ecosystem. Finally, considerable information on policies and practices related to mitigation has been published in the past decade, and the Commission itself has had seventeen years of valuable practical experience in applying its mitigation policies and refining its permit conditions in an effort to successfully compensate for unavoidable adverse environmental impacts of projects it has permitted.

The Commission's staff has conducted extensive literature research on various aspects of mitigation and undertook a review of fifteen years of the Commission's permits requiring mitigation. The results of this research, and staff proposed changes to the Bay Plan mitigation policies, are included in this staff report.

The following provides overall conclusions based on information presented in this background report, and offers general recommendations for improvements to the Commission's mitigation policies and practices where appropriate. Based on the conclusions and general recommendations, approved revisions to the Bay Plan mitigation policies are presented in the next section.

Compensatory Mitigation Type. Compensatory mitigation consists of several types of activities including creation, restoration, enhancement and preservation.

Restoration generally provides a better chance for ecological success than creation, since in an area that once supported a desired habitat type, the proper substrate may still be present, seed sources may be on-site or nearby, and appropriate hydrological conditions may still exist or may be more easily restored. In addition, creation of a new habitat type results in the loss of an existing habitat type which may already be providing important functions to the region, and creation projects should therefore be sited carefully in an effort to promote the health of the entire region.

Enhancement and preservation do not compensate for lost acreage, since neither activity actually increases the available acreage of a particular resource. Although enhancement increases the ecological functionality of an area, preservation neither increases the acreage nor the ecological functionality of an area, at least in the short term. However, preservation does provide benefits in that it can ensure the existing functions of the preserved area are protected and maintained in the long-term, particularly when the functions are not fully protected under existing regulatory programs or are directly threatened by proposed development activities. Both enhancement and preservation, if allowed for compensatory mitigation, often require a greater area enhanced or preserved than the area impacted, in an effort to provide appropriate compensation for impacted functions.

The Commission's mitigation policies do not include any preferences concerning the type of mitigation allowable. However, the policies do state that mitigation should include

"...providing area and enhancement resulting in characteristics and values similar to characteristics and values adversely affected."

As shown from the permit review process, restoration of habitats is the most common type of mitigation required by the Commission, followed by creation, then enhancement (though enhancement is most often included in combination with other types of mitigation). A review of the Commission's use of mitigation ratios (discussed in detail later) shows a link between use of resource enhancement as a mitigation type and higher ratios, supporting the notion that since enhancement does not result in more acreage, higher mitigation ratios may be appropriate to fully compensate for the adverse impact. None of the 62 permits reviewed for the study included preservation as a type of mitigation required by the Commission.

In conclusion, though there is no clear Commission policy regarding mitigation type, the Commission's practices reflect a general preference for restoration over other types of mitigation activities, and a reluctance to allow preservation as a type of mitigation. However, the Commission has clearly allowed for various mitigation methods on a case by case basis, and has utilized other tools, such as mitigation ratios, to secure reasonable and adequate compensation for adverse impacts. A change in the Bay Plan mitigation policies to support the current Commission practices would help assure these practices are continued.

Recommendation. The Commission's policies should be revised to outline a general preference for restoration over creation, but encourage decisions on mitigation type on a case by case basis based on an analysis of the impacts and the ecological feasibility and sustainability of the proposed mitigation.

On-Site, In-Kind Replacement. Decisions between on-site or off-site, in-kind or out-of-kind mitigation involve tradeoffs that require a case-by-case analysis. On-site and in-kind mitigation offers opportunities to replace site specific functions, but the success of on-site mitigation may be compromised by the permitted development project and/or other adjacent land uses. Off-site and potentially out-of-kind mitigation does not replace specific functions locally, but may have a better chance of ecological success and offers flexibility in meeting broader regional goals for resource protection and restoration. In addition, wetlands and related habitats provide various services to human communities, including climate regulation, flood protection, erosion control, food, and recreational and aesthetic benefits. Therefore, there are also social and economic considerations associated with how and where impacted wetlands and related habitats are mitigated.

A broad scientific approach to mitigation includes the selection of mitigation sites based on an assessment at the regional scale to achieve desired habitat functions that promote the health of the entire region. A regional approach can increase mitigation success rates by locating projects in areas with desired biological and physical attributes such as appropriate hydrology and soils, connections to other aquatic habitats, and opportunities for transition zones and buffers. A regional approach does not mean mitigation will always be off-site, rather a regional approach allows for a case-by-case analysis on a broader geographic context, based on the functions of the impacted site and the ecology of the region as a whole, to determine the appropriate mitigation that compensates for the impacted functions, promotes the health of the regional, and has a high likelihood of ecological success.

The Bay Plan mitigation policies do not specifically support a regional approach to mitigation. The policies state in part that "the mitigation program should assure...that the mitigation would be at the fill project site, or if the Commission determines that on-site mitigation is not feasible, as close as possible." In addition, the policies state that mitigation should ensure that the "benefits from the mitigation would be commensurate with the adverse impacts on the resources of the Bay...resulting in characteristics and values similar to the characteristics and values adversely affected."

The majority of the permits reviewed for this study required on-site mitigation, though a substantial number of permits (about one-third) either included off-site mitigation in combination with on-site, or required solely off-site mitigation. Similarly, though the majority of the permits required in-kind mitigation, just over one-third required out-of-kind mitigation either solely or in combination with in-kind. For a fairly high percentage of permits (21 percent), it was unclear whether the required mitigation was in-kind or out-of-kind, either because mitigation plans were missing from the files or had not yet been submitted, or because the habitat type of the impact site, the mitigation site, or both, was not clearly described in the permit.

The implementation of a regional approach to mitigation clearly requires the time, resources and ability to conduct a regional assessment to determine the goals, constraints and opportunities of various mitigation options whether on a permit by permit basis or through a more long-range long-term planning process. Establishment of regional visions, priorities and strategies for restoration, enhancement and preservation of natural resources can greatly assist regulatory agencies and permit applicants in identifying and implementing mitigation that adequately compensates for adverse impacts and meets long-term restoration goals for a region.

In 1999, the *San Francisco Baylands Ecosystem Habitat Goals* report (Goals Report) was released. The Goals Report provides a regional vision of the types, amounts and distribution of wetlands and related habitats that are needed to restore and sustain a healthy Bay ecosystem, and represents the culmination of over three years of work by a widely representative group of scientists, resource managers, and other participants of the San Francisco Bay Area Wetlands Ecosystem Goals Project. The Goals Report offers the first San Francisco Bay regional vision of its depth and magnitude and provides a vital vision and guide for the long-term restoration and improvement of the baylands and related habitats of the Bay.

In conclusion, it is clear from the permit review that despite the Commission's policies that generally favor on-site and in-kind mitigation in an attempt to require mitigation that is appropriate and reasonable, the Commission has evaluated proposed mitigation projects on a permit by permit basis and has allowed, in some cases, both off-site and out-of-kind mitigation. However, there is no overall policy basis for determining the appropriate type, amount and location of compensatory mitigation on a regional scale, nor do the mitigation policies reflect the potential contribution offered by the Goals Report to long-term, long range mitigation planning.

Recommendation. The Commission's mitigation policies should be revised to promote the selection of mitigation type and location on a case-by-case basis in a broader geographic context, favoring mitigation as close to the impact site as feasible based on the likelihood of long-term ecological success of the mitigation project. The policies should support compensation for the impacted functions, address potential social and economic considerations, and ensure a high likelihood of ecological success. A regional approach to mitigation should be informed by the Goals Project.

Habitat Classification Methods. Lack of or inconsistent definitions of habitat type at both the impact site and the mitigation site makes informed decisions regarding the appropriate type, size, and location of mitigation difficult. As described above, for a significant percentage of permits during the permit review it was unclear whether the required mitigation was in-kind or out-of-kind, often because the habitat type of the impact site, the mitigation site, or both, was not clearly described in the permit.

In 1988 the Commission adopted a staff recommendation concerning mitigation evaluation which included proposed changes to the permit application form to include specific environmental information from applicants for proposed projects "such as the types and amounts of tidelands that would be impacted (i.e., pickleweed marsh, cordgrass marsh, intertidal mudflats)...." The current permit application form now includes a question on the square footage of "tidal marsh or wetland area to be filled" and also requires the applicant to "describe in detail the anticipated impacts of the fill on the tidal environment...." However, information on the

specific types of wetlands and related habitats that would be impacted is still not specifically required in the permit application.

The use of standardized and consistent definitions of habitat type would assist the Commission in comparing the impacted site with the proposed mitigation site. To establish regional habitat goals for the San Francisco Bay Area, the Goals Project participants developed a hierarchical classification system of habitats specific to the Bay area. The classification system contains three major habitats–Bay, baylands, and adjacent habitats–which are then further broken down into several, more detailed habitat types.

In conclusion, the classification system as laid out in the Goals Project is specific to the San Francisco Bay Area and is also simple and general enough for use in the Commission's permit applications as well as in staff summaries, staff recommendations, staff reports, and planning reports. In addition, the recent Bay Plan policy revisions on tidal marshes and tidal flats and subtidal habitats are based on the habitats as classified in the Goals Project. Though more detailed information on the structure (i.e., vegetation cover, species diversity) and function (i.e., nutrient retention, hydrologic functions) of various habitat types may be needed on a case by case basis to determine appropriate mitigation, general use of the Goals Project's classification would support staff findings and increase agency accountability for compensatory mitigation decisions by employing consistent, standardized descriptions of habitat type and functions as the basis of a logical, analytical approach to determining if public benefits of a project clearly exceed public detriments.

Recommendation. The Commission's permit application form should be amended to require information on the impacts of projects on specific bayland habitats, based on the classification developed in the Goals Project. The classification system should also be used in staff summaries, staff recommendations, staff reports, and planning documents where appropriate.

Mitigation Ratios. Mitigation ratios (the ratio of the acreage of an area replaced per acreage of area lost) are a widely used tool for regulators to ensure compensatory mitigation successfully offsets impacted resources, and may be higher or lower than one to one (1:1) depending on various factors. However in general, due to the potential lack of success of mitigation projects as well as the common time delay between the impact and the functioning of the mitigation site, ratios greater than 1:1 may be needed in order to ensure full replacement of habitats. In any case, ratios should be based on an identifiable rationale that is clearly described in the mitigation program or plan and approved by the appropriate regulatory agencies.

The Commission has always analyzed and required mitigation ratios on a permit by permit basis, though a 1988 BCDC staff report recommended higher than a 1:1 ratio in general to compensate for time lags between impacts and mitigation, and to compensate for lack of assurances regarding the success of mitigation.

The Commission has historically taken a broader view of what constitutes appropriate and reasonable requirements for the amount and type of mitigation, and does not generally specifically describe mitigation ratios in its permits. Conclusions regarding mitigation ratios in the permit review process were calculated from data on acreages provided in the permit. The mitigation ratios required in the reviewed permits varied, though the majority of the permits required ratios of between 1:1 and 5:1. About 65 percent of the projects required ratios of greater than 1:1, with about 35 percent requiring 1:1 or less. About 15 percent of the projects required ratios of less than 1:1 and about 15 percent required ratios of 5:1 or above.

Most projects requiring less than 1:1 mitigation ratios were requiring compensation for adverse environmental impacts that were temporary in nature, or those resulting from pile-supported fill. Of the projects requiring ratios of 5:1 or greater, the majority included enhancement of degraded habitats as part of the mitigation package.

The reasoning behind the required replacement ratio was assumedly different from permit to permit, depending on a variety of factors on a case-by-case basis including the type of mitigation (creation, restoration, or enhancement), the degree of adverse impact, the expected time lag between loss and replacement, and the relative qualities of the impact and mitigation site. It is clear that mitigation ratios are among the tools the Commission relies upon to achieve reasonable and adequate compensation for unavoidable adverse impacts. A clearly identified rationale for how the required amount of mitigation was determined would help inform decisions regarding the appropriateness of mitigation on a case by case basis, and would support staff findings and increase agency accountability.

Recommendation. The Commission should retain its practice of determining the size or amount of a compensatory mitigation area and type on a case by case basis (based on an analysis of the risk of failure of the mitigation project, the expected time delay and the quality of the impact site as compared to the mitigation site) as a tool for securing appropriate mitigation for impacts and the Bay Plan mitigation policies should be revised to support this practice.

Mitigation Timing. To avoid any time delay between permitted loss of resources and replacement of those resources, compensatory mitigation would have to be implemented prior to when the permitted impacts occur. However, in a regulatory context, it is often infeasible to delay permittee's development projects until mitigation sites are constructed and function to meet performance standards, and requiring mitigation no later than concurrent with the permitted impact is in many cases the most practical compromise. However, unless a mitigation site is functioning prior to the permitted impact, there will be some temporal loss of habitat function until a replacement area is functioning, so higher mitigation ratios may be appropriate. Where feasible, and with particularly risky mitigation projects involving impacts to high quality habitats, advance mitigation may be appropriate.

The Commission's mitigation policies state in part that the mitigation should, "to the extent possible, be provided concurrently with those parts of the project causing adverse impacts." The majority of the reviewed permits required the mitigation to be implemented concurrent with the timing of the approved project, though about a dozen or so permits allowed the mitigation to commence after completion of the permitted project (most of those required higher than one to one mitigation ratios or involved the use of in-lieu-fees where the ratio was not quantified). Only one of the permits reviewed required implementation of the mitigation prior to the project.

In conclusion, the Commission's policies and practices reflect an emphasis on concurrent mitigation. In 1988 the Commission adopted a staff recommendation concerning mitigation evaluation which stated that "mitigation should be carried out concurrently with or prior to the Bay fill project, unless unreasonable. If unreasonable, the permittee should provide a larger mitigation area and greater Bay resource value." However, the current policies do not mention the possibility of advance mitigation, nor do they reference the potential of higher mitigation ratios to compensate for mitigation that occurs after the permitted impact, or for concurrent mitigation in cases where there will be a delay in functioning.

Recommendation. Consistent with the 1988 staff recommendation, the Bay Plan mitigation policies should be revised to include language promoting prior or concurrent mitigation when feasible, as well as language regarding the use of higher mitigation ratios to compensate for time lags between impacts and the implementation and functioning of mitigation projects.

Success Criteria. The inclusion of clear and measurable success criteria, or performance standards, in a compensatory mitigation plan is necessary to determine the success or failure of a mitigation project. Performance standards that include measures of both structure (i.e., vegetation cover, species diversity) and function (i.e., nutrient retention, and particularly hydrologic functions) are better indicators of success than performance standards that only measure structural attributes of a site. The use of reference sites can provide an important basis for compari-

son with the mitigation site, and may be particularly helpful when assessing the success of functions that are not easily described or measured. Even with the use of reference sites functional attributes can be challenging to measure. Furthermore, functional attributes may require a much longer time frame to demonstrate success than structural measures, often beyond the common five to ten year monitoring period required by regulatory agencies. Performance standards based on measuring the rate of specific processes is an emerging idea within the scientific and regulatory community that may help address some common problems associated with more traditional types of performance standards, such as long time frames for functional success and difficulty in measuring specific functional attributes.

The Commission's mitigation policies do not contain any specific reference to the establishment of success criteria or performance standards. However, they do state that mitigation measures are "subject to reasonable controls to ensure success, permanence, and long-term maintenance," which clearly gives the Commission the authority to require success criteria when appropriate.

About one-half of the permits reviewed contained clear success criteria by which to evaluate the success of the mitigation project. However, a substantial portion of those permits that did not include success criteria were completely or primarily either fill removal projects (which generally do not involve detailed habitat creation or restoration so do not generally have listed success criteria), or mitigation in the form of in-lieu-fees or cash donations where success of the mitigation project was not the responsibility of the permittee. All permits that did contain success criteria depended on one or more criteria related to vegetation, the most common of which were criteria related to the percentage of vegetation cover of a site. The second most common success criteria related to the hydrology of the site. The majority of the permits that contained success criteria included between one and three listed criteria. The most common parameter measured for projects with only one listed performance standard was percent cover of vegetation. For projects with two listed performance standards, percent cover of vegetation was supplemented with either another vegetation-related parameter or some standard related to the hydrology of the site such as tidal range or inundation. Finally, there were a handful of listed performance standards in permits that were not clearly defined or measurable, such as "significant increase of percent vegetative cover."

In conclusion, the Commission has generally required clear and measurable success criteria when appropriate. However, there is clearly a reliance on criteria related to vegetative structure of the mitigation site. Measurements of functions were not as commonly used for performance standards, although hydrology was a prevalent second or third choice. Although vegetation structure is an important component of many mitigation sites, and is easy to measure and can often meet coverage goals in a fairly short amount of time, performance standards that include measurements of both structure and function provide a better indication of ecological success. In addition, development of performance standards that allow for some degree of flexibility, where appropriate, should be supported, including measurements of performance curves that evaluate a change in a function over time relative to the functional level of one or more reference wetlands.

Recommendation. The Commission should continue to require clear and measurable performance standards for every project where it determines performance standards are appropriate. The Bay Plan mitigation policies should be revised to require performance standards that are based on both structure and function. The Commission should provide for some flexibility, when necessary and appropriate, to allow for unanticipated environmental changes. In addition, the Commission should encourage and support scientific research on the development of restoration-creation projects and improving criteria for measuring success.

Assessment Procedures. There are many methods available to quantitatively assess and compare the functions of the impacted site with a reference site or the proposed mitigation site.

Many regulatory agencies, especially smaller ones and those without staff scientists, do not have the resources to undertake detailed scientific assessments so rely instead on more qualitative methods for assessment using "best professional judgement," or rely on reports submitted by the permittee. New "rapid assessment" methods offer a science-based and quantitative tool that is fast, relatively simple and can be utilized by those with fairly minimal scientific training. Rapid scientific assessment procedures undertaken by agency staff may not be appropriate in all cases, but offer a feasible alternative to more subjective qualitative assessments and/or dependence on permittees' reports that may or may not include various types of assessment methods. Furthermore, a specific rapid assessment protocol used by all resource agencies involved in San Francisco Bay mitigation would increase agency coordination and provide more predictability and consistency for applicants requiring permits from multiple agencies. Currently, the US Environmental Protection Agency, in partnership with other resource agencies, non governmental organizations (NGOs), and academic institutions, is working to develop a tidal wetland rapid assessment procedure that is appropriate for California, including San Francisco Bay. One outcome of the proposed California rapid assessment method for tidal wetlands would be the development of a process to certify those who are trained to use the assessment method. Such a certification process would assure that the assessment method is being undertaken correctly and would lend more credibility and consistency to determinations of success of tidal wetland mitigation projects, whether such determinations are undertaken by agency staff or contractors hired by permittees.

Recommendation. The use of scientific assessment methods should generally be supported and encouraged. The development of a tidal wetland rapid assessment procedure specifically for San Francisco Bay that is supported and used by all applicable agencies should be encouraged and supported.

Monitoring. Monitoring of mitigation projects is necessary in determining whether the projects are successful in meeting their established success criteria. A five-year monitoring period has been historically common among regulatory agencies. While the traditional five-year monitoring may be appropriate for some structural attributes of a site, such as the success rate of transplanted vegetation, it is too short to determine success of many ecological functions of a site. A growing understanding of the length of time projects may take to reach success has resulted in more variable monitoring periods among agencies, based on the desired functions of the mitigation project. For example, a mitigation project involving fill removal from open water may require little, if any, monitoring, whereas a project involving the creation of a large area of tidal wetland from an upland area adjacent to a development project may require monitoring for ten to twenty years, depending on the specific performance standards listed. In addition, submitted monitoring reports are often not adequately reviewed by agency personnel due to lack of staff time and agency prioritization, thereby leaving the success of mitigation projects unknown.

The Commission's mitigation policies do not specifically address monitoring requirements, though they do allow for the mitigation program to be "subject to reasonable controls to ensure success, permanence, and long-term maintenance," which clearly gives the Commission the authority to require monitoring of compensatory mitigation projects. Monitoring of the mitigation site was required in just over one-half of the 62 reviewed permits. However, of the 35 percent that did not require monitoring, most were completely or primarily fill removal in open water projects or fee-based mitigation. Finally, of the five remaining projects that did not require monitoring, three were very small projects. Of the 33 permits that did require monitoring, the majority required monitoring lengths of five or more years. Five of those projects required monitoring for ten to fifteen years, and one required a twenty-year monitoring period.

In conclusion, though the Bay Plan mitigation policies do not mention monitoring requirements, the Commission has generally required monitoring of those mitigation projects where it

determined monitoring was appropriate. The Commission's practices show variable required monitoring lengths, depending on the size, type and location of the mitigation project, though a five-year monitoring time was the most common on average.

In addition, like most regulatory agencies, Commission staff review of monitoring reports is not a high priority due to staff work load and other regulation driven deadlines. Dedicated time for staff review of monitoring reports would increase mitigation compliance rates. In addition, a central repository for monitoring reports, or another means of sharing the information contained in monitoring reports among and between agencies, academia and NGOs, would contribute to the overall understanding of the science of creation, restoration and enhancement of resources.

Recommendation. The Bay Plan mitigation policies should be revised to require monitoring based on the project goals and listed performance criteria to assure the success of mitigation projects. In addition, the review of monitoring reports should be prioritized and a means for sharing the information contained in monitoring reports among and between agencies and others should be encouraged and supported.

Long-Term Maintenance, Management and Protection. The long-term functionality of a mitigation site is promoted by appropriate siting, design and construction to achieve a site that is ecologically self-sustaining. However, even with a self-sustaining site, once the permittee has undertaken the required monitoring, met the required performance standards and been released of legal obligations, processes are still needed to protect the site from future human alteration, as well as for continued monitoring and maintenance of the site as necessary.

The Commission's mitigation policies state the mitigation program should be "subject to reasonable controls to ensure success, permanence and long-term maintenance." However, of the 62 permits reviewed, only 35 percent contained some sort of long-term maintenance and/or protection requirement.

Fourteen of those permits included protection of the mitigation site in perpetuity, mostly through permit conditions requiring the permittee to permanently dedicate the mitigation area as open space or for wildlife habitat. Five of the fourteen permits requiring permanent protection included the conveyance of the mitigation site to a stewardship agency (such as California Department of Fish and Game, the US Fish and Wildlife Service, or the East Bay Regional Park District) for permanent management and maintenance.

Six of the permits included mechanisms for long term, but not necessarily permanent, maintenance of the mitigation site. Two of those permits required the permittee to maintain the site, including removal of debris, for an unspecified amount of time. One permit required the permittee to secure a 20-year lease for the mitigation site and to restrict the site as open space marsh for that time. Two permits required active maintenance of the site by the permittee specifically for the life of the approved project. Lastly, one permit required elimination of aggressive introduced plant species for 10 years (even though the permit only required three years of mitigation monitoring).

In addition, two permits contained conditions stating that if the mitigation site is preempted or filled or covered for another project or use, than an equivalent amount and kind of replacement mitigation shall be provided by the permittee. Although this mechanism does not fit the definition of long-term stewardship of the original mitigation site, it does provide for a mitigation site to be permanently provided, thus arguably promoting the goal of no net loss of habitat acreage, though not necessarily function.

In conclusion, although the Bay Plan mitigation policies require controls to ensure permanence and long-term maintenance of mitigation sites, the Commission has required such controls in just over one-third of the permits reviewed. Better controls for long-term maintenance, management and protection would increase the success rate of mitigation projects.

Recommendation. The Commission's practices should be revised to ensure the long-term maintenance, management and protection of mitigation sites. The Bay Plan mitigation policies should be revised to require that mitigation programs include a defined procedure for the long-term maintenance, management and protection of the mitigation site, such as an open space dedication or conservation easement, and a transfer of long-term responsibility to an appropriate management entity.

Contingency Planning and Financial Assurances. Legal and financial assurances help ensure the success of a mitigation project, or provide a means to ensure alternative appropriate mitigation measures are implemented if the identified mitigation cannot be altered to achieve success.

The Commission's mitigation policies do not require that the approved mitigation program include either legal or financial assurances. However, the policies do state that the mitigation measures are "subject to reasonable controls to ensure success, permanence, and long-term maintenance," which clearly gives the Commission the authority to require legal and financial assurances where appropriate.

Just under one-half of the permits reviewed contained some sort of contingency plan in case of failure of the mitigation project. However, excluding those permits that involved fill removal in open water or fee-based mitigation, and the small number of permits where the existence of a contingency plan was unknown, only 18 percent of the reviewed permits did not include specified contingency plans or measures in the event of failure of the mitigation site to fulfill performance standards.

Only one of the 62 permits reviewed contained any sort of financial guarantee for the achievement of successful mitigation. That one permit required a performance bond assuring construction of the wetland habitat from the third party responsible for undertaking an in-lieu-fee mitigation project.

In conclusion, although the Bay Plan mitigation policies do not include language regarding legal assurances, the permit review shows the Commission has often required specific contingency plans to assure mitigation success. However, the Commission has not typically required contingency plans or financial assurances for mitigation involving fill removal from open water, most likely because fill removal projects do not typically require the submittal of a mitigation plan, where performance standards would be listed and legal and financial assurances for meeting those standards would be detailed. Fill removal projects are a unique type of restoration project in that the mitigation is considered a success once the fill is removed, and no time is needed to allow the mitigation to meet structural or functional performance standards. However, as with any mitigation requirement, there is the chance that the fill removal project will not be implemented at all. Where the fill removal is required prior to the project, additional legal assurances are not needed as the mitigation will be complete as a condition of the construction of the permitted development project. However, where the fill removal is allowed after the permitted impact, some form of legal and or financial assurance would ensure that the mitigation is successfully completed or that an alternative mitigation project is identified and implemented.

In addition, the Bay Plan mitigation policies do not include language regarding financial assurances and the permit review showed the Commission requiring financial assurances for mitigation only once. However, more recently the Commission has required the posting of performance bonds for mitigation projects in two cases, suggesting a gradual shift in practices towards requiring financial assurances when appropriate.

Recommendation. The Bay Plan mitigation policies should be revised to require specific contingency plans and financial assurances, where appropriate and feasible, to ensure success of mitigation projects.

Compliance/Enforcement. Permit compliance and enforcement by regulatory agencies are crucial to achieving full compensation for permitted impacts and thereby increasing the success of compensatory mitigation. A higher priority on compliance within regulatory agencies is critical, and should include staff time dedicated to review of monitoring reports, site inspections, and ongoing training for staff. Finally, alternative tools for increasing compliance within the current regulatory regime should be explored. Examples include the use of site assessments that require less time and scientific expertise (such as the newer "rapid assessments"), and random audits of mitigation sites.

The 1988 staff report approved by the Commission recommended that increased priority should be given to monitoring mitigation programs and enforcing mitigation requirements. The report also specifically mentioned review of monitoring reports as a way to increase compliance. Currently, there is still a need for increased priority on mitigation compliance and enforcement. The enforcement staffing level is still inadequate to successfully and consistently enforce mitigation requirements whether through reviews of monitoring reports and permits or site visits, and Commission staff is not consistently trained in scientific methods to assess the success of mitigation projects during site visits.

Recommendation. Increased priority and staffing should be given to mitigation monitoring and enforcement at the Commission staff level. Commission staff should have ongoing training in scientific assessment methods and other related skills necessary to adequately monitor and enforce mitigation projects.

Transition Zones and Buffers. A transition zone is an environment that blends the habitat of plants and animals from each of the bordering habitats–such as tidal marsh and oak woodlands. Transition zones are important elements of wetlands and related habitats, and are an essential area for wetland-related plant and animal life.

Buffers are areas adjacent to a transition zone or wetland or related habitat, established to reduce the adverse impacts of surrounding land use activities. Buffers provide various functions to protect existing, restored and created wetlands and related habitats such as through sediment control and erosion prevention, reduction of noise and light, removal of excess nutrients from upland runoff, protection from unrestricted human use, access from feral animals and pets, and illegal dumping.

Transition zones are important habitats inextricably linked to wetlands and related habitats and are therefore an integral component of many successful mitigation projects. In addition, buffers protect created, restored or enhanced wetlands and related habitats from adjacent land uses, thus facilitating the long-term success of a mitigation project.

The Commission's mitigation policies do not specifically discuss incorporating buffers or transitional habitats as part of wetland mitigation projects. However, the policies require that mitigation measures ensure success and permanence, which could include encouraging the creation of transition zones or buffers. The permit review process uncovered nine out of forty-five wetland mitigation permits that specifically called out the creation, restoration or enhancement of transitions zones or "upland habitats" as part of the mitigation plan. Two permits included a "buffer habitat" and one included a "buffer zone."

In conclusion, although the Bay Plan mitigation policies do not include language on either transition zones or buffers as part of mitigation projects, both have been included occasionally as part of the approved mitigation plans. In addition, the Commission has increased its focus on the importance of transition zones by adopted new tidal marshes and tidal flats policies on protecting and increasing transition zones between tidal and upland habitats.

Recommendation. To increase the success and sustainability of mitigation sites, the Bay Plan mitigation policies should be revised to support inclusion of both transition zones and buffers in mitigation projects, where appropriate and practicable.

Mitigation Banking. Mitigation banking involves restoring or creating habitat to produce mitigation "credits" which can be used to offset unavoidable adverse impacts to existing habitats. A mitigation bank is a site where resources (e.g., wetlands or other aquatic resources) are restored, created, or enhanced expressly for the purpose of providing compensatory mitigation in advance of authorized impacts. Mitigation banks may be established by individuals who anticipate needing to mitigate for future impacts from permitted projects (also called "single-user" banks), or by third parties who develop banks as a commercial venture to sell credits to permittees needing to provide compensatory mitigation (also called "entrepreneurial" or "private" banks).

Mitigation banks may provide mitigation in advance of permitted impacts, facilitate the combination of financial resources and technical expertise to create more successful mitigation projects, provide an alternative means for compensatory mitigation that is potentially cost effective for the permittee, and can address the cumulative effects of small fill projects that are too small to be mitigated individually. The practice of mitigation banking also faces some challenges such as how to establish and apply mitigation ratios when using a bank, and how to determine if the use of a mitigation bank (which provides for off-site mitigation only) is an appropriate mitigation option for a specific project. However, support for mitigation banking on both the national and state levels has increased over the years and has resulted in detailed policies and guidance documents aimed at providing procedures to promote ecologically, technically, and administratively successful mitigation banking. The likelihood of mitigation banking success increases when the following are included: enforceable agreements between bank sponsors and regulatory agencies; provisions for long-term responsibility and maintenance of the bank site; financial assurances; and logical and scientifically defensible methods for determining timing and amount of credit withdrawals.

The Commission's mitigation policies state that the Commission "should extend credit for certain fill removal and encourage land banking provided that any credit or land bank is recognized pursuant to written agreement executed by the Commission." In addition, in 1997 the Commission supported the formation of a San Francisco Bay Mitigation Banking System. However, despite general support of mitigation banking, at least for small fill projects in the San Francisco Bay Area, there are currently no, nor have there ever been, any mitigation banks established within BCDC's jurisdiction.

Recommendation. The Bay Plan mitigation policies should be revised to support well-designed mitigation banks, where appropriate, that include: enforceable banking agreements; provisions for long-term responsibility and maintenance of the bank site; financial assurances; and logical and scientifically defensible methods for determining timing and amount of credit withdrawals.

Fee-Based Mitigation. Fee-based mitigation, also called in-lieu-fee mitigation, involves the submittal of a fee by the permittee in-lieu of requiring the permittee to undertake the creation, restoration, or enhancement of a specific mitigation site, or purchasing credits from a mitigation bank. The fee is generally submitted to a third party for implementation of an ongoing or future restoration-creation project.

Like mitigation banking, fee-based mitigation can provide a timely, convenient, and potentially cost effective option for mitigation when on-site mitigation is not feasible or not desirable. In addition, fee-based mitigation can consolidate financial resources from various sources to create a potentially more successful compensatory mitigation project and can provide a source of funding for large, on-going restoration projects. However, fee-based mitigation is subject to several potential risks not associated with mitigation banking. There may be long time lags between permitted impacts and the use of fees to initiate compensation. In addition, it may be challenging to adequately track the use of funds and therefore difficult to determine if the resulting mitigation successfully compensated for the permitted impact. Similarly, it may be dif-

ficult to determine fee rates that are fair and adequate and account for all financial aspects of a mitigation project including administrative costs, monitoring and long-term management. Finally, responsibility for the ecological success of the resulting project has been commonly undefined or unclear in past fee-based mitigation projects, resulting in little accountability for successful mitigation.

However, as with mitigation banking, fee-based mitigation is generally considered a valuable compensatory mitigation option, and attributes of successful fee-based mitigation are beginning to be defined. For example, formal and enforceable in-lieu-fee agreements between the permitting agency and the party receiving the funds, defined legal responsibilities, mechanisms for assuring timely and adequate compensation for impacts, assurances for ecological success, and mechanisms for long-term management and protection, will help increase the success of fee-based mitigation.

In conclusion, the Commission does not have any policies specific to fee-based mitigation. However, eleven mitigation projects involving the use of fee-based mitigation were identified during the permit review process. Funds required by the Commission from permittees have been directed to a specific third party for restoration-creation of a specific site, or have been collected by the Commission for future dispersal for as yet unidentified restoration-creation projects. Under the Commission's fee-based mitigation requirements, responsibility for the ecological success of the mitigation project lay either with the third party receiving the fee, or was not defined. In general, permit conditions regarding fee-based mitigation requirements varied considerably in the eleven projects identified in the permit review, and there was no consistent approach to defining the legal responsibilities of the in-lieu-fee mechanism, nor for assuring ecological success or long-term management and protection.

Recommendation. The Bay Plan mitigation policies should be revised to allow the use of, if other mitigation measures are not feasible, fee-based mitigation that includes: formal and enforceable in-lieu-fee agreements between the permitting agency and the party receiving the funds; identification of specific projects that the fees will be used for in a specific time frame; defined legal responsibilities; mechanisms for assuring timely and adequate compensation for impacts; assurances for ecological success; and mechanisms for long-term management and protection.

Interagency Coordination. With multiple regulatory agencies with often overlapping jurisdictions, it is not uncommon for mitigation for a particular project to be required by more than one regulatory agency. The Commission's mitigation policies state that the mitigation measures should be "coordinated with all affected local, state, and federal agencies having jurisdiction or mitigation expertise to ensure, to the maximum practicable extent, a single mitigation program that satisfies the policies of all the affected agencies."

Efforts such as the San Francisco Bay Area Wetlands Restoration Program (Restoration Program), provide a means for interagency coordination. The Restoration Program was developed by an ad-hoc group of state and federal resource and regulatory agencies to help implement the Goals Report recommendations by supporting and facilitating the restoration of wetlands and associated habitats in the San Francisco Bay Area. To that end, the Restoration Program seeks to provide a forum to identify and resolve any conflicting agency practices, facilitate permitting, and enhance coordination among agencies.

Recommendation. The Commission should continue to work to increase coordination between all agencies and organizations involved in restoration and mitigation in the San Francisco Bay. In particular, the Commission should continue to support and participate in the work of the San Francisco Bay Area Wetlands Restoration Program.

CHAPTER 1

INTRODUCTION

Definition of Mitigation. Under the most basic definition, to "mitigate" is to lessen the severity of any effect. For resource agencies, mitigation generally describes regulatory requirements to lessen or eliminate adverse environmental impacts. Most regulatory agencies define mitigation as a series of actions, generally taken in sequence, to mitigate adverse environmental impacts, specifically first avoiding the impact if possible, then minimizing the impact, and finally, for any unavoidable adverse impacts, provide compensation.

The California Environmental Quality Act (CEQA) Guidelines defines mitigation in more detail as including all of the following:[1]

(a) Avoiding the impact altogether by not taking a certain action or parts of an action.

(b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation.

(c) Rectifying the impact by repairing, rehabilitating, or restoring the impacted environment.

(d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.

(e) Compensating for the impact by replacing or providing substitute resources or environments.

Compensatory mitigation may include several different methods for offsetting the area and functions impacted. The most common types of compensatory mitigation are generally described as follows:

Creation – The formation of a new habitat in an area that does not currently or did not historically support that type of habitat (i.e., the creation of a wetland from an upland area)

Restoration – The re-establishment of a habitat where formerly located (i.e., restoring tidal action to a diked area)

Enhancement – Improving the functions of an existing habitat (i.e., eradicating nonnative vegetation in an existing wetland)

Preservation – Long-term protection of a habitat through a formal, legally enforceable mechanism (i.e., a transfer of title or a deed restriction)

Commission Authority to Require Mitigation. The Commission has required mitigation for unavoidable adverse environmental impacts of projects as a condition of some permits since the early 1970s.[2] In 1985, the Commission revised the *San Francisco Bay Plan* (Bay Plan) to include policies on compensatory mitigation. The policies were adopted in an effort to reflect the Commission's past decisions regarding compensatory mitigation and to provide general policies for determining mitigation requirements.

The Commission's authority to issue permits conditioned on mitigating adverse environmental impacts, and develop policy accordingly, is derived from the McAteer-Petris Act, the Bay Plan, the Suisun Marsh Act, and the *Suisun Marsh Protection Plan*, and is also informed by the California Environmental Quality Act (CEQA).

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[1] Title 14. California Code of Regulations. Chapter 3. Guidelines for Implementation of the California Environmental Quality Act. Section 15370

[2] San Francisco Bay Conservation and Development Commission. 1984. Staff Report on Fill Controls.

Anyone who wants to place fill, extract materials worth more than $20 or make a substantial change in use in any land, water or structure located within the Commission's jurisdiction must first obtain a Commission permit.[3] To approve a permit application and grant a permit, the Commission must find that a proposed project or activity that requires a permit is consistent with the McAteer-Petris Act and the Bay Plan.[4]

The broadest authority for requiring mitigation for fill, extraction of materials (e.g., dredging) or change in use projects is found in the McAteer-Petris Act in Government Code Section 66632(f), which states in part:

> a permit shall be granted for a project if the Commission finds and declares that the project is...of such a nature that it will be consistent with the provisions of this title [the McAteer-Petris Act] and with the provisions of the *San Francisco Bay Plan* then in effect.... The Commission may grant a permit subject to reasonable terms and conditions including the uses of land or structures, intensity of uses, construction methods and methods for dredging or placing of fill.

This authority exists in any situation where a proposed project would be inconsistent with one or more Bay Plan policies and can only be made consistent through the imposition of a reasonable term or condition. The Bay Plan contains a number of policies that might provide a basis for disapproving a proposed fill or dredging project or imposing a reasonable term or condition to make a proposed project consistent with the particular policy. For example, Bay Plan Tidal Marshes and Tidal Flats Policies 1 and 2 provide that any filling, diking or dredging projects should minimize and, if possible, avoid any harmful effects on tidal marshes and tidal flats, and that projects that would substantially harm tidal marshes or tidal flats should be allowed only if the project would provide substantial public benefits, and there is no feasible alternative to the project. Thus, if a proposed project would substantially harm a tidal marsh or tidal flat, the Commission would have to deny the application unless the Commission could impose a reasonable condition that would eliminate or reduce as much as is reasonably feasible such an impact. Similarly, Bay Plan Dredging Policies 1 and 2(c) provide the dredging should be conducted in an environmentally sound manner and that dredging should be authorized only when important fisheries and Bay natural resources are protected through seasonal restrictions or through other appropriate measures.

The Suisun Marsh Preservation Act (Marsh Act) similarly requires a permit for any activity that constitutes a marsh development.[5] To approve an application for a marsh development, the Commission must find that the proposed project would be consistent with the provisions of the Marsh Act and the *Suisun Marsh Protection Plan* (Marsh Plan), or with the provisions of the Suisun Marsh Local Protection Program. Also similarly, the Marsh Plan and the Local Protection Program contain policies intended to protect a variety of marsh resources and would provide the basis for denying an application if the proposed project would be inconsistent with one or more of the policies. In addition, Section 29520 of the Marsh Act states that except as expressly provided in the Marsh Act, the Commission shall use the procedures set forth in the McAteer-Petris Act for the submission, review and issuance of a marsh development permit by the Commission. Thus, the Commission is also authorized by the Marsh Act to impose reasonable terms and conditions when acting on an application for a marsh development permit to make the proposed project consistent with the Marsh Act and Marsh Plan or the Local Protection Program.

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[3] Section 66632(a) of the McAteer-Petris Act (Cal. Govt. Code Section 66632(a)).

[4] Section 66632(f) of the McAteer-Petris Act (Cal. Govt. Code Section 66632(f)).

[5] Suisun Marsh Preservation Act Section 29114(a) and Section 29500.

Further support for requiring mitigation specifically for Bay fill is found in the McAteer-Petris Act in Government Code Section 66605(a) which states in part: "...further filling of San Francisco Bay... should be authorized only when public benefits from fill clearly exceed public detriments from the loss of water areas...."

Support of the Commission's authority to require mitigation for Bay fill can also be found in Government Code Section 66605(d) which states in part:

> ...the nature, location and extent of any fill should be such that it will minimize harmful effects to the bay area, such as, the reduction or impairment of the volume, surface area, or circulation of water, water quality, fertility of marshes or fish and wildlife resources, or other conditions impacting the environment, as defined in Section 21060.5 of the Public Resources Code.

Section 21060.5 of the Public Resources Code defines "environment" as "the physical conditions which exist within the area which will be affected by a proposed project, including land, air, water, minerals, flora, fauna, noise, objects of historic or aesthetic significance."

In addition, Commission authority for requiring avoidance and minimization prior to compensation (as in the mitigation sequencing approach described above) can be found in the McAteer-Petris Act, Section 66605 (b, c, d) which states in part that "fill in the bay... should be authorized only when no alternative upland location is available for such purpose" (avoidance), and that "the water area authorized to be filled should be the minimum necessary..." and "the nature, location and extent of any fill should be such that it will minimize harmful effects to the Bay area" (minimization).

When determining if the public benefits outweigh the public detriments and imposing reasonable conditions, the Commission must also consider relevant court decisions concerning its ability to condition permits. Two cases that are particularly applicable are *Nollan* v. *California Coastal Commission*, 483 U.S. 825 (1987), and *Dolan* v. *City of Tigard*, 512 U.S. 374 (1994).

In the Nollan case, the United States Supreme Court ruled that there must be an "essential nexus" between the interest being protected and the permit condition (or mitigation measure) imposed. In other words, there must be a definite correlation between the impact and the required mitigation. In the Dolan case, the Supreme Court added a second element to the ability of a state to condition permits. Under what is known as the "Dolan test" a condition or a mitigation measure must also be "roughly proportional" to the project's individualized impact. No precise mathematical calculation is required, but the required mitigation must be related both in nature and extent to the impact of the proposed project. In addition, the court stated that the burden of proof of rough proportionality is on the agency, meaning that agencies must carefully document the magnitude of the impact and the expected result of the mitigation.

Finally, although CEQA does not provide independent authority for agencies to require mitigation, the CEQA Guidelines do provide guidance regarding agencies' authority to require mitigation, whether acting as the lead agency or as a responsible agency. Specifically, the Guidelines state in part:[6]

> (a) A lead agency for a project has the authority to require feasible changes in any or all activities involved in the project in order to substantially lessen or avoid significant effects on the environment....
>
> (b) ...the Responsible Agency may require changes in a project to lessen or avoid only the effects, either direct or indirect, of that part of the project which the agency will be called on to carry out or approve.

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[6] Title 14. California Code of Regulations. Chapter 3. Guidelines for Implementation of the California Environmental Quality Act. Article 3. Section 15041.

In conclusion, Commission authority to require mitigation as a condition of project approval is derived from the McAteer-Petris Act, *San Francisco Bay Plan*, the Suisun Marsh Act, and the *Suisun Marsh Protection Plan*, and is also informed by the California Environmental Quality Act.

Reason for Proposed Bay Plan Amendment. Since the adoption of the Bay Plan mitigation polices in 1985, scientific knowledge regarding habitat creation and restoration has evolved. In addition, public and private interest and investment in habitat restoration in the San Francisco Bay Area has resulted in regional visions for the types, amounts and distribution of wetlands and related habitats that are needed to restore and sustain a healthy Bay ecosystem, and an increasing focus on regional restoration efforts. Finally, considerable information on policies and practices related to mitigation has been published in the past decade, and the Commission itself has had seventeen years of valuable practical experience in applying its mitigation policies and refining its permit conditions in an effort to successfully compensate for unavoidable adverse environmental impacts of projects it has permitted.

In addition, the current mitigation policies were adopted into the Bay Plan under Part V, "Carrying Out the Plan," and as with the other sections of Part V, did not include associated findings. A recent restructuring of the Bay Plan (BPA #5-99) deleted Part V and incorporated the policy elements into other applicable sections of the Bay Plan. The mitigation policies are now under Part IV, "Development of the Bay and Shoreline: Findings and Policies," and for consistency purposes, should be revised to include findings from which the policy revisions would be based.

Pursuant to the Commission's FY 2001-2002 work program, in 2001 staff initiated review of the current Bay Plan compensatory mitigation policies for possible update. The following report is the culmination of staff's research on the science and policy of mitigation. Chapter 2 provides an overview of the current existing information on whether compensatory mitigation has and can be successful in meeting scientists' and regulatory agencies' expectations. Chapter 3 follows with a breakdown of the components of compensatory mitigation science and policy by describing the current issues and local and nationwide trends, and presents conclusions on each major subject area. Chapter 4 describes in more depth the Commission's history with regard to the development of its mitigation policies, and Chapter 5 provides a review and analysis of the Commission's mitigation practices over the past fifteen or so years. Overall conclusions and recommendations, and specific proposed revision to the *San Francisco Bay Plan* precede this introduction.

CHAPTER 2

SUCCESS OF COMPENSATORY MITIGATION

As described in the Introduction, compensatory mitigation is a tool used by regulatory agencies to offset permitted unavoidable adverse environmental impacts. More specifically, the goal of most compensatory mitigation projects is to sufficiently and successfully offset loss of both acreage (a measurement of the actual area impacted), and functions (the services provided by the area such as wildlife habitat or flood control), generally by creating, restoring or enhancing specific habitat types. Paramount to the utility of compensatory mitigation as a regulatory tool is whether such efforts are ultimately successful. The following chapter summarizes nationwide success rates of compensatory mitigation projects, both in terms of replacing lost area and functions and in terms of compliance with regulatory requirements, outlines the current state of scientific knowledge and experience regarding habitat restoration-creation, and describes some of the existing scientific gaps.

Focus on Wetlands. Wetlands are transitional areas between upland and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Examples of wetlands habitats include tidal flats, tidal marshes, lagoons, and riparian forests. Wetlands provide many functions including moderating flood flows, recharging groundwater, reducing and preventing shoreline erosion by minimizing wave energy, and improving water quality by filtering surface runoff from surrounding lands. Wetlands also provide important habitat for aquatic and upland plant and animal species, serve as a primary link in the ecosystem's food chain, are an essential feeding and resting places for migratory birds, and provide open space and recreational opportunities.[7] The nation's wetlands have been diked and filled over time for uses such as farming and development, which has led to significant reductions of wetland acreage nationwide. The San Francisco Bay, for example, has seen a loss of approximately 80 percent of its historic tidal marshes.[8]

Due to a growing understanding of the importance of wetlands and increasing concerns over the loss of wetlands in the United States, both the federal government and the State of California currently operate under a general policy of "no net loss" of the nation's remaining wetlands, generally defined as no overall loss of both wetland acreage and wetland functions.[9] Compensatory mitigation is one of the primary regulatory tools involved in the effort to satisfy the no net loss objective. Public and government focus on wetland resources combined with the no net loss policy have resulted in a strong association between compensatory mitigation and impacts to wetlands. As discussed in Chapter 4, the Commission's policies on mitigation are more comprehensive and describe mitigation as measures to compensate for the adverse impacts on natural resources of the Bay, "such as to water surface area, volume, or circulation and to fish and wildlife habitat or marshes or mudflats." However, as a result of the national emphasis on protection and restoration of wetlands, and a recognition of the difficulty of successfully replacing lost wetland habitat, the vast majority of the available studies of mitigation success have focused on wetland resources. The following Chapter therefore focuses primarily on the success of compensatory mitigation to replace lost area and functions of wetlands.

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[7] San Francisco Bay Conservation and Development Commission. 2001. San Francisco Bay Ecology and Related Habitats.

[8] San Francisco Bay Conservation and Development Commission, 2001.

[9] The goal of the California Wetlands Conservation Policy, adopted in 1993, is to "ensure no overall net loss and achieve a long-term net gain in the quantity, quality, and permanence of wetlands acreage and values in California...." (California Wetlands Conservation Policy. August 23, 1993. Available online at: http://ceres.ca.gov/wetlands/policies/governor.html, as of January, 2002).

Replacing Lost Area and Functions with Compensatory Mitigation. Fundamental to the success of any compensatory mitigation policy or program is whether creation and restoration of habitats can successfully replace lost area and functions. Over the last few decades as mitigation requirements have resulted in restoration and creation of lost habitats on a national scale, scientific opinion on whether these efforts have been or can be successful continues to be a highly debated topic.[10]

Early reviews of mitigation in the San Francisco Bay were varied in their assessments of success. For example, in 1985, two assessments of compensatory mitigation projects involving wetland restoration in the San Francisco Bay found very low rates of success.[11] A few years later the Commission concluded that mitigation can and has restored Bay resources, but that in a review of fourteen wetland mitigation projects, just under one-half were considered successful (please refer to Chapter 3 for more information on the review).[12]

In a recent effort to address the success rate of mitigation efforts for wetlands nationwide, the National Academy of Sciences' National Research Council (NRC) undertook a thorough review of existing scientific studies from around the nation as well as conducted field visits to several wetland mitigation sites.[13] Table 1 displays some results of the NRC's review, summarizing success of compensatory mitigation projects via three parameters; overall acreage gained or lost, acreage provided compared to acreage required, and how well the mitigation project provided equivalent ecological functions as compared to the impacted area, or stated differently, the ecological success of the mitigation project.

Table 1

Summary Review of Studies on Wetland Compensatory Mitigation Implementation, Compliance, and Ecological Success.

Parameter	No. of Studies	No. of States	Mean	Median
% Area gain (loss) for mitigation attempted, based on field inspections	8	5	(17)	(32.5)
% Compliant based on acreage required versus actual acreage realized	9	4	61	62
% Compliant based on functional equivalency of completed mitigation	9	4	21	18

Source: Adapted from National Research Council. 2001. Compensating for Wetland Losses Under the Clean Water Act. National Academy Press, Washington, DC: 121.

[10] Goals Project. 1999. Baylands Ecosystem Habitat Goals. A report of habitat recommendations prepared by the San Francisco Bay Area Wetlands Ecosystem Goals Project. U.S. Environmental Protection Agency, San Francisco, Calif./S.F. Bay Regional Water Quality Control Board, Oakland, Calif.; Mitch, William, and Renee Wilson. 1996. Improving the Success of Wetland Creation and Restoration With Know-How, Time, and Self-Design. Ecological Applications. 6(1):77-83; and National Research Council. 2001. Compensating for Wetland Losses Under the Clean Water Act. National Academy Press, Washington, DC;

[11] Eliot, Wendy. 1985. Implementing Mitigation Policies in San Francisco Bay: A Critique. California Coastal Conservancy. Oakland, CA.; and Race, Margaret. 1985. Critique of present wetland mitigation policies in the United States Based on an Analysis of Past Restoration Projects in San Francisco Bay. Environmental Management 9:71-82.

[12] San Francisco Bay Conservation and Development Commission. 1988. Mitigation: An Analysis of Tideland Restoration Projects in San Francisco Bay.

[13] National Research Council, 2001.

As shown in Table 1, based on the wide range of nationwide studies reviewed by the NRC there was a net loss in wetland area of 17 percent to about 32 percent, and about 62 percent of the mitigation projects met the required acreage. Finally, the functional equivalency of mitigation sites was only about 20 percent of that intended. Overall, the NRC found that there appears to be a net loss of wetland acreage and functions nationwide.

Only one published assessment of mitigation success has been undertaken in the San Francisco Bay Area in the past fifteen years. In the 1994 assessment of thirty mitigation sites, about ten of which were in the Bay (all thirty sites are captured in the above Table 1), Deweese found that based on a subjective analysis of the quality of the mitigation sites, though there was a net gain in wetland area there was a net loss in ecological functionality. Of the 30 total projects evaluated and assigned a value rating of between 0 and 10, only one project had a rating of ten, and the average rating for all the projects was just under five.[14]

One criticism of the available studies of mitigation success is that many, if not most, are qualitative assessments of ecological success, rather than quantitative. Qualitative assessments are inherently somewhat subjective, thus objective, quantitative conclusions regarding nationwide success of compensatory mitigation are difficult to generate. In addition, qualitative assessments are often based on structural attributes of a site such as vegetation cover or plant species diversity, and may not be providing a complete understanding of the success of various functions of a site, including habitat, primary productivity or hydrologic functions.[15]

Ecological failure of compensatory mitigation sites is often attributed to either poor siting (i.e., the location is not appropriate for the mitigation goals) and/or poor design. Specifically, a lack of proper hydrology has been identified as one of the major causes of failure of mitigation projects.[16] Ecological failure may also be attributed to a lack of time given to the habitat to achieve success. In other words, a restored or created resource may need more time to achieve ecological success than the time given those responsible for the mitigation project to meet required performance standards.[17]

Despite a history of net loss of acreage and functions of wetlands and related habitats, there is evidence that many types of restored or created wetlands, such as freshwater emergent marshes and some saltmarsh habitat, can and have replaced wetland acreage and functions. The recent NRC report, prepared by an interdisciplinary committee who undertook an extensive literature review as well as visited mitigation sites around the nation, concluded that "enough is understood about wetland hydrology, place in the landscape, soils, and other determinants of wetland structure to specify design requirements that will result in a site that will develop into a wetland and provide for a number of wetland functions."[18] The NRC report acknowledges, however, that other types of wetlands such as wet prairies, sedge meadows, shrub swamps, forested wetlands, and particularly vernal pools, fens and bogs are more difficult to restore or create.[19]

For wetland habitats, the types that are easier to restore or create are those that contain one dominating vascular plant species (particularly a species that has been well studied) that grows in relatively wet conditions and is a natural colonizer of bare substrate. Furthermore, success of restoration or creation is higher at sites where environmental conditions are relatively stable (i.e., a low risk of extreme events such as flood or drought), and where there is a connection to

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[14] Deweese, J. 1994. An evaluation of selected wetland creation projects authorized through the Corps of Engineers Section 404 program. U.S. Fish and Wildlife Service, Sacramento, CA.

[15] Ambrose, Richard. 2001. Wetland Mitigation in the United States: Assessing the Success of Mitigation Policies. Wetlands (Australia) 19:1-27.

[16] Ambrose, 2001; Mitsch and Wilson, 1996; National Research Council, 2001.

[17] Mitch and Wilson, 1996; National Research Council, 2001.

[18] National Research Council, 2001: 150.

[19] National Research Council, 2001.

other wetlands for plant and animal colonization. In contrast, it is more difficult to successfully restore or replicate habitats with poorly studied species, with several types of vegetative species that are not ready colonizers of bare substrates, and in areas which experience high environmental variability and with no aquatic or upland connection to other wetlands.[20]

In addition, restoration of previously existing habitats (such as diked wetlands), is generally more successful than the creation of a habitat where it never existed (such as creating wetland from upland). Restoration, as opposed to creation, is generally more feasible and more sustainable. In an area that once supported a desired habitat type, the proper substrate may still be present, seed sources may be on-site or nearby, and appropriate hydrological conditions may still exist or may be more easily restored.[21]

Similarly, the success of a restoration project also depends on the degree to which the restoration site and the surrounding area is degraded. In a degraded area in an urbanized environment for example, the success of a mitigation project may be compromised by altered hydrologic conditions that can result in vegetation failure, scouring, floods, water quality problems, and failure to provide appropriate habitat for fish and wildlife. A mitigation project in an urban environment may also be susceptible to non-native species invasions, and effects of intrusion by humans, pets and feral animals.[22]

In conclusion, despite the overall loss of habitat area and functions nationwide, the current scientific literature suggests that, with the exception of some difficult to restore types of habitat, there is enough scientific knowledge and enough experience gained to be able to design and construct wetlands and associated habitats that have a high probability of success in terms of providing at least some identified functions.[23]

Measuring Success of Compensatory Mitigation Projects. If the knowledge and experience exist to successfully achieve at least some success with habitat restoration-creation, the question remains, why do studies continue to show a lack of success of mitigation projects? The answer may lie in part in how "success" is defined and determined.

The success of a mitigation project can be measured by whether the project successfully replaces the impacted functions, or is "functionally equivalent" to the impacted site, or an existing historically similar site. As a regulatory tool, however, the success of a mitigation project can also be measured by what degree the mitigation project meets previously established standards for success, or put another way, is in compliance with regulatory requirements such as permit conditions.

While some of the failure of mitigation can be attributed to the scientific challenges of successfully creating and restoring habitats, and there is certainly a need for continued scientific research, perhaps the biggest obstacle to successful replacement of lost acreage and functions is not a lack of science, but a lack of compliance with mitigation requirements.[24] The NRC's summary of eighteen field studies measured the number of restoration or creation sites that met permit conditions as an indicator of permit compliance and found an average of only about 55 percent of the projects were in complete compliance.[25]

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[20] National Research Council, 2001; and Zedler, Joy. 1996. Coastal Mitigation in Southern California: The need for a Regional Restoration Strategy. Ecological Applications. 6(1):84-93.

[21] National Research Council, 2001.

[22] Goals Project, 1999; Mitch and Wilson, 1996; and Zedler, Joy, and John Callaway. 1999. Tracking Wetland Restoration: Do Mitigation Sites Follow Desired Trajectories? Restoration Ecology. 7(1):69-73.

[23] Goals Project, 1999; Mitch and Wilson, 1996; and National Research Council, 2001.

[24] Race, Margaret, and Mark Fonseca. 1996. Fixing Compensatory Mitigation: What Will it Take? Ecological Applications. 6(1):94-101; and National Research Council, 2001.

[25] National Research Council, 2001.

Noncompliance can arise at various stages of the mitigation project process. The NRC's review of eight separate studies nationwide reviewing a total of 778 permits found that about 25 percent of mitigation projects were never even initiated.[26] Projects that are actually initiated may not be implemented according to approved plans. For example, a recent report from the state of Washington found that of 42 implemented wetland mitigation projects, 38 percent were not implemented according to approved plans.[27] Even if projects are implemented to plan, they may not meet established performance standards, and may not employ required contingency measures to ensure successful establishment of performance standards. The same Washington study found that of 34 mitigation projects, 47 percent did not meet the performance standards identified in the mitigation plans. Finally, once designed and constructed, projects may not include required maintenance of the mitigation site such as eradication of non-native species or removal of debris.[28]

Noncompliance may also result when ecological equivalency is not reached within the time frame set by the regulatory process, and in fact some functions at a site may never reach equivalency. Furthermore, the development of a habitat is a dynamic process and different functions may develop at different, perhaps unpredictable, rates that are difficult to define in a regulatory requirement.[29]

Poor compliance has also been linked to poorly defined performance standards in permit conditions, resulting in an inability to adequately measure mitigation effectiveness.[30] Furthermore, tracking compliance can be hampered by lack of established processes within regulatory agencies to collect and analyze monitoring results from mitigation projects. Successful mitigation is hindered by lack of agency resources, adequate personnel, training and expertise, and agency priority on monitoring and enforcement of permit conditions.[31]

Gaps in Restoration-Creation Science. Although the success of compensatory mitigation largely depends on the appropriate design, construction, and maintenance of a project, restoration and creation of habitats is still an evolving field, and there are some significant scientific gaps in the current state of knowledge.

For example, a greater understanding is needed on the relationship between individual mitigation projects and the health of the regional ecosystem as a whole. For example, the function of a wetland in an ecosystem is affected by the health of the entire watershed. In return, the location and functioning of a particular wetland can in turn affect watershed hydrology, water quality, and species diversity and abundance.[32] Additionally, more comparative field studies are needed involving sites with different existing conditions and different restoration-creation objectives and designs. Perhaps most importantly, more information is needed on the functions of specific habitat types. Specifically, there is a lack of understanding regarding the relationship between the structure of an area (such as vegetation cover, density, diversity) and the functions of that area (such as wildlife use, primary productivity, hydrology, sediment accretion, nutrient retention). Finally, the length of time it takes for the establishment of specific functions is poorly understood, as is how structure and functions change through time (i.e., do specific structures

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[26] National Research Council, 2001.

[27] Johnson, Patricia, Dana Mock, Emily Teachout, and Andy McMillan. 2000. Washington State Wetland Mitigation Evaluation Study – Phase I: Compliance. Washington State Department of Ecology. Publication No. 00-06-016.

[28] National Research Council, 2001.

[29] National Research Council, 2001. Zedler, Joy, and John Callaway. 1999. Tracking Wetland Restoration: Do Mitigation Sites Follow Desired Trajectories? Restoration Ecology. 7(1):69-73.

[30] National Research Council, 2001; and Zedler, 1996.

[31] National Research Council, 2001.

[32] National Research Council, 2001.

or functions develop in a smooth predictable fashion or do they follow a more sporadic development curve).[33]

Conclusion. There have been very few studies in the San Francisco Bay on the success of compensatory mitigation projects. Nationwide, the current literature points to potential for ecological success of mitigation projects, at least for some functions of some types of habitats. However, despite the potential for success, compensatory mitigation has resulted in a nationwide loss of acreage and especially ecological functions, particularly for wetland resources. This persistent loss of acreage and functions has been linked to poorly sited or designed projects, a lack of compliance with permit conditions (such as not implementing projects, not constructing projects correctly and not maintaining sites), poorly defined success standards, and a lack of agency resources focused on compliance and enforcement. Although more scientific information is certainly needed, the lack of success of compensatory mitigation nationwide appears to be largely due to lack of compliance, or poorly defined or inappropriate requirements, rather than a lack of science.

[33] Mitch and Wilson, 1996; National Research Council, 2001; Race and Fonseca, 1996; and Zedler and Callaway, 1999.

CHAPTER 3

CURRENT COMPENSATORY MITIGATION ISSUES

The following chapter describes the major components of current nationwide discussion and debate regarding compensatory mitigation policy. Each section describes the current knowledge and trends of the particular issue, and provides examples from both the Commission's policies and practices, other California state agencies as well as coastal state agencies nationwide, and federal agencies.

Compensatory Mitigation Types. Compensatory mitigation may include several different methods for offsetting the area and functions impacted. The most common types of compensatory mitigation are generally described as follows:

Creation – The formation of a new habitat in an area that does not currently or did not historically support that type of habitat (i.e., the creation of a wetland from an upland area)

Restoration – The re-establishment of a habitat where formerly located (i.e., restoring tidal action to a diked area)

Enhancement – Improving the functions of an existing habitat (i.e., eradicating nonnative vegetation in an existing wetland)

Preservation – Long-term protection of a habitat through a formal, legally enforceable mechanism (i.e., a transfer of title or a deed restriction)

Based on the current scientific understanding of mitigation, habitat restoration has a better chance for ecological success than habitat creation, where the appropriate conditions, such as hydrology or nearby seed banks, may not be available to achieve success.[34] In addition, creation by its very nature replaces one type of pre-existing habitat with different type of habitat which can result in an undesirable net change in habitat types in a region.

Some regulatory agencies include policies that give preference to restoration over creation. For example, the State of Wisconsin's mitigation policies state in part that mitigation "may involve one or a combination of techniques including restoration, enhancement or creation of wetlands. Restoration is the preferred technique."[35] In a different approach, the Corps' 2001 Guidance Letter for the establishment and maintenance of compensatory mitigation projects states that "The current view is that restoration efforts provide the best potential for success in terms of providing functional compensation; however, each type of mitigation has utility and may be used as compensatory mitigation."[36]

Neither enhancement nor preservation compensate for lost acreage, since neither activity actually increases the available acreage of a particular resource. Although enhancement increases the ecological functionality of an area, preservation neither increases the acreage nor the ecological functionality of an area, at least in the short term. However, preservation does provide benefits in that it can ensure the existing functions of the preserved area are protected and maintained in the long-term, particularly when the functions are not fully protected under existing regulatory programs or are directly threatened by proposed development activities. Both enhancement and preservation, if allowed for compensatory mitigation, often require a greater area enhanced or preserved than the area impacted, in an effort to provide appropriate compensation for impacted functions.

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[34] National Research Council, 2001.

[35] Wisconsin Department of Natural Resources. Chapter NR 350. Wetland Compensatory Mitigation.

[36] U.S. Army Corps of Engineers. 2001a. Regulatory Guidance Letter No. 01-1. Page 3.

Agencies differ in their approach to allowing enhancement and particularly preservation as mitigation. For example, though the role of preservation has traditionally not been emphasized in the Corps' history, the new Guidance Letter outlines the role of preservation stating that mitigation credit may be given for preservation when the proposed resources to be preserved perform physical, chemical and/or biological functions that are important tot the region as a whole. In addition, the letter states that aquatic areas proposed for preservation, including wetlands, must be currently under some threat of development.[37] In the Draft Programmatic Environmental Impact Statement for Nationwide Permits, the Corps defends the role of preservation for preserving the health of a watershed, as an agency that has no authority to regulate upland activities. Preservation of upper watershed wetlands, the Corps asserts, can be an effective means to protect aquatic functions lower in the watershed. In addition, the Corps points out the scientific uncertainty associated with many restoration and creation activities and asserts that in some cases preservation of threatened or particularly valuable resources may be the best way to increase the health of a watershed.[38] It should be noted that many environmental groups opposed the new Guidance Letter due to what they felt was a weakening of the Corps' wetland policies.[39]

The Commission's policies do not include any preferences concerning the type of mitigation allowable. However, the policies do state that mitigation should consist of "...providing area and enhancement resulting in characteristics and values similar to characteristics and values adversely affected"[40] which could be interpreted as allowing for restoration or creation, as well enhancement and possibly preservation.

In conclusion, compensatory mitigation consists of several types of activities including creation, restoration, enhancement and preservation. Of those options, only creation and restoration result in an increase in habitat area, as enhancement focuses on improving the functions of existing habitat areas and preservation focuses on protecting existing rare or high quality habitats. Therefore, when enhancement or preservation is used as a mitigation type, higher mitigation ratios may be necessary to adequately compensate for the permitted impact. In general, restoration provides a better chance for ecological success than creation. Restoration, as opposed to creation, is generally more feasible and more sustainable since in an area that once supported a desired habitat type, the proper substrate may still be present, seed sources may be on-site or nearby, and appropriate hydrological conditions may still exist or may be more easily restored. In addition, creation of a new habitat type results in the loss of an existing habitat type which may already be providing important functions to the region.

On-Site, In-Kind Replacement Requirements. Most regulatory agencies currently operate under a policy preference for compensatory mitigation adjacent to or near the area of impact, or "on-site" mitigation, over "off-site" mitigation, in an attempt to fully replace the site-specific functions that were impacted.

Similarly, most regulatory agencies emphasize replacing the same type of habitat impacted, or "in-kind" mitigation, as having the greatest potential to compensate for the actual functions impacted and minimize changes to the ecosystem.[41] The alternative to in-kind mitigation is commonly called "out-of-kind" mitigation and consists of creating, restoring or enhancing resources that are different than those impacted. The current Bay Plan mitigation policies emphasize in-kind mitigation by stating in part that "the benefits from the mitigation" should

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[37] U.S. Army Corps of Engineers, 2001a.

[38] U.S. Army Corps of Engineers, 2001b. Nationwide Permits – Draft Programmatic Environmental Impact Statement.

[39] National Wildlife Federation. 2001. Army corps Ignores "No Net Loss" Wetlands Policy. Available online at: http//www.nwf.org/wetlands/guidanceletter.html as of December 4, 2001.

[40] San Francisco Bay Plan, 2002: 60.

[41] Race and Fonseca, 1996.

be "commensurate with the adverse impacts on the resources of the Bay and consist of providing area and enhancement resulting in characteristics and values similar to the characteristics and values adversely affected."[42]

Many regulatory agencies do allow for off-site and potentially out-of-kind mitigation when on-site and in-kind mitigation is not practicable or feasible. In this vein, the Bay Plan mitigation policies state in part that "the mitigation program should assure...that the mitigation would be at the fill project site, or if the Commission determines that on-site mitigation is not feasible, as close as possible."[43]

Some agencies allow for various alternatives, but in order of acceptability. For example, the California Department of Fish and Game's policies state a preference for in-kind, on-site mitigation as the first alternative, or if that is not feasible, in-kind and off-site, followed by out-of-kind and on-site, and finally out-of-kind and off-site. In addition, some agencies also allow for off-site and potentially out-of-kind mitigation when it is determined that off-site mitigation will provide greater environmental benefits than on-site. For example, the Army Corps of Engineers (Corps) and the U.S. Environmental Protection Agency (EPA) Federal Guidance on Mitigation Banking states that bank credits "may only be authorized when on-site compensation is either not practicable or use of a mitigation bank is *environmentally preferable* to on-site compensation." [emphasis added].[44]

There are several reasons why off-site mitigation may be more environmentally beneficial than on-site mitigation. The success of a mitigation project on the same site as the permitted development may be compromised due to changes to hydrologic conditions, the potential for invasive plants and animals, human intrusion, and the accumulation of trash and debris as a result of the adjacent land uses.[45] Furthermore, on-site mitigation may even be harmful to the environment in some cases as the process of restoring or creating habitat adjacent to developed areas may stir up hazardous materials in soils.[46] In addition, there may be environmental benefits associated with combining mitigation sites into fewer, larger sites. It has been suggested by some scientists that in disturbed settings such as highly urbanized areas with substantial existing habitat fragmentation, it may not make sense to cling to the idea of on-site mitigation, and that larger consolidated habitats made feasible through off-site mitigation are more rare and are important for some wildlife species.[47]

Conversely, in addition to replacing impacted site-specific functions, on-site mitigation, if successful, may increase preservation of small isolated wetlands and related habitats that are ecologically important and provide valuable habitat for some wetland-related plant and animal species.[48] The retention of several smaller wetlands and related habitats also provides alternative resting, nesting and foraging areas for wildlife when a primary site suffers an environmental stressor such as pollutant load or drought conditions.

Additionally, wetlands and related habitats provide various services to human communities, including climate regulation, flood protection, erosion control, and recreational and esthetic benefits. Therefore, there are also socioeconomic considerations associated with how and where impacted wetlands and related habitats are mitigated.[49] For example, reducing the number of small wetlands adjacent to various communities around the Bay, including more urbanized and

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[42] San Francisco Bay Plan, 2002:60.
[43] San Francisco Bay Plan, 2002:60.
[44] Fed. Regist. 60(Nov. 28):58605-58614
[45] Goals Project, 1999.
[46] Mitch and Wilson, 1996, National Research Council, 2001; and Race and Fonseca, 1996.
[47] Race and Fonseca, 1996.
[48] Goals Project, 1999; and National Research Council, 2001.
[49] Scodari, P. and L. Shabman. 2001. Rethinking Compensatory Mitigation Strategy. National Wetlands Newsletter. 23(1).

poorer neighborhoods, in favor of larger, consolidated sites in less populated regions may have some ecological benefits but may also have impacts on the numbers and types of communities who benefit from the services wetlands and related habitats provide.

Similar debates surround in-kind mitigation versus out-of-kind. In-kind mitigation, if successful, is more likely to result in no net loss of specific habitat types and functions. However, from a regional perspective mitigation provides an opportunity to restore important and/or rare habitats that may or may not be the same type as the habitat impacted. For example, the California Department of Fish and Game (CDFG) policies on mitigation acknowledge there may be situations "where fish and wildlife resources would be better served from a regional standpoint if creation of wetlands of a different type than those adversely impacted...were selected as mitigation."[50] In another example, the State of Washington acknowledges that past mitigation practices focused on requiring in-kind mitigation, but that the Washington State Department of Ecology currently makes an individual assessment in each case and in some cases, encourages out-of-kind mitigation based on the value of the habitat impacted, and the available opportunities to recreate or restore the same type of habitat as that impacted and the potential to restore a different, potentially higher-value habitat.[51]

Furthermore, out-of-kind mitigation options may help prevent the creation of a required habitat type at the expense of an existing important habitat in an effort to meet strict in-kind requirements where opportunities for in-kind replacement may be constrained (i.e., excavation and planting of important mudflat habitat to create tidal marsh).[52] One risk of allowing out-of-kind mitigation options, however, is the continued restoration-creation of those habitats that are the easiest and most cost effective, rather than those that provide the greatest benefits for the health of the region. Additionally, allowing out-of-kind mitigation to promote regional benefits requires both a thorough understanding of the current state of a region, as well as a concept of the appropriate ecological future of a region.

In response to concerns regarding the success of on-site mitigation and an acknowledgement of the potential benefits of off-site and/or out-of-kind mitigation, an emerging nationwide regulatory trend is a move away from requirements for mitigation at the project site to a broader focus on mitigating within the same drainage basin or watershed as the impacted site, based on broader ecosystem goals. For example, the State of Washington generally requires the replacement habitat to be located in the same drainage basin in an effort to replace regional hydrologic and fish habitat functions, and acknowledges that on-site compensatory mitigation is now seldom required since adequate opportunities are rarely available at a project site.[53]

Similarly, at the federal level, under the EPA and the Corps, although on-site mitigation still exists in several policy documents as the preferred method, encouragement of a watershed-based approach to mitigation is emerging. The 2000 Federal Guidance on the Use of In-Lieu-Fee Arrangements states that in-lieu-fee mitigation projects "should be planned and developed to address the specific resource needs of a particular watershed."[54] The 1995 Federal Guidance on Mitigation Banking states the overall goal of a mitigation bank is to compensate for wetland and other aquatic resources "in a manner that contributes to the long-term ecological functioning of the watershed...."[55] Furthermore, the Corps' 1999 Standard Operating Procedures specifically advises the districts that the preference for on-site/in-kind mitigation over off-site/out-of-kind

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[50] California Department of Fish and Game. Fish and Game Commission Policies on Wetland Resources. Available online at: http://www.dfg.ca.gov/fg_comm as of June, 2002.

[51] Washington State Department of Ecology. 1998. How Ecology Regulates Wetlands. Publication No. 97-112.

[52] Zedler, Joy. 1997. Restoring Tidal Wetlands: A Scientific View. National Wetlands Newsletter. January-February 1997.

[53] Washington State Department of Ecology, 1998.

[54] Federal Register. 65(Nove.7):66914-66917.

[55] Federal Register. 60(Nov.28):58605-58614.

should not be considered as a "hard and fast policy," that "Corps field experience has shown ecological value in pursuing practicable and successful mitigation within a broader geographic context," and that "the bottom line test for mitigation should be what is best for the overall aquatic environment."[56] Finally, in part as a response to the recent NRC report, the Corps issued a Regulatory Guidance Letter in October, 2001 for compensatory mitigation which encourages a watershed approach for mitigation.

The recent NRC report recommends that selection of mitigation sites be based on an assessment at the regional or watershed scale to achieve desired habitat functions that meet regional goals, rather than sticking to the historical regulatory preference of in-kind and on-site compensatory mitigation. The NRC report outlines several benefits of watershed approach including allowing the restoration of certain habitat types that have been disproportionately lost in the watershed and that would better improve the health of the watershed, and increasing mitigation success rates by locating projects in areas with desired biological and physical attributes such as appropriate hydrology and soils, connections to other aquatic habitats, and opportunities for transition zones and buffers.[57]

The implementation of a watershed or regional approach to mitigation clearly requires the ability to conduct a watershed assessment to determine the goals, constraints and opportunities of various mitigation options whether on a permit by permit basis or through a more long-range long-term planning process. Establishment of regional visions, priorities and strategies for restoration, enhancement and preservation of natural resources can greatly assist regulatory agencies and permit applicants in identifying and implementing mitigation that adequately compensates for adverse impacts and meets long-term restoration goals for a region.

In conclusion, decisions between on-site or off-site, in-kind or out-of-kind mitigation involve tradeoffs that require a case-by-case analysis. On-site and in-kind mitigation may help compensate for site specific functions, but may be constrained by the permitted development project and other adjacent land uses. Off-site and potentially out-of-kind mitigation doesn't replace specific functions locally, but may have a better chance of ecological success and offers flexibility in meeting long-term regional goals. A broader approach to mitigation includes the selection of mitigation sites based on an assessment at the regional or watershed scale to achieve desired habitat functions that meet regional goals. A regional approach may include the restoration of certain habitat types that have been disproportionately lost in the watershed and that would better improve the health of the watershed, and can increase mitigation success rates by locating projects in areas with desired biological and physical attributes such as appropriate hydrology and soils, connections to other aquatic habitats, and opportunities for transition zones and buffers. A regional approach does not mean mitigation will always be off-site and out-of-kind, rather a regional approach allows for a case-by-case analysis on a broader geographic context, based on the functions of the impacted site and the goals of the region as a whole, to determine the appropriate mitigation that compensates for the impacted functions, promotes the health of the entire region, addresses potential social and economic effects, and has a high likelihood of ecological success.

Habitat Classification Methods. The use of standardized and consistent definitions of habitat type assists in comparing the impacted site with the proposed mitigation site. For example, the 1979 comprehensive wetlands classification system developed by Cowardin et al is used by the USFWS and the CDFG. The Cowardin system includes several hierarchical attributes for classification including: a subsystem of water flow; classes of substrate types; subclasses of vegetation type and dominant species, as well as flooding regimes and salinity levels. The National Wetlands Inventory (NWI) of the USFWS produces information on the characteristics, extent, and

[56] U.S. Army Corps of Engineers. 1999. Standard Operating Procedures for the Regulatory Program. Available online at http://www.nwp.usace.army.mil/op/g/notices/Reg_Stan_SOP.pdf as of April 24, 2002.
[57] National Research Council, 2001.

status of the Nation's wetlands and deepwater habitats, classified using the Cowardin system. The Corps, on the other hand, uses a different classification system, called the hydrogeomorphic method (HGM). Unlike the Cowardin system which relies heavily on wetland structure, particularly vegetative, the HGM classifies habitats based on three functions: the geomorphic setting (i.e., depressional, riverine, fringe); the water source (i.e., precipitation, lateral flows, groundwater), and hydrodynamics (i.e., primarily vertical flows, primarily unidirectional and horizontal, primarily bidirectional and horizontal).

To establish regional habitat goals for the San Francisco Bay Area, the San Francisco Bay Area Wetlands Ecosystem Goals Project (Goals Project) participants developed a hierarchical classification system of habitats specific to the Bay area. The classification system contains three major habitats – Bay, baylands, and adjacent habitats – which are then further broken down into several, more detailed habitat types. An abbreviated typology of the Goals Project typology is shown in the following Figure 1.

Figure 1
Abbreviated Typology of the San Francisco Baylands Ecosystem Habitats

BAY	BAYLANDS		ADJACENT HABITATS
	Tidal	Diked	
Deep Bay	Tidal Flat	Diked Wetland	Riparian Forest
Deep Channel	Tidal Marsh	Managed Marsh	Willow Grove
Shallow Bay	Salt Marsh	Diked Marsh	Grassland
Shallow Channel	Brackish Marsh	Agricultural Bayland	Non-Native Annual Grassland
	Lagoon	Salt Pond	Moist Grassland
		Storage/Treatment Pond	Grassland/Vernal Pool Complex
			Coastal Prairie
			Oak Woodland
			Coastal Live Oak Woodland
			Valley Oak Woodland
			Foothill Oak Woodland
			Mixed Evergreen Forest

Source: Adapted from the Goals Project, 1999, p. 72.

The classification system as laid out in the Goals Project is specific to the San Francisco Bay Area but is also simple and general enough for use in permit applications as well as in staff summaries, staff recommendations and planning reports, though more detailed information on the structure and function of various habitat types may be needed on a case by case basis to determine appropriate mitigation.

Mitigation Timing. To avoid any time delay between permitted loss of resources and replacement of those resources, compensatory mitigation would have to be implemented prior to when the permitted impacts occur. However, in a regulatory context, it is generally infeasible to delay permittee's development projects until mitigation sites are constructed and function to meet performance standards, and requiring mitigation no later than concurrent with the permitted impact is in many cases the most practical compromise.[58] For example, the Commission's mitigation policies state in part that the mitigation should, "to the extent possible, be provided concurrently with those parts of the project causing adverse impacts."[59]

However, unless the mitigation site is functioning prior to the permitted impact, there will be some temporal loss of habitat function until the replacement area is functioning, so higher mitigation ratios may be appropriate and financial assurances may be desired to assure success

[58] National Research Council, 2001.
[59] San Francisco Bay Plan, 2002:60.

of the mitigation.[60] Where feasible and with particularly risky mitigation projects involving impacts to high quality habitats, advance mitigation may be considered by some regulatory agencies.

Mitigation Ratios. The mitigation ratio sets the overall size of the mitigation project and is defined as the acreage of the area replaced per acreage of the area lost (for example, two acres restored for one acre impacted, or a 2:1 ratio).

Determination of the mitigation ratio assists regulatory agencies in ensuring impacted functions are adequately offset.[61] For example, higher ratios help compensate for time lags between loss of habitat function and replacement through mitigation. Ratios can also be used to compensate for loss of site specific functions, the required ratios could be increased as the distance between the impact and mitigation sites increase, for example.[62] Ratios may also be used to compensate for differences in relative quality of functions of the impacted site and the mitigation site, or for a unique loss such as an impact that severs an important connection between two existing wetland sites.[63]

Ratios are also used to reflect the differences in type of compensatory mitigation. Mitigation consisting of restoration of a site might require a lower ratio than mitigation consisting of enhancement of a site, since enhancement of an existing habitat, though it may result in an increase in function, does not result in a net increase in acreage. Similarly, preservation is different than other types of mitigation in that it does not increase the area or improve the ecological functionality of an area in the short term, and may therefore require the use of higher ratios. Finally, ratios may help compensate for scientific uncertainty, and therefore the risk of failure, in replicating certain habitat types and functions.

Policies on mitigation ratios vary widely among regulatory agencies. Some agencies have detailed formulas for establishing the required mitigation ratio. For example, the State of Maryland has produced a lengthy list of wetland types and scenarios requiring various replacement ratios that range from 1:1 (for emergent wetlands and farmed wetlands, for example), to 4.5:1 (for forested wetlands of special State concern when using a mitigation bank, for example).[64]

Another interesting example is the Southern California Eelgrass Mitigation Policy, a policy developed by both federal and state resource agencies specifically for impacts to eelgrass. The Southern California Eelgrass Policy generally requires a ratio of 1.2 square meters of new eelgrass habitat for every square meter impacted. The ratio of greater than 1:1 is based on the expected lag time between habitat loss and function of the mitigation site (an estimate of about three years for an eelgrass mitigation site to be fully utilized by fish).[65]

Other agencies have fairly general policies on ratios, but include recommendations that are more specific. For example, the State of Washington's mitigation policies require provisions for mitigation ratios based on a case by case analysis of the risk of failure, the expected time lag between the impact and the functioning of the mitigation site, and the type, quality and quantity of the ecological functions of the mitigation area as compared to the impacted area. How-

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[60] National Research Council, 2001.

[61] Hymanson, Zachary, and Hope Kingma-Rymek. 1995. Procedural Guidance for Evaluating Wetland Mitigation Projects in California's Coastal Zone. California Coastal Commission; and National Research Council, 2001.

[62] US Army Corps of Engineers, 2001a.

[63] Breaux, Andree, and Feride Serefiddin, 1999. Validity of Performance Criteria and a Tentative Model for Regulatory Use in Compensatory Wetland Mitigation Permitting. Environmental Management. 24(3):327-336.

[64] State of Maryland. Mitigation Policies. Available online at: http://www.mde.state.md.us/wetlands/mitigate.html as of December, 2001.

[65] The Southern California Eelgrass Mitigation Policy. Available online at: http://swr.ucsd.edu/hcd/eelpol.htm as of December, 2001.

ever, the State of Washington also published general guidelines for mitigation ratios that recommends more specific creation and restoration ratios for different types of wetlands, ranging from 1.25:1 to 6:1, with doubled ratios for mitigation involving enhancement.[66]

Other resource agencies rely more exclusively on determination of ratios on a case by case basis, occasionally with a baseline ratio as a starting point. The Corps' policy sets a general 1:1 minimum ratio, but states the ratio may be higher or lower depending on the functional values of the impacted site as compared to the replacement site and the likelihood of success of the mitigation.[67] The Bay Plan mitigation policies do not include any specific requirements for mitigation ratios, rather the ratio is determined on a permit by permit basis. However, the 1988 *Staff Recommendation Concerning Mitigation Evaluation* did include a recommendation that although ratios should be determined on a case by case basis, permit mitigation conditions should require the restored area be larger in size and greater in value than the impacted Bay resources in an effort to compensate for both scientific uncertainty and time lags between impacts and mitigation.[68]

In conclusion, ratios are an accepted and widely used tool for regulators to ensure compensatory mitigation successfully offsets impacted resources, and may be higher or lower than 1:1 depending on various factors. However in general, due to the potential for lack of success of mitigation projects as well as the common time delay between impact and the functioning of the mitigation site, ratios greater than 1:1 may be needed in order to ensure full replacement of habitats. In any case, ratios should be based on an identifiable rationale that is clearly described in the mitigation program or plan and approved by the appropriate regulatory agencies.

Success Criteria. Success criteria, also called performance standards, are observable or measurable attributes over some period of time that can be used to define and determine the success or failure of a compensatory mitigation project in meeting its goals. Legally enforceable success criteria (listed, for example, either in permit conditions or in an approved mitigation plan that becomes part of the permit) allow regulatory agencies to determine if the objectives of a mitigation project have been met and can also facilitate enforcement actions for projects that fail. As discussed in Chapter 1, studies have shown that many mitigation projects may not include clear measurable success criteria, and therefore it is often difficult to determine whether lost functions have been adequately compensated. Furthermore, a lack of standardized performance criteria and standardized measurement techniques for similar habitats makes comparisons of success between and among similar mitigation projects difficult, thus reducing the amount of information that can be gained from past mitigation projects and applied to future endeavors.[69]

Performance standards may include measurable attributes related to composition or structure, such as vegetation cover, density, or species diversity. Performance standards may also include attributes related to the functions of the site. Such functional attributes may include: habitat for fish, wildlife or plant; support of specific species; genetic diversity; nutrient retention; hydrologic functions; and primary productivity. Performance standards, whether structural or functional, may also be assessed as compared to similar nearby established resource areas – what are commonly referred to as "reference sites."

In order to facilitate permit compliance within a fairly short time period, success criteria generally focus on easily measurable structural attributes.[70] Conversely, functions (especially processes such as primary productivity, decomposition or nutrient cycling) are more difficult and potentially costly to measure and may take a longer time to reach equivalency, and are

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[66] Washington State Department of Ecology. 1998. How Ecology Regulates Wetlands. Publication No. 97-112.
[67] U.S. Army Corps of Engineers, 1999.
[68] San Francisco Bay Conservation and Development Commission, 1988.
[69] Breaux and Serefiddin, 1999.
[70] National Research Council, 2001.

therefore used less often. However, the use of one or two easily measured parameters of a mitigation site based only on structure may not adequately reflect the ecological success or functional equivalency of the site.[71] For example, vegetation is one of the easiest and most common success criteria used, but some argue that although vegetation cover is an easy way to measure success, it may be a poor indicator of function in some cases (i.e., a site with a high percentage of vegetative cover may not be providing desired functions such as water quality improvements. Conversely, a site with a low percentage of vegetative cover may still be providing a valuable habitat for a particular species).[72]

In a recent review of 110 Army Corps approved compensatory mitigation projects in the San Francisco Bay Area, the most common success criteria used was vegetation (generally percent cover). Although the authors of the study concluded that the use of 70%-90% vegetative cover by the end of five years appeared to be a scientifically sound measurement (at least for perennial tidal wetlands), they asserted that a combination of two or more criteria, such as percent vegetative cover and wildlife use, would be preferable to adequately measure the success of a mitigation project.[73]

Similarly, hydrology has been found to be one of the most important components of a wetland restoration-creation project, but is also one of the most difficult functions to restore-create successfully.[74] However, even if hydrology may be the most important component of the success of a particular project, a performance standard based on hydrology should be correlated with an additional criterion such as vegetation to achieve a more complete analysis of success.[75]

Some scientists also advocate the inclusion of performance standards that measure indicators of self-sustainability of the mitigation project, as a successful mitigation project is one that does not need constant maintenance to retain the desired functions. Criteria for sustainability could include resistance to exotic species invasions, for example.[76]

Another possible approach to mitigation performance standards is to measure the evolution of specific functions over time. Such process-based performance standards have several potential advantages over the standard "snapshot" approach to establishing and measuring success criteria. For example, monitoring of specific processes such as water-level fluctuations, sediment accretion, plant growth rates, or bird nesting, can identify potential problems early to allow for corrective action. By designing performance standards to measure processes over time and defining success as falling within some percentage of a prior established goal, there is an acknowledgement that the evolution of a particular site may be more important than the static snapshot, and process-based monitoring also allows for the varying amounts of time various functions take to reach a level of ecological success. Measuring the evolution of functions also grants the possibility of allowing some flexibility in the determination of success of a project. For example, a site that does not meet high percent vegetation cover criteria may be providing significant habitat support for wildlife, which could be identified during a process-based monitoring program.[77]

A reference site is generally defined as a minimally impaired site that is representative of the expected ecological conditions of a habitat of a particular type and region. The reference sites serve as the measuring stick to determine the integrity of other sites. Whether employing a snapshot method for functional assessment or a process-based method, the use of reference sites

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[71] National Research Council, 2001; Zedler, 1997.
[72] Mitch and Wilson, 1996
[73] Breaux and Serefiddin, 1999.
[74] National Research Council, 2001.
[75] Breaux and Serefiddin, 1999.
[76] Zedler, 1997.
[77] Jeremy Lowe, Phil Williams Associates. April 5, 2002, personal communication; National Research Council, 2001;and Breaux and Serefiddin, 1999.

as a basis for comparison with mitigation projects can provide for flexibility to allow for unanticipated environmental conditions, such as drought conditions or disease, within the performance standards. Reference sites also provide a template for successful restoration-creation projects, and provide the opportunity to compare functions that typify specific sustainable habitats in a specific region.[78]

In conclusion, the inclusion of clear and measurable performance standards in a compensatory mitigation plan is necessary to determine the success or failure of a mitigation project. Performance standards that include measures of both structure and function are better indicators of success than performance standards that only measure structural attributes of a site. The use of reference sites can provide an important basis for comparison with the mitigation site, and may be particularly helpful when assessing the success of functions that are not easily described or measured. Even with the use of reference sites functional attributes can be challenging to measure. Furthermore, functional attributes may require a much longer time frame to demonstrate success than structural measures, often beyond the common five- to ten-year monitoring period required by regulatory agencies. Performance standards based on measuring the evolution of specific processes is an emerging idea within the scientific and regulatory community that may help address some common problems associated with more traditional types of performance standards.

Assessment Procedures. To quantitatively evaluate the loss of functions at an impact site, and the successful replacement of those functions (or other functions if deemed appropriate) at the mitigation site, there are many different methods used. These methods, generally called "functional" or "biological" "assessment procedures," are scientific processes used to characterize the functions of the area that will be impacted as well as the functions of the proposed mitigation site so that a comparison can be made as to the functional equivalency between the two, and potential tradeoffs between functions can be analyzed.[79] An assessment provides data upon which mitigation ratios and other decisions about the type, location, design, and management of the mitigation site can be based. Perhaps most importantly, an assessment procedure provides a possible method to relate the structure of a site to the resulting functions, a desirable tool when determining whether mitigation sites have met specific functional success criteria.

There are more than forty common assessment procedures used by various agencies, organizations and scientists around the nation. Regional differences in habitat types, related functions and restoration goals has resulted in a lack of one uniformly accepted and utilized assessment procedure. Many assessment procedures are designed to assess one or two specific functions, such as wildlife habitat, rather than providing a comprehensive assessment of all functions.[80]

However, many regulatory agencies do not have the resources, including staff, time and scientific training, to conduct detailed and time consuming functional assessments. In lieu of using a functional assessment therefore, many agencies rely on best professional judgement of available agency staff, or rely on the permittee to gather and submit data on the impact and mitigation sites. Either of these approaches may be insufficient when an agency is responsible for determining whether the permittee has met the established success criteria and has fully achieved their mitigation requirements.

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[78] Brinson, Mark and Richard Rheinhardt. 1996. The Role of Reference Wetlands in Functional Assessment and Mitigation. Ecological Applications. 6(1):69-76.

[79] Although there are methods to assess social and economic functions of an area, the term "functional assessment procedure" generally refers to a science-based assessment of ecological functions.

[80] National Research Council, 2001.

One emerging category of assessment procedures is what are generally referred to as "rapid assessments." Rapid assessments are science-based assessment procedures that allow for a comprehensive yet simple, quick assessment of a site by persons who do not necessarily have extensive scientific training. For example, South Florida Water Management District has developed a rapid assessment technique specifically for regulatory evaluation of created, restored or enhanced wetland sites, called the Wetland Rapid Assessment Procedure (WRAP). The goal of the WRAP rating index is to provide a simple, accurate, consistent and timely tool for regulators. The WRAP combines information gathered in the office (using mostly aerial photographs) with field evaluations to rate six specific attributes – wildlife utilization, overstory/shrub canopy, vegetative ground cover, adjacent upland/buffer, hydrology, and water quality input and treatment.[81] Currently, the US Environmental Protection Agency, in partnership with other resource agencies, non governmental organizations, and academic institutions, is working to develop a tidal wetland rapid assessment procedure that is appropriate for California, including San Francisco Bay.

In conclusion, there are many methods available to quantitatively assess and compare the functions of the impacted site with a reference site or the proposed mitigation site. Many regulatory agencies, especially smaller ones and those without staff scientists, do not have the resources to undertake detailed scientific assessments so rely instead of more qualitative methods for assessment using best professional judgement or rely on reports submitted by the permittee. New rapid assessment methods offer a science-based and quantitative tool that is fast and relatively simple and can be utilized by those with fairly minimal scientific training. Rapid assessment procedures may not be appropriate in all cases, but offer an alternative to qualitative assessments and/or dependence permittees' reports.

Monitoring Requirements. As discussed above, the measuring of established performance standards allows regulatory agencies to determine the success of a mitigation project in meeting its goals. Ongoing monitoring of the site to determine if performance standards are being achieved is generally the responsibility of permittee with periodic reports delivered to the permitting agencies for review. If the monitoring reports show a failure of the site to meet the established performance standards, remedial action may be identified and undertaken.

Among regulatory agencies nationwide, a five-year monitoring period is quite common.[82] Within a five-year monitoring period, it is possible to get an accurate assessment of some structural attributes of a site, such as the success rate of transplanted vegetation or the colonization of the site by pioneer species.[83]

However, many suggest that a five-year monitoring period is arbitrary and may not be long enough in many cases to determine whether the mitigation project is a success and the permittee is in full compliance with the permit conditions.[84] Types of projects that may take longer than the common five-year period to achieve success include those in degraded sites or creation projects (where the initial conditions are quite far from the desired outcome), and those with more challenging goals such as achieving functional equivalency of complex habitats (such as coastal salt marshes), habitat support for endangered species or restoration of a habitat type that has not been replaced in previous restoration efforts.[85] Furthermore, certain functions (such as hydrological processes) may take much longer to reach ecological equivalency than some structural goals (such as vegetation cover).

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[81] Miller, Raymond and Boyd Gunsalus. 1999. Wetland Rapid Assessment Prodecure (WRAP). Technical Publication Reg-001. South Florida Water Management District, Natural Resource Management Division, Regulation Department.

[82] National Research Council, 2001.

[83] Mitch and Wilson, 1996.

[84] Mitch and Wilson, 1996; National Research Council, 2001; and Zedler and Calloway,1999.

[85] Mitch and Wilson, 1996; and Zedler and Calloway, 1999.

In response to concerns about the length of monitoring periods, agencies are beginning to require more variable, and often longer, monitoring requirements. For example, as stated in the Corps' recent Regulatory Guidance Letter, monitoring of compensatory mitigation projects "will be required for an adequate period of time, normally 5-10 years, to ensure success."[86] In another example, the State of Wisconsin's recently revised mitigation policies require a monitoring schedule "of adequate frequency and duration to measure specific performance standards and to assure long-term success of the stated goals for the site." Wisconsin's policies also go on to specifically note that based on the NRC report, monitoring to determine compliance with success criteria is likely to take more than five years.[87] In a more detailed approach, the California Regional Water Quality Control Board staff is researching possible mitigation policy revisions that would implement a tiered monitoring program based in part on the size of the impact. For example, a relatively small impact of less than two acres might require monitoring for five years, while a larger impact of over five acres may require monitoring for as long as twenty years (though not necessarily annually).[88]

The Commission's mitigation policies do not specifically address monitoring requirements, though they do allow for the mitigation program to be "subject to reasonable controls to ensure success, permanence, and long-term maintenance," which clearly gives the Commission the authority to require monitoring of compensatory mitigation projects.

Although mitigation monitoring is now a common requirement of permittees by regulatory agencies, and monitoring lengths are becoming more variable in accordance with available knowledge regarding functional success of mitigation projects, review of monitoring reports by agency personnel is often impeded by a lack of staff time dedicated to reviewing the reports. In addition, there is no one entity responsible for compiling all the monitoring reports from various mitigation projects in the San Francisco Bay Area. Such a repository of monitoring reports would provide a critical source of information that could help improve the success rates of future mitigation projects.

In conclusion, monitoring of mitigation projects is necessary in determining whether the projects are successful in meeting their established success criteria. A five-year monitoring period has been historically common among regulatory agencies. However, a growing understanding of the length of time projects may take to reach success has resulted in more variable monitoring periods based on the desired functions of the mitigation project. For example, a mitigation project involving fill removal from open water may require little, if any, monitoring, whereas a project involving the creation of a large area of tidal wetland from a degraded upland area may require monitoring for up to twenty years. Finally, submitted monitoring reports are often not adequately reviewed by agency personnel due to lack of staff time and agency prioritization. Dedicated time for staff review of monitoring reports would increase mitigation compliance rates, and some sort of central repository for monitoring reports, or another means of sharing the information contained in monitoring reports among and between agencies, academia and NGOs, would contribute to the overall understanding of the science of creation, restoration and enhancement of resources.

Contingency Planning and Financial Assurances. Contingency measures that are reviewed and approved by regulatory agencies as part of a mitigation plan, serve as legal assurances that in the event performance standards are not met by the permittee, the problems will be identified and remedial actions will be implemented. In some cases, contingency planning may include a performance bond, collateral, or some other sort of financial assurance. Financial

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[86] US Army Corps, 2001a, Page 7.

[87] State of Wisconsin Natural Resources Board. 2001. Order of the State of Wisconsin Natural Resources Board Amending, Repealing and Recreation and Creating Rules. FH-47-00.

[88] Andree Breaux. California Regional Water Quality Control Board, personal communication, February 15, 2002.

assurances provide funding for any mid-course corrections necessary to meet the project's performance standards.

The Corps' Habitat and Mitigation Monitoring Proposal Guidelines states that applicants may be required to provide some sort of financial assurance. The actual amount of the assurance is determined by the Corps, based on the costs associated with site acquisition and preparation, establishment of vegetation, operational costs, and the completion of monitoring reports.[89] In the more recent Guidance Letter, the Corps takes a more stringent approach to requiring financial assurances by stating that "The permittee or party responsible for accomplishing and maintaining the mitigation project, including contingency funds for adaptive management, is responsible for securing adequate funds to accomplish those responsibilities associated not only with the development and implementation of the project, but also its long-term management and protection."[90]

In a more detailed approach, the State of Wisconsin's mitigation policies outline a lengthy procedure for financial assurances when required (they are not mandatory). Included in the procedure is the determination of the dollar amount (based on costs of construction, operation, monitoring and maintenance of the mitigation site, as well as costs for corrective actions if necessary), a list of legal requirements for the financial assurance, an opportunity for reevaluation of the amount or form of the financial assurance, and details pertaining to multiple projects and multiple jurisdictions.[91]

The Commission's mitigation policies do not require that the approved mitigation plan include either legal or financial assurances. However, the policies do state that the mitigation measures are "subject to reasonable controls to ensure success, permanence, and long-term maintenance," which clearly gives the Commission the authority to require legal and financial assurances where appropriate.

In conclusion, legal and financial assurances help ensure the success of the mitigation project, or provide a means to ensure alternative appropriate mitigation measures are implemented.

Long-Term Maintenance, Management and Protection. Many compensatory mitigation sites have ongoing maintenance and management needs beyond fulfillment of the required monitoring period, such as removal of non-native species, removal of trash, and periodic monitoring to assess the ongoing functionality of the site.[92] In addition, the long-term protection of a mitigation site is a goal shared by most regulatory agencies. For example, the California Department of Fish and Game's policies state that since the loss of habitat is permanent, the mitigation site should be maintained in perpetuity.[93] The Corps also agrees that the mitigation project "should be permanently protected with appropriate real estate instruments."[94] The Comprehensive Conservation and Management Plan for the San Francisco Bay-Delta states that "mitigation sites should be permanently guaranteed for open space and wildlife habitat purposes."[95] The Com-

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[89] U.S. Army Corps of Engineers. 1996. Habitat Mitigation and Monitoring Proposal Guidelines. Available online at: http://www.spk.usace.army.mil/cespk-co/regulatory/habitatmon.html as of March, 2002.

[90] U.S. Army Corps of Engineers, 2001a.

[91] State of Wisconsin. Department of Natural Resources. Chapter NR 350. Wetland Compensatory Mitigation.

[92] An exception would be mitigation sites that do not involve the restoration or creation of complex habitat types. For example, restoration involving removal of fill from open water may not require long-term maintenance or monitoring.

[93] California Department of Fish and Game. Department of Fish and Game Recommended Wetland Definition, Mitigation Strategies, and Habitat Value Assessment Methodology. Available online at: http://www.dfg.ca.gov/fg_comm/p4misc.html, as of June, 2002.

[94] US Army Corps of Engineers, 2001a:7.

[95] The Comprehensive Conservation and Management Plan (CCMP) consists of a blueprint of specific actions to restore and maintain the Bay and Delta, and was developed with participation from over one hundred representatives

mission's policies state in part that mitigation program should be "subject to reasonable controls to ensure success, permanence, and long-term maintenance."[96] A transfer of title, deed restrictions and conservation easements are several methods for establishing the long-term protection of a compensatory mitigation site.

Permanence of a mitigation site is promoted when the site is sited and designed to be as ecologically self-sustaining as possible. Self-sustaining sites do not require human intervention in order to exist and so are a more permanent component of the ecosystem, recognizing, of course, the dynamic nature of natural resources.[97]

However, long-term protection and maintenance of a mitigation site may still have ongoing time and cost implications for the responsible party. Permittees often do not have the time, resources, expertise, or interest in maintaining mitigation sites for the long-term. To address this issue, the NRC report recommends that for all mitigation sites, after the site has been designed, constructed and monitored, and the performance standards have been met, the permittee should transfer the long-term site management and maintenance responsibility, along with a cash endowment for these purposes, to a prescribed management authority.[98] This option allows the permittees to submit a one-time payment to the appropriate stewardship entity rather than undertake long-term maintenance and management themselves. The NRC report suggests that the cash payment might be limited to the cost of administrative charges for annual monitoring or periodic assessments of the mitigation site, and that the charge could even be based on a sliding scale based on the self-maintenance capabilities of the site.

In conclusion, the long-term functionality of a mitigation site is promoted by appropriate siting, design and construction to achieve a site that is ecologically self-sustaining. However, even with a self-sustaining site, once the permittee has undertaken the required monitoring, met the required success criteria and been released of its legal obligations, processes are still needed to protect the site from future human alteration, as well as for continued monitoring and maintenance of the site as necessary.

Compliance/Enforcement. As discussed in Chapter 2, much of the failure of compensatory mitigation can be attributed to a lack of compliance with permit conditions (such as not implementing projects, not constructing projects correctly and not maintaining sites), poorly defined success standards, and a lack of agency resources focused on compliance and enforcement. Clearly permit compliance and enforcement by regulatory agencies is critical to achieving full compensation for permitted impacts. Lack of agency staff and resources (including time and training) restricts active and thorough enforcement of permit conditions. As a result of a lack of site inspections (both during project construction and particularly during the monitoring period and at the completion of the monitoring) and a lack of training to adequately assess compliance during the site inspections that are undertaken, mitigation projects may result in failure.

The recent NRC report recommends that permit compliance be given a much higher priority within regulatory agencies including site inspections, and suggests the need for continuing education of agency staff. The NRC also suggests, based on the current limited agency resources available for compliance, random audits of mitigation sites as a supplement to the current self-reporting requirements.[99]

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from the public and private sectors, including government, industry, business and environmental interests, as well as elected officials from all twelve Bay-Delta counties. The CCMP is available online at: http://www.abag.ca.gov/bayarea/sfep/reports/ccmp/ as of July, 26, 2002.

[96] San Francisco Bay Plan, 2002:60.

[97] National Research Council, 2001; and Zedler, 1996.

[98] The NRC report defines the time frame of "long-term stewardship" as that typical for other publicly valued natural assets such as parks.

[99] National Research Council, 2001.

In conclusion, permit compliance and enforcement by regulatory agencies is crucial to achieving full compensation for permitted impacts and thereby increasing the success of compensatory mitigation. A higher priority on compliance within regulatory agencies is critical, and should include staff time dedicated to review of monitoring report, site inspections, and ongoing training for staff. Finally, alternative tools for increasing compliance within the current regulatory regime should be explored. Examples include the use of site assessments that require less time and scientific expertise (such as the newer "rapid assessments" discussed earlier), and random audits of mitigation sites.

Transition Zones and Buffers. A transition zone is a habitat type located where a gradual change from wetland to upland occurs. The transition zone supports vegetation and wildlife found in both wetlands and upland habitats. The transition zone is linked to wetlands and is an essential area for wetland-related plant and animal life. For example, transition zones provide areas of temporary refuge for many wetland species during flooding and high tides, and other species use transitional habitats for feeding.[100]

Buffers are areas adjacent to a transition zone or wetland or related habitat, established to reduce the adverse impacts of surrounding land use activities. Buffers provide various functions to protect existing, restored and created wetlands and related habitats such as through sediment control and erosion prevention, reduction of noise and light, removal of excess nutrients from upland runoff, protection from unrestricted human use, access from feral animals and pets, and illegal dumping.[101]

While transition zones are a unique habitat type, buffers are best thought of as a management concept. In addition, transition zones are located between wetlands and uplands, while buffer zones are generally defined as upland areas. In other words, a successful wetland mitigation project may include both a transition zone (as an important habitat type inextricably linked to wetlands) and an upland buffer beyond the transition zone. However, it should be noted that the terms transition zones, upland habitat, buffers and buffer zones are often used interchangeably in the regulatory world and the distinction between a habitat type and a management concept is not always clear.

Many regulatory agencies include policies on transition zones or buffers within their mitigation policies. For example, in an example of a buffer policy, the Department of Fish and Game states that "buffers...should be included as an integral component of all mitigation plans."[102] Similarly, the recent NRC report recommends that to help create or restore ecologically self-sustaining wetlands, mitigation sites should preserve large buffers.[103] The Comprehensive Conservation and Management Plan for the San Francisco Bay-Delta includes a transition zone policy under the proposed action for compensatory mitigation which states "Mitigation should include an area of adjacent upland habitat for wetland species that require such habitat."[104]

The Commission's mitigation policies do not specifically discuss incorporating buffers or transitional habitats as part of wetland mitigation projects. However, the policies require that mitigation measures ensure success and permanence, which could certainly allow for require-

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[100] San Francisco Bay Conservation and Development Commission. 2001. Staff Report; San Francisco Bay Ecology and Related Habitats.

[101] Goals Project, 1999; San Francisco Bay Conservation and Development Commission. 1997. Staff Report: Wetlands in the North Bay Planning Area; and Washington State Department of Ecology. 1992. Wetland Buffers: Use and Effectiveness. Publication No. 92-10.

[102] California Department of Fish and Game. Recommended Wetland Definition, Mitigation Strategies, and Habitat value Assessment Methodology. Available online at: http://www.dfg.ca.gov/fg_comm/p4misc.html, as of March 8, 2002.

[103] National Research Council, 2001.

[104] Comprehensive Conservation and Management Plan, Action WT-2.3. Available online at: http://www.abag.ca.gov/bayarea/sfep/reports/ccmp/ccmp3wt.html.

ments for transition zones or buffers. In addition, recent revisions to the Bay Plan Tidal Marshes and Tidal Flats Policies include a specific policy on transition zones. Policy 3 states:

> Projects should be sited and designed to avoid, or if avoidance is infeasible, minimize adverse impacts on any transition zone present between tidal and upland habitats. Where a transition zone does not exist and it is feasible and ecologically appropriate, shoreline projects should be designed to provide a transition zone between tidal and upland habitats.

In conclusion, transition zones are important habitats inextricably linked to wetlands and are therefore an integral component of successful wetland mitigation projects. In addition, buffers protect created, restored or enhanced wetlands and related habitats from adjacent land uses, thus facilitating the long-term success of a mitigation project.

Mitigation Banking. The concept of mitigation banking involves restoring or creating habitat to produce mitigation "credits" which can be used to offset permitted unavoidable adverse impacts to existing habitats. A mitigation bank would be a site where resources (i.e., wetlands or other aquatic resources) are restored, created, or enhanced expressly for the purpose of providing compensatory mitigation in advance of authorized impacts to similar resources.[105] Mitigation banks may be established by individuals who anticipate needing to mitigate for future permitted impacts (also called "single-user" banks), or by third parties who develop banks as a commercial venture to sell credits to permittees needing to provide compensatory mitigation (also called "entrepreneurial" or "private" banks).

Advantages of mitigation banking include:[106]

- Mitigation banks can (if required by applicable laws and policies) offer the implementation and functioning of mitigation in advance of permitted impacts, thereby reducing temporal losses of functions and uncertainty over the success of the mitigation project.
- Mitigation banks facilitate the combination of financial resources and technical expertise that can increase the rate of success of mitigation projects, and can provide mechanisms for long-term maintenance and protection.
- Financial assurances such as construction bonds are a common component of mitigation banks and help assure the successful creation or restoration of the identified habitat type(s).
- Mitigation banking can provide an important cost effective alternative when there is no feasible or desirable on-site option.
- The use of mitigation banks can help streamline permitting procedures.
- Mitigation banks can address the cumulative effects of many small fill projects that are too small to be mitigated individually.
- There are some ecological benefits to having large consolidated mitigation sites.

Disadvantages of mitigation banking include:[107]

- Mitigation banks provide for off-site compensatory mitigation, and thereby do not adequately replace site-specific on-site impacts.

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[105] National Research Council, 2001.

[106] Environmental Law Institute. 1993. Wetland Mitigation Banking: An Environmental Law Institute Report. Washington, DC.; National Research Council, 2001; Stein, Eric, Fari Tabatabai, and Richard Ambrose. 2000. Wetland Mitigation Banking: A Framework for Crediting and Debiting. Environmental Management. 26(3):233-250; and Zinn, Jeffrey. 1997. Wetland Mitigation Banking: Status and Prospects. CRS Report for Congress. Available online at: http://cnie.org/NLE/CRSreports/wetlands/wet-8.cfm as of March, 2002.

[107] Environmental Law Institute, 1993; Stein et al, 2000; and Zinn, 1997.

- Some contend that an available mitigation bank might make compensatory mitigation more cost effective than avoiding the impact, thereby increasing the overall loss of habitat areas.
- Although there are some ecological benefits to larger, consolidated habitat areas, there are also important functions provided by smaller, more isolated habitats.
- There may be difficulty in establishing logical and scientifically defensible procedures for applying mitigation ratios when using a mitigation bank.

However, despite some lingering concerns regarding mitigation banking, the use of mitigation banks to compensate for adverse environmental impacts continues to increase. The Environmental Law Institute (ELI) is currently undertaking a comprehensive study to analyze wetland mitigation banking in the United States. Preliminary results from the study indicate that the number of wetland mitigation banks continues to grow. There are currently over 200 federally approved mitigation banks in the United States, whereas in 1992 there were less than 50. California was found to have the second highest number of mitigation banks behind Louisiana. The ELI study also found an increase in what are called "umbrella instruments," banking agreements sponsored by a single entity to establish and operate a regional banking program with multiple sites. ELI estimates that there are currently at least 27 umbrella agreements nationwide that have authorized the establishment of about 220 individual bank sites.[108]

The ELI's recent study on mitigation banking builds upon their detailed review of mitigation banking in 1993. Conclusions from the 1993 report, based on a review of all current and proposed banks at that time, included that wetland mitigation banking can provide ecologically sound and viable compensatory mitigation. In addition, the 1993 report asserted that regulatory agencies should promote mitigation banking and in particular should adopt national mitigation banking guidance.[109]

In 1995, the Corps, EPA, FWS, Natural Resources Conservation Service, and NOAA published an interagency federal guidance on the establishment, use and operation of mitigation banks. Under the process outlined in the 1995 guidance, a bank sponsor submits a prospectus for a proposed mitigation bank to the Corps, which is then reviewed by the Mitigation Banking Review Team, an interagency group with representatives from local, state, federal, and/or tribal agencies. The resulting formal agreement, the banking instrument, includes information on the ownership of the bank site, the bank size and types of habitats included, a site plan and specifications, a description of existing conditions at the site prior to restoration-creation, the type of impacts suitable for compensation at the bank site, financial assurances, compensation ratios, and provisions for long-term management and maintenance. The guidance does allow for the possibility of early withdrawals (withdrawals prior to the successful ecological establishment of the bank resources) but only in limited circumstances when there is a high likelihood that the bank will achieve its performance standards and other requirements have already been met such as provision of financial assurances. The 1995 guidance also transfers legal responsibility for compliance of the mitigation site to the bank sponsor (as opposed to the permittee).

On the state level, in 1995 the Resources Agency of the State of California issued an "Official Policy on Conservation Banks." The policy includes the endorsement of conservation banks by the executive and legislative branches and specifies that banks may be used to compensate for impacts to wetlands, threatened or endangered species, Environmentally Sensitive Habitat Areas, mudflats, sub-tidal areas, and less sensitive resources. The policy also includes some general conservation banking principles including: 1) There is no minimum or maximum size of a conservation bank but the bank should be large enough to be ecologically self-sustaining, or

[108] Environmental Law Institute. 2001. Preliminary Findings of the Environmental Law Institute's Wetland Mitigation Banking Study. Available online at: http://www2.eli.org/wmb/wmbinterim.pdf, as of March 10, 2002.
[109] Environmental Law Institute, 1993.

be part of a larger conservation strategy; 2) Upon sale of the first credit, the land in the bank must be permanently protected through fee title or a conservation easement; 3) Prior to the selling of bank credits, a bank should be approved by the appropriate regulatory agency(s); 4) Provisions for monitoring and for long-term management of the bank lands should be secured; and 5) Award of bank credits should be negotiated on a case-by-case basis by the project proponent in need of the credits, the appropriate regulatory agencies, and the bank manager.[110]

As of 1988, the California Department of Fish and Game reported the existence of 43 conservation banks in California, composing of thousands of acres of habitat, and covering 13 counties. The CDFG reports that these banks "allow the private and public sectors to harness market forces to improve significantly upon traditional ways of protecting and restoring wildlife habitat" and asserts that as a result of the 1995 State policy, the "successful use of conservation banking as a means to achieve important natural resources management objectives is flourishing in California."[111]

The Commission's mitigation policies state that the Commission "should extend credit for certain fill removal and encourage land banking provided that any credit or land bank is recognized pursuant to written agreement executed by the Commission." In an effort to further evaluate the potential for mitigation banking in the Bay area, Commission staff initiated a detailed mitigation banking study in the late 1990's. A proposed San Francisco Bay Mitigation Banking System resulted in 1997, and the Commission voted to endorse mitigation banking in the San Francisco Bay region that would: (a) advance the Commission's adopted Bay Plan policy on mitigation; (b) be consistent with the "Federal Guidance for the Establishment, Use and Operation of Mitigation Banks"; and (c) be consistent with the mitigation banking policies in the Comprehensive Conservation and Management Plan for the San Francisco Estuary. Furthermore, the Commission directed the staff, in consultation with other agencies, interested parties, and the general public, to develop a memorandum of agreement between BCDC and other state, federal and local agencies to provide consistent guidance on the establishment, use and operation of mitigation banks in the Bay area. However, there are currently no, nor have there ever been, any mitigation banks established within BCDC's jurisdiction.

Review of Mitigation Bank Success. A 1996 study of 68 national wetland mitigation banks found that banks were established in every year from 1984 to 1995, and ranged in acreage from 1 acre to 7,014 acres. By analyzing the compensation method and mitigation ratios of each bank, the study authors predicted that on a national level, mitigation banking will lead to a substantial net loss of wetland acreage, mostly due to several large banks that used preservation or enhancement with compensation ratios of only 1:1, resulting in a net loss of acreage. However, the study found the net loss was concentrated in the western Gulf coastal region and that other parts of the country were experiencing net gains in acreage. The authors concluded that despite the net loss of wetland acreage and the potential ecological problems associated with spatial redistribution of wetlands in a region, mitigation banking is a conceptually sound environmental policy and planning tool with considerable potential if applied correctly.[112]

In 1992, the Corps of Engineers' Institute for Water Resources (IWR) conducted a study of 22 wetland mitigation banks in the nation. The 1992 study found that at least one-third of the mitigation banks had technological or administrative problems. In 1996, the IWR conducted a follow up review of the banks originally reported as being unsuccessful and found that the majority of those banks were functioning successfully according to the original goals. Success of

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[110] The Resources Agency and the California Environmental Protection Agency. 1995. Official Policy on Conservation Banks. Available online at: http://ceres.ca.gov/wetlands/policies/mitbank.html as of May, 2002.

[111] California Department of Fish and Game. Brief Report on Conservation Banking. Available online at: http://www.dfg.ca.gov/hcpb/conplan/mitbank/banking_report.shtml as of June, 2002.

[112] Brown, Phillip and Christopher Lant. 1999. The Effect of Mitigation Banking on the Achievement of No-Net-Loss. Environmental Management. 23(3):333-345.

the banks was attributed in some cases to the additional time allowed in which the banks achieved success with no remedial action, and in other cased was a result of corrective measures taken by the bank manager. The IWR report concluded with several lessons learned from the follow up review including: proper site selection was critical for success; contingency plans and monitoring provisions should be enforceable, and; a mitigation bank should include an enforceable banking instrument which defines roles and responsibilities and appropriate uses of the bank. The IWR also noted that all of the reviewed mitigation banks were established prior to the development of the federal guidance on mitigation banking, and assumed greater success of mitigation banks in the future under the procedures set forth in the federal guidance.[113]

Conclusion. Mitigation banks may provide mitigation in advance of permitted impacts, facilitate the combination of financial resources and technical expertise to create more successful mitigation projects, provide an alternative means for compensatory mitigation that is potentially cost effective for the permittee, and can address the cumulative effects of small fill projects that are too small to be mitigated individually. Mitigation banking also includes some challenges such as how to establish and apply mitigation ratios when using a bank, and how to determine if the use of a mitigation bank (which provides for off-site mitigation only) is an appropriate mitigation option for a specific project. However, support for mitigation banking on the both the national and state levels has increased over the years and has resulted in detailed policies and guidance documents aimed at providing procedures to promote ecologically, technically, and administratively successful mitigation banking. The likelihood of mitigation banking success increases when the following are included: enforceable agreements between bank sponsors and regulatory agencies; provisions for long-term responsibility and maintenance of the bank site; financial assurances; and logical and scientifically defensible methods for determining timing and amount of credit withdrawals.

Fee-Based Mitigation. Fee-based mitigation, also called in-lieu-fee mitigation, involves the submittal of a fee by the permittee in-lieu of requiring the permittee to undertake the creation, restoration, or enhancement of a specific mitigation site, or purchasing credits from a mitigation bank. The fee is generally submitted to a third party for implementation of an ongoing or future restoration-creation project.

A distinction can be drawn between an established in-lieu-fee program from other fee-based compensatory mitigation mechanisms, sometimes refered to as "ad hoc" in-lieu-fee mitigation. Ad hoc in-lieu-fee mitigation typically involves one permittee for one restoration project without formal agreement between permitting agency and the third party receiving the funds.[114]

The benefits of fee-based compensatory mitigation are similar to some of the benefits of mitigation banking, including the potential to leverage financial resources from various sources for consolidated and more ecologically successful projects, and providing a timely, convenient, and cost efficient mitigation option when on-site mitigation is not feasible. In addition, fee-based mitigation can provide a source of funds for ongoing restoration-creation projects. Some of the potential problems identified with the use of fee-based compensatory mitigation are also similar to those of mitigation banking, such as resulting off-site and potentially out-of-kind mitigation and the charge that developers are in essence, buying the right to impact wetlands and associated habitats. In addition, several concerns unique to the use of fee-based mitigation exist including:[115]

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[113] Tabatabai, Fari and Robert Brumbaugh. 1998. National Wetland Mitigation Banking Study – The Early Mitigation Banks: A Follow-up Review. Working Paper. Institute for Water Resources. Alexandria, VA.

[114] Environmental Law Institute. 2001. Preliminary Findings of the Environmental Law Institute's Wetland Mitigation Banking Study. Available online at: http://www2.eli.org/wmb/wmbinterim.pdf, as of May 31, 2002.

[115] Apogee Research, Inc. 1993. Alternative Mechanisms for Compensatory Mitigation: Case Studies and Lessons About Fee-Based Compensatory Wetlands Mitigation. Prepared for the U.S. Army Corps of Engineers as part of the USACE National Wetland Mitigation Banking Study; Environmental Law Institute, 2001; National Research

- There may be long lag times between permitted impacts and use of fees to initiate compensation – may result in temporal losses in acreage and functions.[116]
- The permittee generally fulfills their mitigation requirements with submittal of a fee before a mitigation project is completed, or even, in some cases, identified. It may be difficult to track the use of funds and the resulting end product, making it difficult to determine success of mitigation in replacing lost functions and values.
- The responsibility for the ecological success of the project may be undefined or unclear, and therefore accountability may be lacking.
- Lack of assurances for ecological success. Unlike mitigation banks, ILF programs do not have the capital to post financial assurances prior to fee collection.[117]
- It may be difficult to determine fee rates that are consistent, fair and adequate. For example, fee rates may not be sufficient to cover the full costs of implementing required compensation for permitted impacts (i.e., land values and costs of securing sites, mitigation planning and construction costs, maintenance and monitoring costs, long-term site management costs, assurance funding for possible remedial action and other contingencies, and administrative costs). In addition, fees may be used for other purposes than direct mitigation of adverse impacts (e.g., research, overhead, education, preservation) which may result in a less than 1:1 compensation ratio.

The Army Corps of Engineers (Corps) states that it typically approves the use of in-lieu-fee arrangements for mitigation for minor impacts and when the area adversely impacted is relatively small. The Corps also allows the use of fee-based mitigation options as a less cumbersome alternative for permittees to performing their own mitigation, and when on-site mitigation is not feasible or not ecologically preferable. In response to questions and concerns regarding the use of fee-based mitigation, the EPA and the Corps published federal guidance on the use of in-lieu-fee arrangements in November 2000.[118] In-lieu-fee (ILF) requirements outlined in the guidance include:

- Use of a mitigation bank is generally preferable to ILF mitigation.
- ILF agreements may be used if an arrangement is developed, reviewed and approved using the process established for mitigation banks in the Banking Guidance.
- The demonstrated performance of natural resource management organizations must be evaluated prior to approving them to manage ILF arrangements.
- Specific ILF arrangements should be made in consultation with other agencies and only after public notice and comment.

Council, 2001; Scodari, Paul and Leonard Shabman. November 2000. Review and Analysis of In-Lieu Fee Mitigation in the CWA Section 404 Permit Program. Prepared for the Institute of Water Resources, U.S. Army Corps of Engineers, Alexandria, VA.; and U.S. States General Accounting Office. May 2001. Wetlands Protection: Assessments Needed to Determine Effectiveness of In-Lieu Fee Mitigation. Report to Congressional Requesters.

[116] In some cases, the authority of the agency dispersing the funds affects the timeliness of the dispersal. For example, many state agencies must follow specific procurement regulations that may require competitive bidding on projects, which can increase the time delay between the impact and the mitigation. Dispersal of fees directly from permittees to the third party, such as a nonprofit, may help alleviate time delays associated with bidding and contracting procedures. Another option is for the state agency to enter into contract with a third party prior to collection of in-lieu-fees from various permittees.

[117] Some ILF programs include a failure risk "premium" in the fees charged to permittees which provide extra financial resources that might be needed in case of project failures. The failure risk cost is imposed on permit recipients, and the ILF program accepts responsibility for the ecological success of required mitigation.

[118] Federal Register. 65(Nove.7):66914-66917.

- Organizations qualified to implement formal ILF arrangements should supply the Corps with information in advance on potential sites, schedule, and financial, technical and legal mechanisms to ensure long-term success.
- ILF arrangements must contain provisions that clearly state that the legal responsibility for ensuring mitigation terms are satisfied fully rests with the organization accepting the in-lieu fee.
- The ILF sponsor is responsible for securing adequate funds for the operation and maintenance of the mitigation sites and the sites should be protected in perpetuity with appropriate real estate arrangements.

Although in-lieu-fee programs generally involve a third party who serves as the program sponsor, some states do have Corps-approved ILF programs where the state agency responsible for environmental regulation serves as the program administrator for an ILF program (e.g., Pennsylvania, North Carolina, and Florida).[119] The program administrator in these cases evaluates projects proposed by other conservation entities and transfers fee revenues to the projects selected for funding. In some cases, a Request for Proposal, or RFP, process is used to identify and select projects for funding.

Though many states have policies on mitigation banking, very few states include specific policies on the use of fee-based mitigation. However, recent research by the Environmental Law Institute found 21 states with formalized in-lieu-fee programs, administered either by the state in conjunction with the Corps, by Corps district offices, or by local governments or private organizations.[120]

Although the Bay Plan mitigation policies do not specifically address fee-based mitigation, the Commission has approved permits with fee-based mitigation components. Fee-based mitigation approved by the Commission is generally ad-hoc in-lieu-fee mitigation as defined by the Corps, and the Commission does not have any established in-lieu-fee programs.

Review of Fee-Based Mitigation Success. According to a 2001 report published by the United States General Accounting Office (GAO), the effectiveness of the Corps' use of fee-based mitigation is uncertain. In particular Corps oversight and monitoring of mitigation performed under ad-hoc arrangements need improvement. Furthermore, most Corps-approved ad-hoc arrangements do not contain a transfer of responsibility for success of the mitigation to the fund recipient, resulting in a lack of assurances of ecological success of ad-hoc mitigation efforts.[121]

Even with the more formalized use of Corps-approved in-lieu-fee mitigation as outlined in the federal guidance, the success of such arrangements in adequately compensating for adverse impacts is difficult to assess. The GAO reported a lack of data and/or contradictory data from Corps district offices regarding adequate replacement of wetland acreage and functions through the use of in-lieu-fee mitigation, and a general lack of assurances that fee-based mitigation will be effective. The GAO report concluded that, although the 2000 federal guidance for in-lieu-fee mitigation provides a good framework for creating successful fee-based arrangements, well-defined performance standards for assessment of the success of fee-based mitigation are still necessary, and that responsibility for the long-term success of both in-lieu-fee and ad-hoc mitigation must be clearly assigned in each case to either the permittee or the fund recipient.

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[119] Environmental Law Institute, 2001.

[120] Environmental Law Institute, 2001.

[121] United States General Accounting Office, 2001. Wetlands Protection: Assessments Needed to Determine In-Lieu-Fee Mitigation. GAO-01-325.

Conclusion. Like mitigation banking, fee-based mitigation can provide a timely, convenient, and potentially cost effective option for mitigation when on-site mitigation is not feasible. In addition, fee-based mitigation can consolidate financial resources from various sources to create a potentially more successful compensatory mitigation project and can provide a source of funding for large, on-going restoration projects. However, fee-based mitigation is subject to several potential risks, not associated with mitigation banking. There may be long time lags between permitted impacts and the use of fees to initiate compensation. In addition, it may be challenging to adequately track the use of funds and therefore difficult to determine if the resulting mitigation successfully compensated for the permitted impact. Similarly, it may be difficult to determine fee rates that are fair and adequate and account for all financial aspects of a mitigation project including monitoring and long-term management. Finally, responsibility for the ecological success of the resulting project has been commonly undefined or unclear in past fee-based mitigation projects, resulting in little accountability for successful mitigation.

However, as with mitigation banking, fee-based mitigation is generally considered a valuable compensatory mitigation option, and attributes of successful fee-based mitigation are beginning to be defined. For example, formal and enforceable in-lieu-fee agreements between the permitting agency and the party receiving the funds, defined legal responsibilities, mechanisms for assuring timely and adequate compensation for impacts, assurances for ecological success, and mechanisms for long-term management and protection, will help increase the success of fee-based mitigation.

Mitigation and Restoration Linkages. Historical alterations of the Bay's habitats have resulted in major effects on its wildlife, plant communities, and on the overall health of the Bay. In an effort to address the impacts associated with land use changes in the Bay and secure the future health of the Bay, habitat restoration is a tool utilized more and more by both public and private entities.

In the Bay area, habitat restoration, particularly of wetlands, has been underway since the late 1960's. Between 1999 and 2001 more than 11,000 acres of wetlands in the Bay-Delta Estuary were restored or enhanced, and as of September 2001, more than 25,000 acres of restoration and enhancement projects were either planned or in progress throughout the San Francisco Bay estuary.[122]

In 1999, the *San Francisco Baylands Ecosystem Habitat Goals* report (Goals Report) was released. The Goals Report provides a regional vision of the types, amounts and distribution of wetlands and related habitats that are needed to restore and sustain a healthy Bay ecosystem, and represents the culmination of over three years of work by a widely representative group of scientists, resource managers, and other participants of the San Francisco Bay Area Wetlands Ecosystem Goals Project. The Goals Report proffers the first San Francisco Bay regional vision of its depth and magnitude and provides a vital vision and guide for the long-term restoration and improvement of the baylands and related habitats of the Bay.

Many local and regional restoration strategies and on-the-ground efforts are currently underway in the San Francisco Bay Area. Since the release of the Goals Report, an ad-hoc group of resource and regulatory agencies, the Bay Area Wetlands Planning Group, has been working on developing a San Francisco Bay Area Wetlands Restoration Program (Restoration Program) to help implement the Goals Report recommendations by supporting and facilitating the restoration of wetlands and associated habitats in the San Francisco Bay Area. The Restoration Pro-

[122] San Francisco Estuary Project. 2001. Bay-Delta Environmental Report Card. Comprehensive Conservation and Management Plan Implementation Progress 1999-2001.

gram is being designed to complement private and public habitat restoration efforts, and to augment existing project development, review and permitting processes.[123]

In another example, In 2001 members of the San Francisco Bay Joint Venture, a broad-based group of public and private members, produced an implementation strategy for restoring the San Francisco Bay Estuary. The Joint Venture's goal is the protection, restoration or enhancement of 260,000 acres of baylands and creeks by 2020 through a series of specific partnership-based strategies.[124]

In addition, the National Audubon Society is currently implementing its San Francisco Bay Restoration Program to restore and preserve the San Francisco Bay through a three-prong strategy of science (building on the Goals Report recommendations), public policy and conservation education.[125] Efforts on a more local level include the Marin Audubon Society and Marin Baylands advocates' Save Marin Baylands Campaign, an effort to acquire and permanently protect tidal wetlands and diked baylands in private ownership which has completed over 700 acres of tidal restoration projects.[126]

Successful restoration of desired San Francisco Bay resources is a costly endeavor, however, and is contingent upon available monetary resources. The Joint Venture, for example, estimates the cost of reaching its objectives over the next 20 years at $1.7 billion.[127]

Though restoration and compensatory mitigation have inherently different purposes and intents, in many cases the two programs share the same objectives and results – successfull restoration of Bay resources. Compensatory mitigation is thereby recognized as providing one possible avenue for funding for Baywide restoration objectives. For example, the Joint Venture's Implementation Strategy for restoring the Estuary includes among its strategies to accomplish its funding objectives, "Coordinate with Caltrans' mitigation needs to maximize habitat restoration benefits."[128] Likewise, the National Audubon Society, under its San Francisco Bay Restoration Program, while supporting avoidance of any adverse impacts as the first priority, acknowledges there may be some unavoidable impacts to Bay wetlands and associated habitats (particularly from public infrastructure projects to meet a growing population's needs) and supports the leveraging of compensatory mitigation funding within a regional approach for Bay restoration.[129]

As compensatory mitigation programs increasingly supply funding for Baywide restoration efforts, the link between restoration goals and objectives and compensatory mitigation goals and objectives becomes stronger, as does the opportunity for information sharing regarding the science of creation, restoration and enhancement of Bay resources.

Recent revisions to the Bay Plan policies on tidal marshes and tidal flats include new policies on restoration. Policy 5 in the revised Tidal Marshes and Tidal Flats Policies states:

> Any tidal restoration project should include clear and specific long-term and short-term biological and physical goals, and success criteria and a monitoring program to assess the sustainability of the project. Design and evaluation of the project should include an analysis of: (a) the effects of relative sea level rise; (b) the impact of the project on the Bay's sediment budget; (c) localized sediment erosion and accretion; (d) the role of tidal

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[123] Bay Area Wetlands Planning Group. 2002. Draft Document. San Francisco Bay Area Wetlands Restoration Program.

[124] San Francisco Bay Joint Venture. 2001. Restoring the Estuary: An Implementation Strategy for the San Francisco Bay Joint Venture. Oakland, CA.

[125] http://www.AudubonSfbay.org.

[126] http://www.marinaudubon.org/habitat.htm.

[127] San Francisco Bay Joint Venture, 2001.

[128] San Francisco Bay Joint Venture, 2001. Page 50.

[129] National Audubon Society. 2002. First Draft. San Francisco Bay Regional Mitigation Report. San Francisco, CA.

flows; (e) potential invasive species introduction, spread, and their control; (f) rates of colonization by vegetation; (g) the expected use of the site by fish, other aquatic organisms, and wildlife; and (h) site characterization. If success criteria are not met, appropriate corrective measures should be taken.

Similarly, Policy 3 in the new subtidal areas section of the Bay Plan states:

> Subtidal restoration projects should be designed to: (a) promote an abundance and diversity of fish, other aquatic organisms and wildlife; (b) restore rare subtidal areas; (c) establish linkages between deep and shallow water and tidal and subtidal habitats in an effort to maximize habitat values for fish, other aquatic organisms, and wildlife; or (d) expand open water areas in an effort to make the Bay larger.

And Subtidal Areas Policy 4 states:

> Any subtidal restoration project should include clear and specific long-term and short-term biological and physical goals, and success criteria and a monitoring program to assess the sustainability of the project. Design and evaluation of the project should include an analysis of: (a) the scientific need for the project; (b) the effects of relative sea level rise; (c) the impact of the project on the Bay's sediment budget; (d) localized sediment erosion and accretion; (e) the role of tidal flows; (f) potential invasive species introduction, spread, and their control; (g) rates of colonization by vegetation, where applicable; (h) the expected use of the site by fish, other aquatic organisms, and wildlife; and (i) characterization of and changes to local bathymetric features. If success criteria are not met, appropriate corrective measures should be taken.

In conclusion, restoration and mitigation programs clearly differ in their purposes and intents. While regional restoration efforts are focused on achieving a net gain of habitat acreage and functions, mitigation programs seek adequate compensation for lost resources in an effort to avoid a net loss of habitat acreage and functions. However, the results are often the same – restoration of Bay resources. In addition, as a regulatory requirement, permittees carry the monetary responsibility for compensatory mitigation. As a result, compensatory mitigation can provide a funding resource to help meet regional restoration goals. Furthermore, the linkages between mitigation and restoration provide an important avenue for information sharing in an effort to improve the overall scientific understanding of restoration.

Additionally, it is critical that any restoration project that is a component of a compensatory mitigation program be compatible with regional restoration policies, goals and objectives. For the San Francisco Bay, the Goals Report provides a vital vision and guide for the long-term restoration and improvement of the baylands and related habitats of the Bay. The Goals Report provides a tool for evaluating potential compensatory mitigation options in terms of the overall restoration objectives of the region. In addition, the Goals Report provides a tool for evaluating the impacted site to help determine the functions of the site from a regional perspective and thus assist in establishing the appropriate mitigation to compensate for the impacted functions.

Interagency Cooperation/Authority Overlap. With multiple regulatory agencies with often overlapping jurisdictions, it is not uncommon for mitigation for a particular project to be required by more than one regulatory agency. For example, an applicant with a proposed project that impacts wetlands in the San Francisco Bay may be required to provide mitigation for those impacts by the local city and/or county, the Regional Water Quality Control Board, the CDFG, the Commission, the USFWS, and/or the Corps, depending on the nature and location of the project.

The Commission's mitigation policies state that the mitigation measures should be "coordinated with all affected local, state, and federal agencies having jurisdiction or mitigation expertise to ensure, to the maximum practicable extent, a single mitigation program that satisfies the policies of all the affected agencies."

Efforts such as the San Francisco Bay Area Wetlands Restoration Program (Restoration Program), provide a means for interagency coordination. The Restoration Program was developed by an ad-hoc group of resource and regulatory agencies to help implement the Goals Report recommendations by supporting and facilitating the restoration of wetlands and associated habitats in the San Francisco Bay Area. To that end, the Restoration Program seeks to provide a forum to identify and resolve any conflicting agency practices, facilitate permitting, and enhance coordination among agencies.[130]

[130] Bay Area Wetlands Planning Group. 2002. Draft Document. San Francisco Bay Area Wetlands Restoration Program.

CHAPTER 4

SAN FRANCISCO BAY CONSERVATION AND DEVELOPMENT COMMISSION MITIGATION POLICY HISTORY

As stated in the Introduction, the Commission has required mitigation as a conditions of some permits since the 1970's, and adopted Bay Plan policies on mitigation in 1985. The following Chapter describes the Commission's history with regard to creating, assessing, and revising its mitigation laws, policies and practices.

Fill Controls Staff Report - 1984. The Commission's *Staff Report on Fill Controls* was published October 1984 for the purpose of reviewing the Commission's laws and policies on fill in the Bay for a possible amendment to the Bay Plan. Included in the report was an analysis of the Commission's authority to require mitigation for significant impacts resulting from Bay fill (see discussion on the Commission's authority to require mitigation in the introduction). The report also contained a discussion on processes for specifying and implementing mitigation. Among the report's conclusions on mitigation practices was that it would not be productive for the Commission to attempt to establish detailed criteria for mitigation requirements since: a) such criteria, in order to be successful, would be extremely cumbersome; b) any independent criteria established by the Commission would surely differ from other state and federal criteria; and c) a degree of flexibility to allow review and analysis of impacts and benefits on a case by case basis was desirable. However, though the report recommended that the Commission continue its current case-by-case evaluation in consultation with other agencies, it also recommended that the Bay Plan should be amended to "reflect the requirement that any mitigation should be commensurate with the impacts of the associated project, and the assumptions and general practices of the Commission should be described."[131]

Adoption of Mitigation Policies in Bay Plan – 1985. Based on the recommendations of the Staff Report on Fill Controls, the Commission adopted specific mitigation policies in the Bay Plan in 1985. The Bay Plan Mitigation Policy states:

> Mitigation for the unavoidable adverse environmental impacts of any Bay fill should be considered by the Commission in determining whether the public benefits of a fill project clearly exceed the public detriment from the loss of water areas due to the fill, and whenever mitigation is necessary for the Commission to comply with the provisions of the California Environmental Quality Act. Whenever mitigation is needed, the mitigation program should be provided as part of the project. Mitigation should consist of measures to compensate for the adverse impacts of the fill to the natural resources of the Bay, such as to water surface area, volume, or circulation and to fish and wildlife habitat or marshes or mudflats. Mitigation is not a substitute for meeting the other requirements of the McAteer-Petris Act concerning fill. When mitigation is necessary to offset the unavoidable adverse impacts of approvable fill, the mitigation program should assure:
>
> (a) That benefits from the mitigation would be commensurate with the adverse impacts on the resources of the Bay and consist of providing area and enhancement resulting in characteristics and values similar to the characteristics and values adversely affected;
>
> (b) That the mitigation would be at the fill project site, or if the Commission determines that on-site mitigation is not feasible, as close as possible;

[131] San Francisco Bay Conservation and Development Commission. 1984. Staff Report on Fill Controls. Page. 7.

(c) That the mitigation measures would be carefully planned, reviewed, and approved by or on behalf of the Commission, and subject to reasonable controls to ensure success, permanence, and long-term maintenance;

(d) That the mitigation would, to the extent possible, be provided concurrently with those parts of the project causing adverse impacts; and

(e) That the mitigation measures are coordinated with all affected local, state, and federal agencies having jurisdiction or mitigation expertise to ensure, to the maximum practicable extent, a single mitigation program that satisfies the policies of all the affected agencies.

If more than one mitigation program is proposed that satisfies all five factors above, the Commission should consider the cost of the alternatives in determining the appropriate program.

To encourage cost effective and comprehensive mitigation programs, the Commission should extend credit for certain fill removal and encourage land banking provided that any credit or land bank is recognized pursuant to written agreement executed by the Commission. In considering credit or land bank agreements, the Commission should assure that the five factors listed above will be met.

Additional Bay Plan Policies Related to Mitigation. Although studies and reports on compensatory mitigation tend to focus on mitigating impacts to wetland habitats (please refer to Chapter 2 for more information on this subject) the Commission's mitigation policies are clearly more comprehensive in describing mitigation as measures to compensate for the adverse impacts on natural resources of the Bay, "such as to water surface area, volume, or circulation and to fish and wildlife habitat or marshes or mudflats."

Other policies in the Bay Plan also support mitigation for impacts other than to wetlands. For example, the Bay Plan policies on water surface area and volume state in part that the "surface area of the bay and the total volume of water should be kept as large as possible..." and that "Filling and diking that reduce surface area and volume should therefore be allowed only for purposes providing substantial public benefits and only if there is no reasonable alternative."

In addition, the Bay Plan has been recently revised with the addition of a new section on subtidal areas. The Bay Plan defines subtidal areas of the Bay as encompassing the land and water below mean low tide, which includes both shallow and deep segments of the Bay. New Bay Plan Subtidal Areas Policy 4 states in part: "any proposed filling or dredging project in a subtidal area should be thoroughly evaluated.... Projects in subtidal areas should be designed to minimize, and, if feasible, avoid any harmful effects."

In addition, new Policy 2 states:

> Subtidal areas that are scarce in the Bay or have an abundance and diversity of fish, other aquatic organisms and wildlife (e.g. eelgrass beds, sandy deep water or underwater pinnacles) should be conserved. Filling, changes in use, and dredging projects in these areas should therefore be allowed only if: (a) there is no feasible alternative; and (b) the project provides substantial public benefits.

Impacts to wetlands are still in the forefront of scientific and regulatory research and debate, and wetland are the primary focus of many regulatory agencies' mitigation policies. However, a

growing understanding of the importance of other types of resources to the general health of a region is reflected in more comprehensive mitigation policies.[132]

***Mitigation Practices Guidebook* – 1987.** The Commission published the *Mitigation Practices Guidebook* (Guidebook) in May 1987, a publication intended to assist permit applicants and interested parties in determining when, how much, and what type of mitigation has been required by the Commission for projects involving fill in San Francisco Bay, and thus help both the Commission and project applicants identify similar mitigation for future Bay fill projects. The Guidebook was based on a detailed analysis of Commission permits issued between 1974 and 1987 to determine the mitigation practices typically required by the Commission and was not intended to be used as regulatory standards for mitigation.

Descriptions of Commission mitigation practices in the Guidebook are broken into categories (work in the shoreline band, dredging, floating fill, submerged fill, pile-supported fill, and earth fill) and each category contains information on what mitigation the Commission has generally required for each type of impact.

The Guidebook, though now almost fifteen years old, is still dispersed to permit applicants who desire assistance in understanding what mitigation requirements may be required by the Commission.

***Mitigation: An Analysis of Tideland Restoration Projects in San Francisco Bay* – 1988.** In 1988, Commission staff (with the help of a consultant) undertook an evaluation of the success of fourteen permitted mitigation programs involving tideland restoration in San Francisco Bay. Based on both permit review and field investigations, success of the fourteen mitigation programs was assessed based on whether the completed mitigation project met the requirements specified in the permit authorized by the Commission and whether the program either enhanced or created valuable Bay resources that were comparable to similar, relatively undisturbed Bay wetlands and related habitats.

General conclusions from the evaluation of the fourteen mitigation programs included that mitigation programs can and have successfully created and enhanced Bay resources, but that despite those successes there is no certainty that any given creation or restoration program will meet all of its mitigation goals. The report recognized that tidal restoration efforts contain elements of risk and uncertainty based on lack of science, the dynamic nature of the system, natural events such as storms and floods, and the unpredictability of colonization of a site by plants and animals. In addition, the report concluded that due to the inherent risk and uncertainty, it makes sense for mitigation projects to restore or create areas that are larger in size and greater in habitat value than the area adversely impacted, but that exactly what the ratio of area impacted to area mitigated should be was difficult to determine, and that any strict formula would be somewhat arbitrary.

The report further concluded that the primary reason some mitigation programs were not successful in the past was that some portion of the required work was not performed, and that many mitigation programs have been delayed by the difficulty of finding and acquiring suitable creation or restoration sites.

Finally, the report concluded that permits contained little information on the specific Bay resources lost, that clear mitigation goals were not generally stated, that monitoring of completed mitigation projects had rarely been required, and that enforcement of mitigation requirements had not been a Commission priority. Based on the above conclusions, the report

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[132] For example, the U.S. Fish and Wildlife Service's Mitigation Policy was established for the purpose of "mitigating the adverse impacts of land and water development on fish, wildlife, their habitats, and uses thereof." (Federal Register Vol 46(15):7656-7663).

put forth several recommendations to improve the success of mitigation programs in the San Francisco Bay.

Staff Recommendation Concerning Mitigation Evaluation – 1988. The information and recommendations put forth in *Mitigation: An Analysis of Tideland Restoration Projects in San Francisco Bay*, were brought to the Commission in the Staff Recommendation Concerning Mitigation Evaluation in 1988. The adopted recommendations included the following:

1. **Changes to the Permit Application Form**. The permit application form should be amended to require specific environmental information from applicants for fill projects such as the types and amounts of tidelands that would be impacted (i.e., pickleweed marsh, cordgrass marsh, intertidal mudflats), the effect of the project on tidal circulation, the amount of Bay surface area and/or volume impacted, and the plants and animals impacted.
2. **Advice to Applicants Concerning Mitigation**. Applicants should be informed of the probable need for a mitigation program as early as possible in the application process.
3. **Changes to Permit Mitigation Conditions.**
   a. **Description of Impacted Resources.** Findings should clearly describe the specific Bay resources that will be impacted.
   b. **Statement of Mitigation Program Goals**. Mitigation conditions should clearly state the mitigation program goals.
   c. **Mitigation Plan**. Mitigation conditions should require preparation of a mitigation plan, to be received and approved by or on behalf of the Commission, that is prepared by or in association with a tidal hydrologist and a biologist experienced in tideland restoration. The plan should provide: precise elevations; an analysis of constraints to tidal flow; a soils analysis; a list of bay resources to be created; a requirement that the program contractor certify that the grading and excavation are in conformance with the mitigation plan; a clear schedule; and a list of persons responsible for planning and implementing the program.
   d. **Size of Restoration Area.** The restored area should be larger in size and greater in natural resource value than the impacted Bay resources.
   e. **Timing of Mitigation Program Implementation.** Mitigation should be carried out concurrently with or prior to the Bay fill project, unless unreasonable. If unreasonable, the permittee should provide a larger mitigation area and greater Bay resource value.
   f. **Mitigation Monitoring and Maintenance Program.** A monitoring and maintenance program should be prepared and approved by or on behalf of the Commission. Monitoring should be carried out by persons who are recognized as knowledgeable in restoration. The permittee should report annually to the Commission and the report should include: the dates various elements of the mitigation program were completed; an evaluation of the existing site conditions; identification of any problems; an evaluation of how closely the site compares with the mitigation plan including plant coverage; and an evaluation of whether restoration is proceeding in accord with the approved program and schedule.

      The permittee should be responsible for the maintenance of the mitigation sites as long as any fill for the project remains in place.

The permittee should be responsible for monitoring the mitigation program until 75% of the target resources have become established on site and the site has reached a dynamic equilibrium similar to that of natural wetlands.

4. **Enforcement of Mitigation Requirements.** Increased priority should be given to monitoring mitigation programs and enforcing mitigation requirements. Review of annual reports should assist in this effort.

5. **Promote and Assist Tidelands Restoration.** The Commission should promote and assist tidelands restoration programs and the dissemination of knowledge concerning tidelands restoration. This should include the promotion of a comprehensive regionwide plan or strategy concerning restoration and management goals for San Francisco Bay's tidelands and associated wetlands. In addition, the state should establish a regionwide mitigation bank.

Since 1988 and the adoption of the above recommendations, the Commission has not undertaken any further review and analysis of its mitigation policies and practices.[133]

[133] The one exception is staff work in the late 1990s on mitigation banking, which is discussed in more detail in Chapter 3.

CHAPTER 5

REVIEW AND ANALYSIS OF THE COMMISSION'S MITIGATION PRACTICES

The following chapter provides more detailed information on the Commission's policies and practices with regard to mitigation. The findings from a detailed review of fifteen years of permits requiring compensatory mitigation is presented.

Avoidance, Minimization and Rectification. As explained in the Introduction, the California Environmental Quality Act (CEQA) defines mitigation as including avoiding, minimizing, rectifying, reducing, and compensating for unavoidable adverse environmental impacts. Mitigation requirements under most local, state and federal policies specify a sequential approach. Sequencing begins with avoidance of impacts to the greatest extent possible, then minimization of impacts (including rectifying an impacted area), and, finally, compensation for any remaining adverse environmental impacts.

Although the Commission's current mitigation policies in the Bay Plan do not specify a sequencing procedure, Commission authority for requiring avoidance and minimization before compensation can be found in the McAteer-Petris Act, Section 66605 (b, c, and d), which state in part that "fill in the bay...should be authorized only when no alternative upland location is available for such purpose," "that the water area authorized to be filled should be the minimum necessary...," and that "the nature, location and extent of any fill should be such that it will minimize harmful effects to the bay area...."

Permits authorized by the Commission, in accordance with McAteer-Petris Act regulations, include findings regarding alternative upland locations and how the fill is the minimum amount necessary. In addition, permit conditions often includes measures to minimize potential adverse environmental impacts. For example, special conditions may require construction timing restrictions to avoid adverse effects on sensitive species such as herring during spawning season, establishment of a buffer around sensitive habitats such as clapper rail nests, requirements that construction operations be performed to prevent construction materials from falling into the Bay, requiring a biologist on-site during construction to monitor potential adverse impacts on wildlife, employment of best management practices to keep construction materials from falling into the bay such as soil fences and jute matting, and minimizing all traffic in marsh and mudflat areas during construction. Permit conditions for rectification typically require the permittee to restore the impacted area to its previous condition as soon as possible following construction, including returning the area to its original elevation and soil composition and, if the area does not revegetate to its former condition within a certain period of time, requiring the permittee to seed disturbed areas with appropriate vegetation.

Permit Review Methodology. To gain information regarding the implementation of the Commission's compensatory mitigation policies and practices, staff reviewed all permits between the years 1985 (when the mitigation policies in the Bay Plan were adopted) and 2000, to locate permits where compensatory mitigation was required. Applicable permits were identified by reviewing the Commission's files of executed original permits.[134] The year 2000 was chosen as a cutoff point, rather than 2001, as there may be a lag time between issuance of a permit and the submittal from the permittee of an executed permit. Also, the intention was to review any detailed mitigation plans which are often submitted in accordance with permit conditions after the permit is issued. In fact, the collected data for the later years is less complete for this reason, as some of the required mitigation plans have not yet been submitted.

[134] There may exist permits issued between 1985 and 2000 containing mitigation requirements where BCDC does not yet have an executed original on file.

Only permits with clear compensatory mitigation requirements to offset adverse impacts to Bay resources were reviewed.[135] Permits requiring mitigation measures other than compensatory, such as avoiding or minimizing the impact, were not included in the review. Similarly, permits containing only on-site restoration requirements for temporary impacts (such as revegetation of an area disturbed during construction) were not included, as according to the definition of the mitigation sequence described in the CEQA guidelines[136] those permits required "rectification" of the actual impact by restored the impacted area, not compensatory mitigation. However, those permits that required mitigation for temporary impacts beyond restoration of the impacted area were included as those fell under the definition of compensatory mitigation, where the impacts are compensated for by replacing or substituting for the impact.

Once the applicable permit numbers were identified from the executed original files, the actual permit files were reviewed for more detailed information. Information was captured on a three page questionnaire and then transferred to an excel database for analysis. To streamline the process, information was only obtained in the permit files from staff summaries, staff recommendations, approved permits, mitigation plans, and correspondence. Other sources of potential information such as environmental documents or permit applications were not reviewed.

For consistency the term "permit" is used throughout the results section, whether the information was found directly in the permit or in a separate mitigation plan submitted as a condition of the permit (and therefor legally part of the permitted project).

General Results. A total of 62 approved permits (38 "major" permits and 24 administrative permits, or "minors") between the years 1985-2000 were identified as containing a compensatory mitigation requirement for unavoidable adverse environmental impacts (see Figure 2). Of the 62 permits reviewed, 58%, were from applicants from public entities, 31% were from private applicants, and 11% consisted of public and private co-applicants.

Types and Locations of Mitigation Projects. Of the 62 permits reviewed, 33% required restoration only as the type of compensatory mitigation, 26% required creation only, 5% required enhancement only, 31% required a combination of mitigation activities, and for 5% of the projects, the mitigation type was unknown. No permits included preservation as a compensatory mitigation type. Figure 3 shows, of the 59 permits where the information was available, the number of permits requiring each type of mitigation activity, and whether that activity was included in a package of required mitigation types, or as the only mitigation type required.

[135] Permits that contained a restoration component but that did not contain clear language linking the restoration to compensation for unavoidable adverse impacts of fill were not included.

[136] As described in the Introduction, CEQA defines mitigation as including: avoiding, minimizing, rectifying, reducing, and compensating for the adverse impact.

Figure 2

BCDC Permits with Compensatory Mitigation Requirements 1985-2000

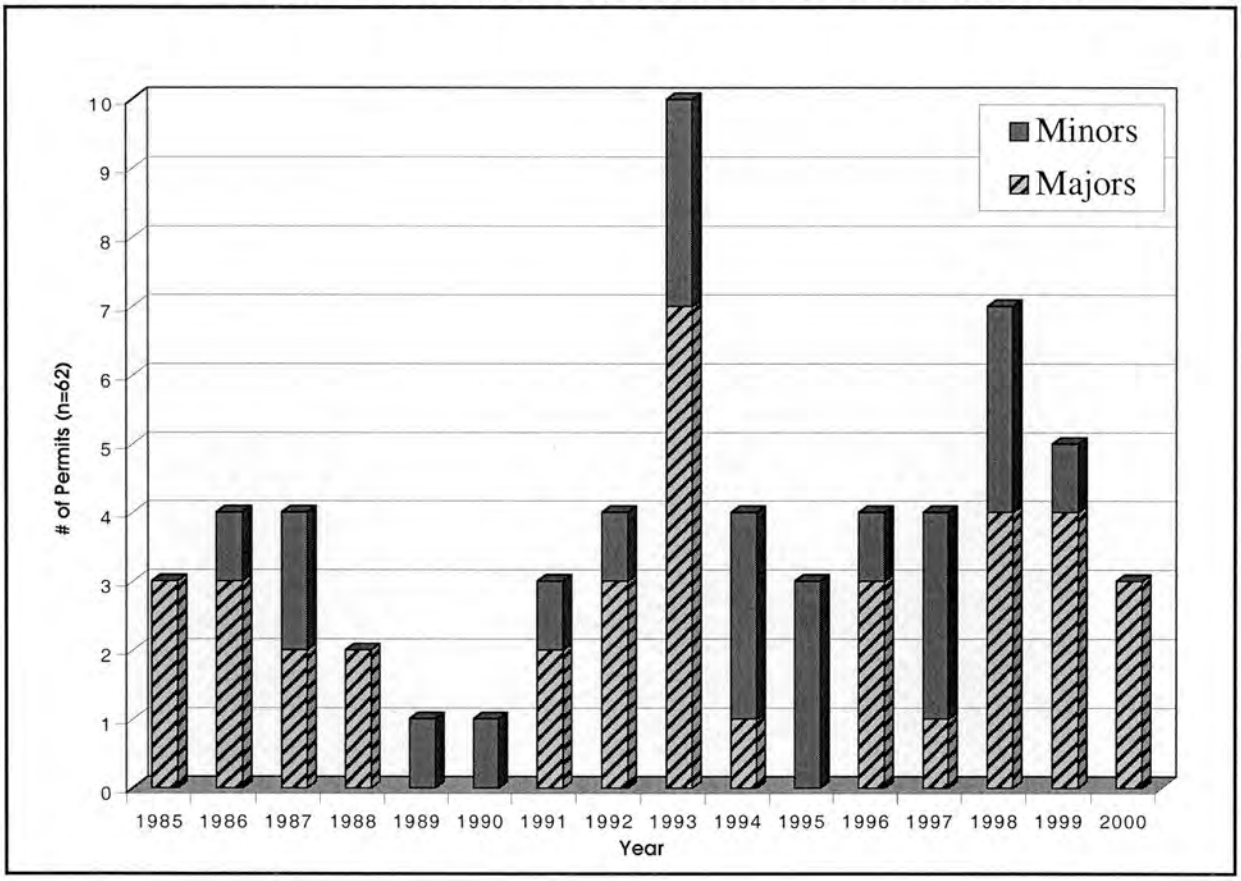
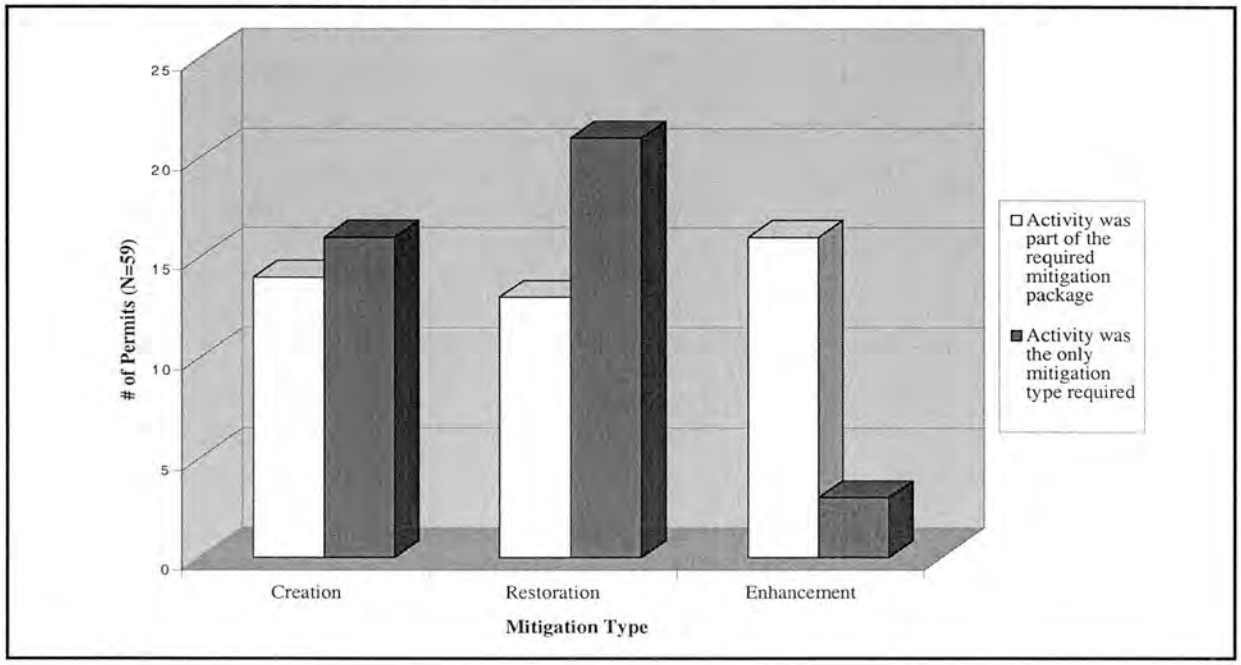


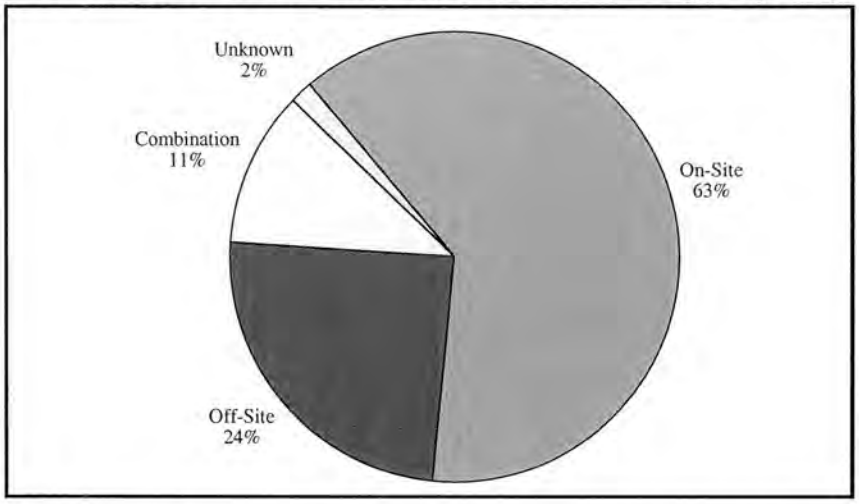
Figure 3

Breakdown of Types of Permitted Compensatory Mitigation Projects



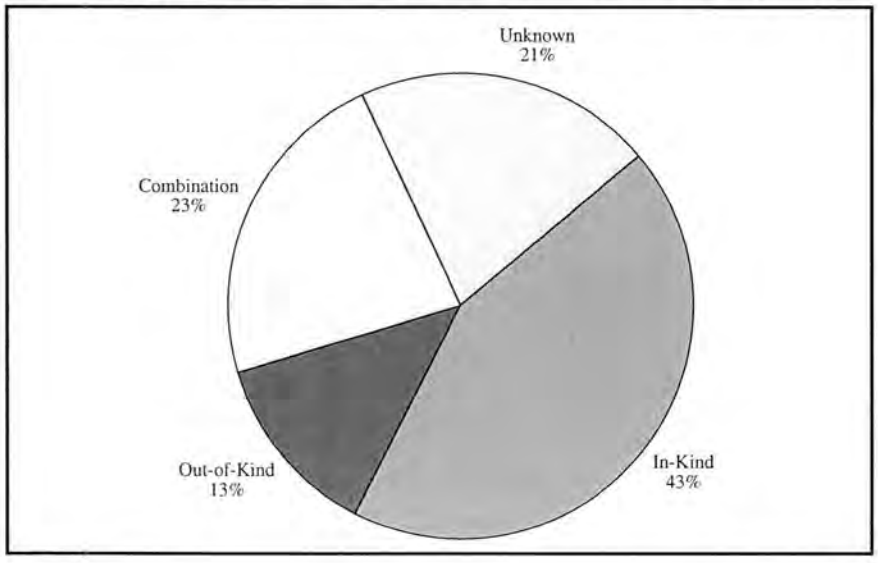
As Figure 4 shows, 63% of the permits required on-site mitigation, though almost a quarter of the projects required off-site mitigation, and 11% included a combination of both on-site and off-site. For 2% of the permits, the mitigation site location was unknown.

Figure 4
Location of Permitted Compensatory Mitigation Projects (N=62)



In addition, as shown in Figure 5, 43% of the permits required in-kind mitigation, 13% required out-of-kind mitigation, and 23% required a combination of in-kind and out-of-kind. For 21% of the projects, it was unknown whether the mitigation was in-kind or out-of-kind, either due to mitigation plans missing from files or not yet submitted, or the lack of consistent and clearly stated habitat descriptions of the area impacted and/or the area mitigated which made comparisons between habitat types difficult.

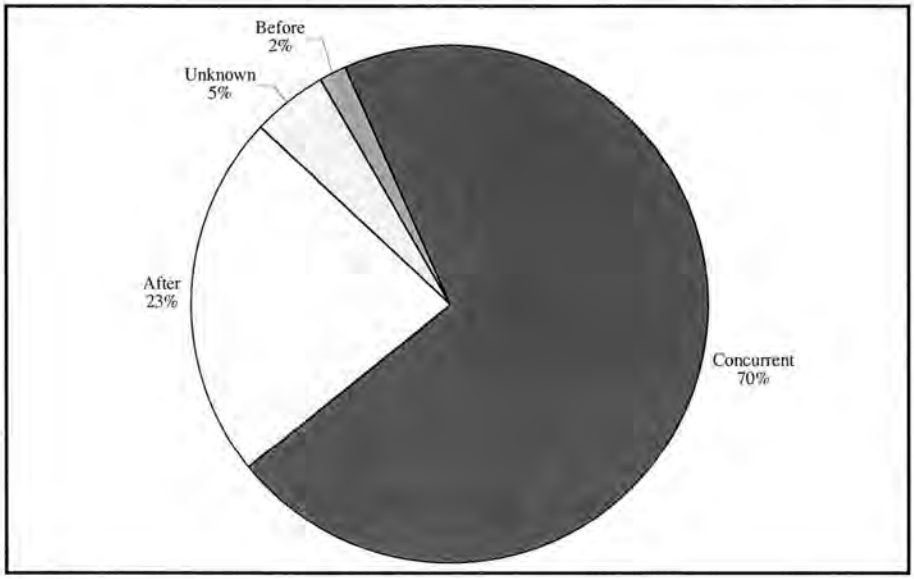
Figure 5
Breakdown of Required Compensatory Mitigation Types (N=62)



Mitigation Timing. The majority of the mitigation projects (71%) were required by the Commission be implemented concurrent with the timing of the approved project, or very close (e.g., within sixty days). Mitigation was allowed to commence after the completion of the project for 23% of the permitted projects. It should be noted that of those fourteen projects that included mitigation after the impact, one was a mitigation requirement for prior unauthorized fill so therefore could not have been required earlier, and one permit required additional mitigation requirements in the form of a fee to compensate for the time delay between the impacts and the mitigation.

One permit (issued in 1986) required implementation of the mitigation prior to the project, consisting of restoring or enhancing tidal marsh on-site at a one-for-one replacement ratio prior to the construction of a bridge.

Figure 6
Timing of Mitigation as Compared to Timing of Permitted Project (N=62)



Mitigation Ratios. The Commission does not generally specifically describe mitigation ratios in its permits. Conclusions regarding mitigation ratios in the permit review process were calculated from data on acreages provided in the permit.

The mitigation ratio varied among the 62 permits. In some instances, the mitigation ratio was indeterminable from the permit. For example, five permits required alternative mitigation requirements such as in-lieu-fees without specifying the exact acreage the money would be used to create or restore. Two other permits required the creation of tidal channels for habitat enhancement without specifying the resulting acreage of the enhanced area.

For those permitted mitigation projects where the mitigation ratio was determinable,[137] The majority of the mitigation projects contained ratios of between 1:1 and 5:1. About 15% contained mitigation ratios of *less than* 1:1. About 35% of the projects required ratios of 1:1 *or less* with

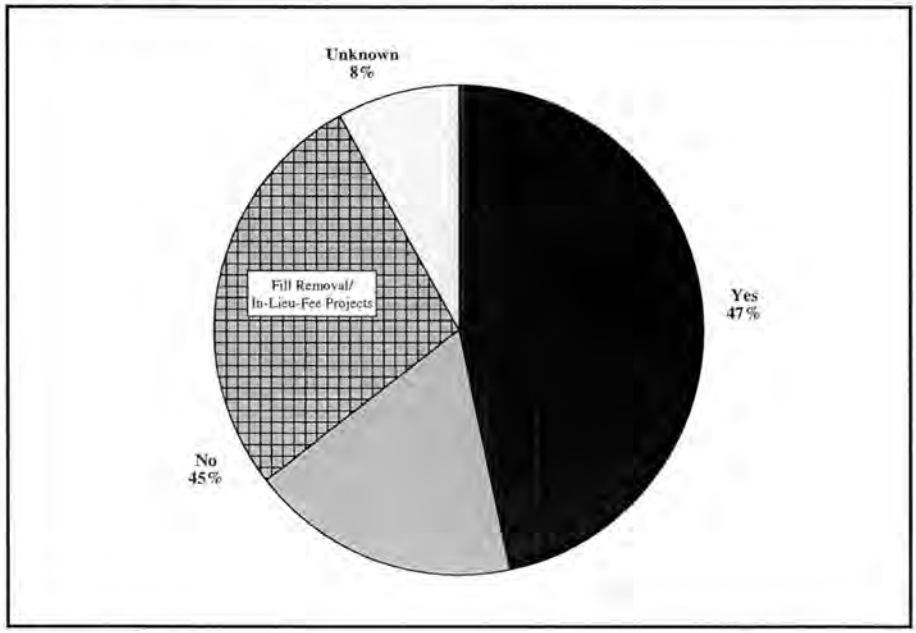
[137] The total number of individual projects with determinable mitigation ratios does not correspond to the total number of permits that included determinable mitigation ratios, as some permits included more than one mitigation project type, often with differing ratios. The total number of permits that included determinable ratios was 54, the total number of projects evaluated was 60.

about 65% of the projects therefore requiring ratios of *greater than* 1:1. About 12% of the projects contained mitigation ratios of *greater than* 5:1.

Most projects requiring less than 1:1 mitigation ratios were requiring compensation for adverse environmental impacts that were temporary in nature, or those resulting from pile-supported fill (pile-supported fill, while potentially disrupting and displacing benthic communities, creating shade, and disrupting animal movement, often does not have as significant an adverse impact as solid fill[138]). Of the projects requiring ratios of 5:1 or greater, the majority included enhancement of degraded habitats as part of the mitigation package. Enhancement of degraded sites does not create new acreage of habitat, so often requires a higher mitigation ratio to adequately compensate for the impact. As another example, one project involved both permanent habitat loss as well as temporary construction-related impacts to several endangered species, and required a relatively high ratio of 7:1. It should be noted, however, that the permits did not consistently call out the mitigation ratio, or include an explanation of how the ratio was determined.

Success Criteria. As Figure 7 shows, of the 62 permits reviewed, 45% did not list any clear performance standards or success criteria. Although 17 of those 28 permits contained compensatory mitigation requirements that were completely or primarily either fill removal projects (which generally do not involve detailed habitat restoration with measurable attributes so do not generally have listed success criteria), or mitigation in the form in-lieu fees or cash donations where success criteria were not the responsibility of the permittee. For 8% of the reviewed permits, it was unclear whether there were listed performance standards (mitigation plans may missing from file or not yet submitted). The remaining 47% did list performance standards by which the success of the project could be assessed.

Figure 7
Percentage of Permits with Identified Performance Standards (N=62)



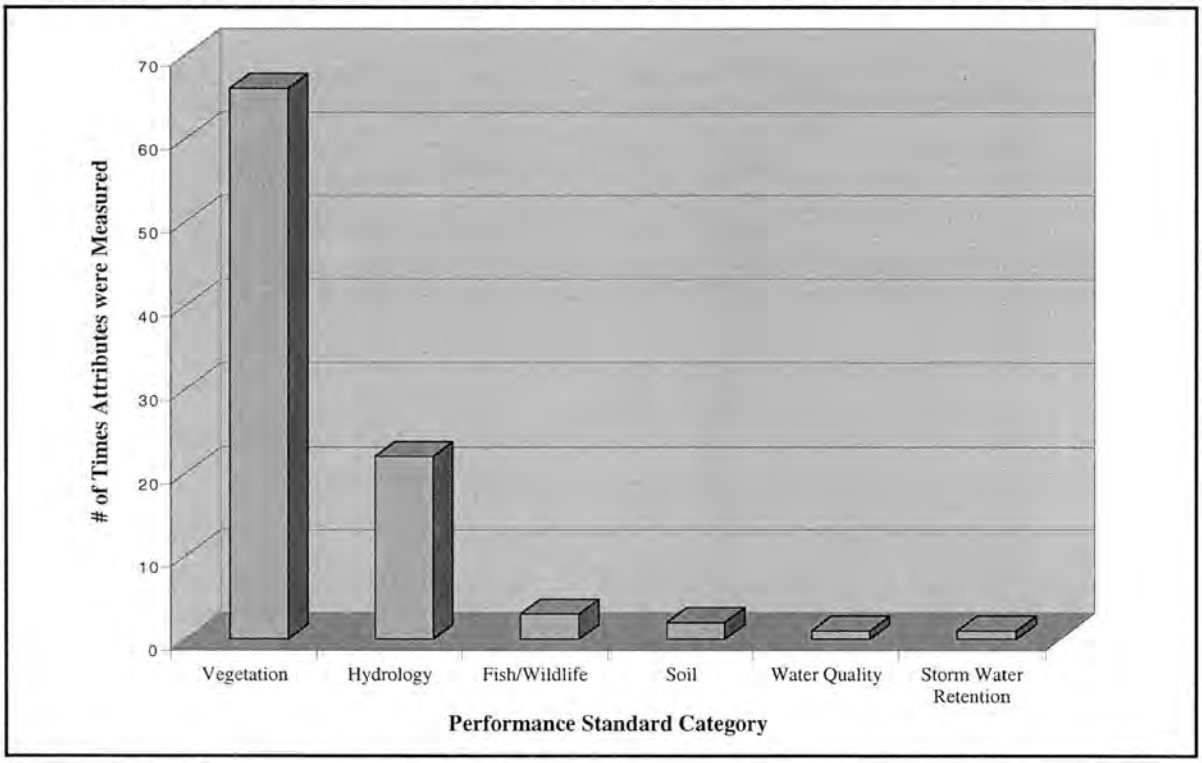
The types of attributes measured as performance criteria can be broken down into several categories. Figure 8 shows six categories of performance criteria and displays the number of

[138] BCDC. 1987 Mitigation Practices Guidebook.

times attributes in each category were specified in the permits. The most common success criteria category measured was vegetation (see Figure 9 for a breakdown of the types of vegetation attributes measured). The second most common criteria measured was hydrology, which included attributes related to channel geometry, tidal range, elevation, sedimentation rates, water volume, surface area, simply the presence or performance of hydrology, and most often, inundation. Attributes related to wildlife were rarely used, but included usage of the area (for fish passage for example) and occurrence of specific species (i.e., invertebrates). Soil was listed twice and consisted of the existence of hydric or bay mud soil, and both water quality and storm water retention were listed once (both within one permit) and consisted of a measurement of function as compared to a reference site.

Figure 8

Number of Times Attributes in each Performance Standard Category were Measured

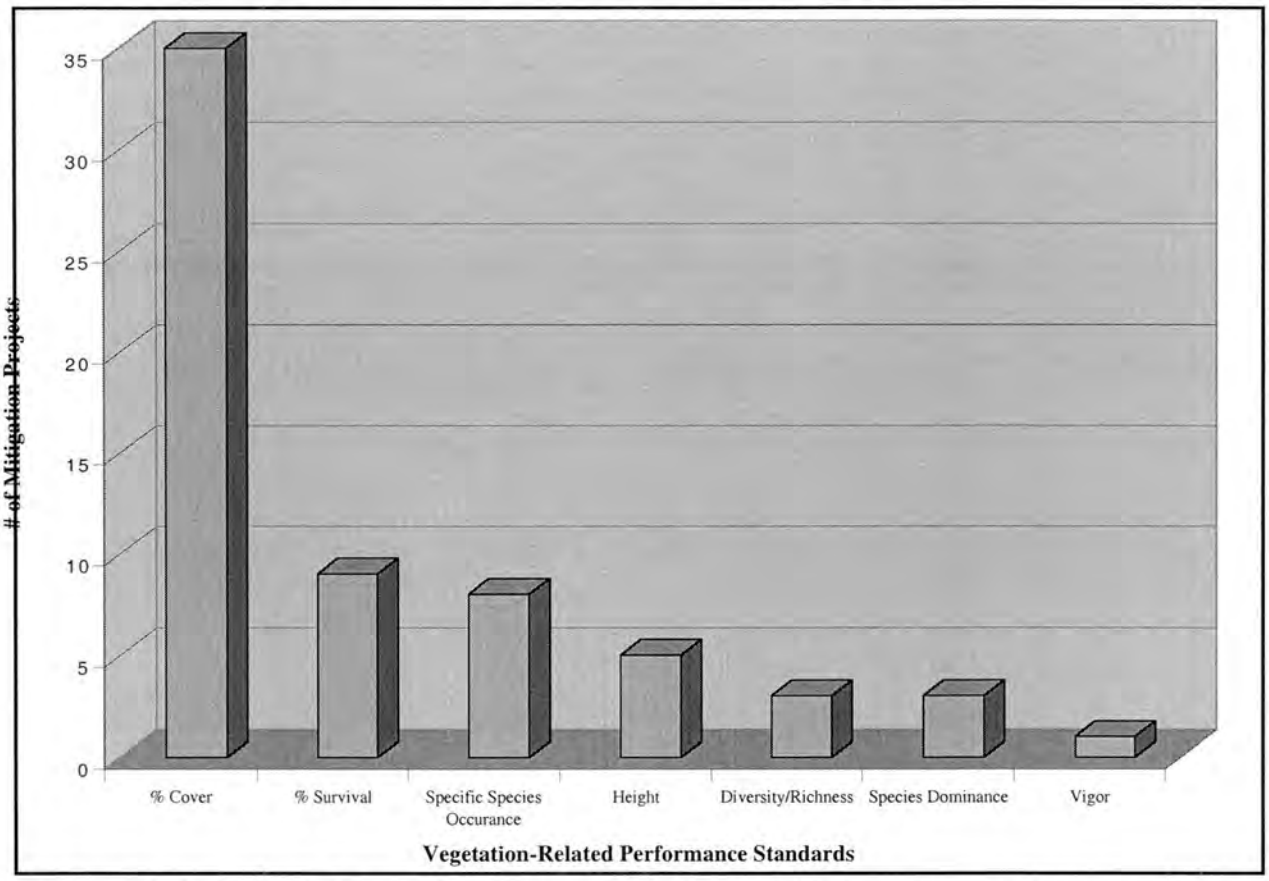


Every one of the 29 permits that contained performance standards for measuring the success of a mitigation project depended on one or more criteria related to vegetation. A breakdown of types of performance standards related to vegetation is shown in Figure 9 below.

Percent cover of vegetation was the most common vegetation-related parameter measured. The targeted goal for percent vegetative cover generally ranged from 50% to 90%, and often included targets for relative cover of specific species or relative cover of native (or nonnative) species within, or as, the total percent cover goal. For example, a permit might specify a target for percent vegetation cover of 80%, with 50% relative cover of pickleweed. Or a target for percent vegetation cover of 50% of native species. Percent cover was also occasionally defined as percent of open space or amount of bare area allowable.

The second most common vegetation-related performance standard was percent survival of vegetation. Percent survival was commonly used for upland transitional habitats or seasonal wetlands with seeded or transplanted trees and shrubs. Percent survival was measured as an overall target, such as 90% survival of vegetation, or a target for a specific species, such as 50% survival of transplanted shrubs.

Figure 9
Breakdown of Vegetation-Related Performance Standards*



* Total exceeds the 29 permits that contain performance standards as individual permits may include the creation, restoration or enhancement of more than one habitat type and/or area.

Occurrence of specific species was listed several times as a performance standard in various forms such as occurrence of a one or more specific species (such as pickleweed), occurrence of a minimum number of native species, and general occurrence of wetland plant species or hydric vegetation.

Performance standards related to vegetation height were listed a handful of times and included targeted average height of specific species, height minimums over specific percentage of area, and comparisons to reference sites.

Species diversity or richness was listed only three times as a performance standard within the reviewed permits, and was always measured in comparison to a reference site.

Species dominance was also listed three times as a performance standard and either specified a specific species (such as pickleweed) required to be dominant at the site, or specified a general category of species (such as wetland plant species).

Finally, evaluation of vigor was listed once as a performance standard and it was not clear how vigor was to be measured.

Number of Parameters Measured. The majority of the permits listed between one and three parameters to be measured as performance standards for each mitigation project, as

shown below in Figure 10. As the above discussion would suggest, the most common parameter measured for projects with only one performance standard was percent cover of vegetation. For projects with two performance standards, percent cover of vegetation was supplemented with a variety of different parameters, including a measure of hydrology such as tidal range or inundation, or an additional vegetation-related parameter such as occurrence of specific vegetative species, or vegetation height. No discernable pattern was found for projects requiring three or more parameters.

Figure 10
Number of Parameters Measured for Project Performance Standards*

# of Parameters	1	2	3	4	5	More than 5
# of Projects	9	8	9	2	2	4

* total exceeds the 29 permits that contained performance standards as individual permits may include the creation, restoration or enhancement of more than one habitat area

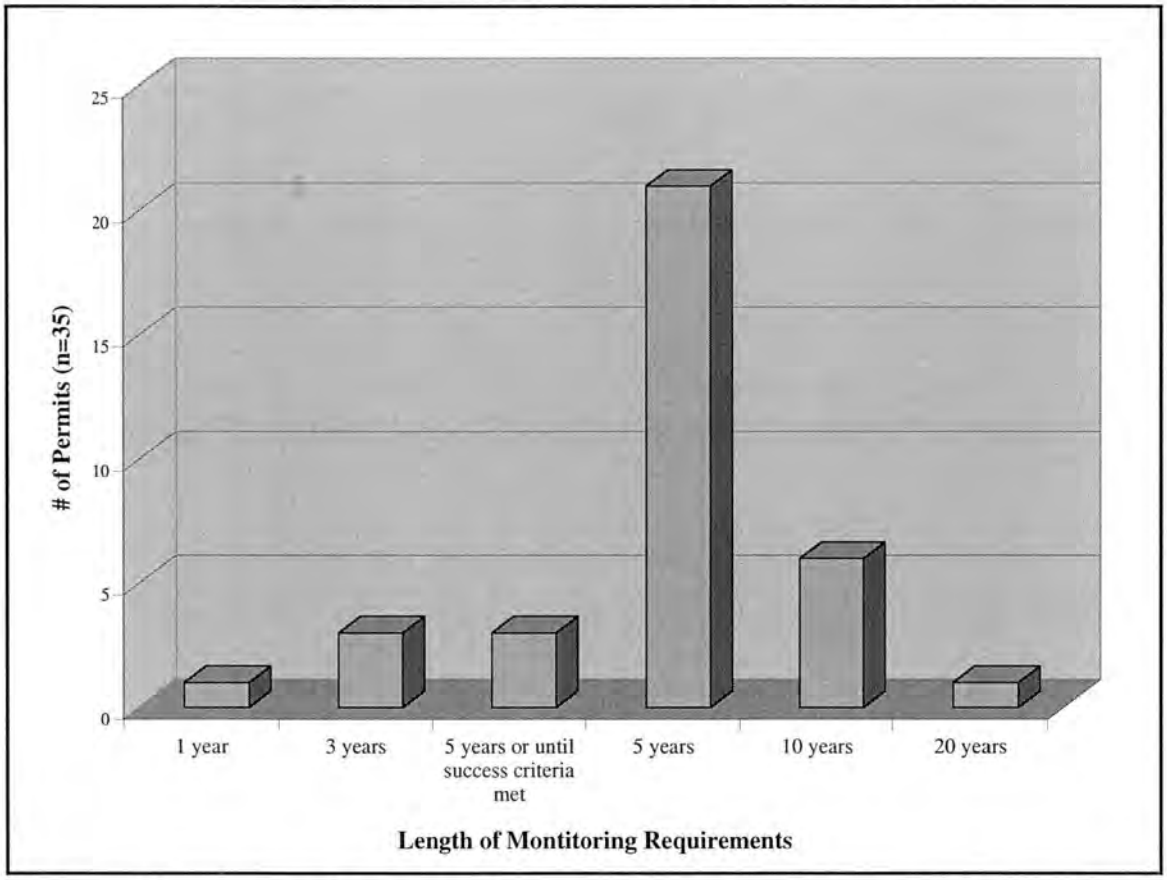
It is important to note that while most of the listed performance standards consisted of defined, measurable attributes, not all of the listed performance standards were clearly measurable. Performance standards that were unclear or contained attributes that were not measurable included "significant increase of percent vegetative cover," (without defining how "significant" was to be determined or measured) and "minimal presence of undesirable species" (with no definition of what constitutes "minimal"). Other examples were "desirable plant species richness" (with no definition of "desirable") and "vegetation success" (with no definition of how "success" was to be measured). Again, although these types of ambiguous performance standards were rare, they were encountered in a handful of mitigation projects during the permit review process.

Monitoring Requirements. Of the 62 permits reviewed for monitoring requirements, 56% required monitoring of the required compensatory mitigation projects, and 35% did not require any monitoring. Finally, in 8% of the projects the monitoring requirements were unknown or unclear (the mitigation plan was missing from the file or not yet submitted).

Of the 22 projects that did not require any monitoring, seventeen were completely or primarily either fill removal in open water projects (which generally do not involve detailed habitat restoration with measurable attributes so do not generally have either listed success criteria or any monitoring requirements), or in-lieu-fee mitigation or cash donation, where monitoring requirements, if any, are the responsibility of a third party. Of the remaining five projects with no monitoring requirements, three were very small projects, requiring restoration or creation of 500 square feet or less of marsh habitat.

As shown in Figure 11, of the permits requiring monitoring of the compensatory mitigation projects, 77% required five years or more of monitoring, and 20% of those projects required monitoring for ten or more years. Two of the permits that had five-year monitoring requirements included the potential for additional monitoring if success criteria were not met, and four of the permits that had ten-year monitoring requirements contained a permit condition allowing the Commission to make the determination after the initial ten-year monitoring period to continue monitoring for an additional five years.

Figure 11
Monitoring Requirements for Compensatory Mitigation Projects



Long-term Maintenance, Management and Protection. For purposes of this review, long-term management requirements are defined as ongoing stewardship (including necessary maintenance) of the compensatory mitigation site for at least as long as any fill for the project remains in place, or in other words, for at least the life of the permitted project for which compensatory mitigation was required. Long-term stewardship may be required of the permittee themselves, or a mechanism to protect the site may have be required (such as a deed restriction or transfer of title).

Of the 62 permits reviewed, 35% contained some sort of long-term maintenance and/or permanence requirement.

Fourteen of those permits included protection of the mitigation site in perpetuity, mostly through permit conditions requiring the permittee to permanently dedicate the mitigation area as open space or for wildlife habitat. Five of the fourteen permits requiring permanent protection included the conveyance of the mitigation site to a stewardship agency (such as California Department of Fish and Game, the US Fish and Wildlife Service, or the East Bay Regional Park District) for permanent management and maintenance.

Six of the permits included mechanisms for long-term, but not necessarily permanent, maintenance of the mitigation site. Two of those permits required the permittee to maintain the site, including removal of debris, for an unspecified amount of time. One permit required the permittee to secure a twenty year lease for the mitigation site and to restrict the site as open space marsh for that time. Two permits required active maintenance of the site by the permittee specifically for the life of the approved project. Lastly, one permit required elimination of

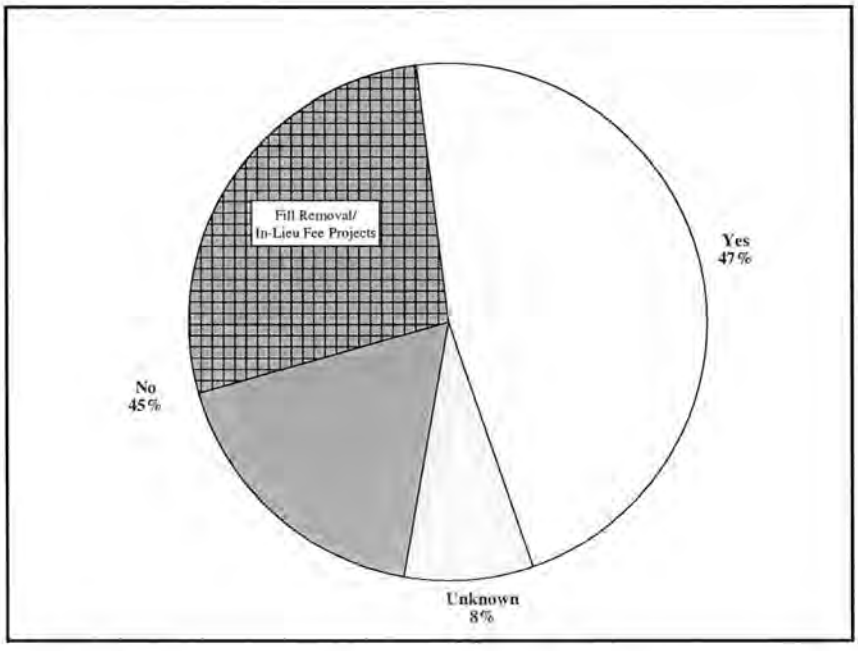
aggressive introduced species for ten years (even though the permit only required three years of mitigation monitoring).

Lastly, two permits contained conditions stating that if the mitigation site is pre-empted or filled or covered for another project or use, than an equivalent amount and kind of replacement mitigation shall be provided by the permittee. Although this mechanism is does not fit the definition of long-term stewardship of the original mitigation site, it does technically provide for a mitigation site to be permanently provided.

Contingency Plans. The 62 permits were reviewed for the existence of specified contingency plans or measures in the event of failure of the mitigation site to fulfill performance standards. About one-half, or 47%, of the permits contained some sort contingency plan, while 45% did not, and for a small number of permits (8%), the existence of contingency measures were unknown (the mitigation plan was missing from the file or not yet submitted, for example).

Of the permits that did not contain a contingency plan, seventeen were completely or primarily either fill removal projects (which do not involve detailed habitat restoration with measurable attributes so do not generally include either listed success criteria or a contingency plan), or in-lieu-fee mitigation or cash donation (where the mitigation implementation is the responsibility of a third party). Therefore, excluding fill removal and in-lieu-fee or cash donation mitigation, only 18% of the permits did not include specified contingency plans or measures in the event of failure of the mitigation site to fulfill performance standards (see Figure 12 below).

Figure 12
Identified Contingency Plans for Compensatory Mitigation Projects (N=62)



Of the permits that did contain a contingency plan, the majority were in the form of general permit conditions stating that if adverse conditions are identified, the permittee shall take corrective action. A few permits included some specific potential contingency measures such as regrading or filling, replanting, weeding, or finding alternative mitigation sites. One permit required as a contingency plan for failure to introduce tidal action at the proposed site, the provision of an additional acre of tidal marsh for every two years that restoration is delayed.

Financial Guarantees. Only one of the 62 permits reviewed contained any sort of financial guarantee for the achievement of successful mitigation, or financial assurances for long-term maintenance. That one permit required a performance bond assuring construction of the wetland habitat from the third party responsible for undertaking an fee-based mitigation project.

Transition Zones and Buffers. Nine out of 45 wetland mitigation permits specifically called out the creation, restoration or enhancement of transitions zones or "upland habitats" as part of the mitigation plan. Two permits included a "buffer habitat" and one included a "buffer zone."

Mitigation Banks and Fee-Based Mitigation. There were no permits that involved the use of mitigation banks. A few permits mentioned the applicant's request to potentially bank "extra" mitigation, but required the permittee to return to the Commission at a later date for review of any potential banking proposal once the required mitigation was completed. Eleven mitigation projects involving the use of fee-based mitigation were identified during the permit review process. Funds required by the Commission from permittees have been directed to a specific third party for restoration-creation of a specific site, or have been collected by the Commission for future dispersal for as yet unidentified restoration-creation projects. Under the Commission's fee-based mitigation requirements, responsibility for the ecological success of the mitigation project lies either with the third party receiving the fee, or is not defined. In general, permit conditions regarding fee-based mitigation requirements varied considerably in the eleven project identified in the permit review, and there was no consistent approach to defining the legal responsibilities of the in-lieu-fee mechanism, nor for assuring ecological success or long-term management and protection.