An Evaluation of Compensatory Mitigation Projects Permitted Under Clean Water Act Section 401 by the California State Water Quality Control Board, 1991-2002.

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Final Report
(Review Copy)

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Note to reader:

This report is the Final Report under California State Water Resources Control Board Contract 03-259-250 to the University of California, Los Angeles. Because the recommendations in this report may result in changes to State and Regional Water Quality Control Board regulatory practice, the report is being made available for public review; thus, it is designated the Final Report (Review Copy). Following receipt of comments on the report (due no later than November 15, 2006), this version of the report will be revised to produce a Final Report.

Abstract

The purpose of this project, which was funded by the California State Water Resources Control Board (SWRCB), was to evaluate the compliance and wetland condition of compensatory wetland mitigation projects associated with Clean Water Act Section 401 Water Quality Certifications throughout California. This was done by selecting, reviewing and performing field evaluations for 143 permit files distributed across the 12 Water Board regions and sub-regions of the State. For each permit file we assessed the extent to which permittees complied with their mitigation conditions, including acreage requirements, whether the corresponding mitigation efforts resulted in optimal wetland condition, and if the habitat acreages gained through compensatory mitigation adequately replaced those lost through the permitted impacts. We found that permittees are largely following their permit conditions (although one-quarter to one-third of the time these are not met), but the permit conditions that are being met are not resulting in compensatory mitigation projects that are similar to natural wetlands.

Methods

Our goal was to evaluate the mitigation actions associated with at least 100 randomly chosen Section 401 permit files issued in California between 1991 and 2002. The permit files were selected using the SWRCB's permit tracking database, and reviewed through multiple visits to the SWRCB, each of the three Army Corps of Engineers district offices (Los Angeles, San Francisco, and Sacramento), and various Regional Boards. Mitigation projects from 129 permit files were visited for assessment of compliance with permit conditions (including acreage) and wetland condition, and 14 additional files were evaluated for compliance only.

Our determinations of Section 401 compliance included consideration of all mitigation conditions specifically outlined in the 401 permit letter, plus any additional conditions found in other agency permits when the 401 permit included explicit or implicit statements requiring that those documents be followed. In addition to the regulatory permits, the mitigation plan, if present, was carefully read to extract the essential compliance elements. Compliance with these conditions was scored using categorical scores, on a scale from 0% (no attempt to comply) to 100% (condition fully met).

To evaluate existing wetland condition, we performed the California Rapid Assessment Method (CRAM) at all assessable mitigation sites associated with our permit files. CRAM includes evaluations of the following attributes: buffer and landscape context, hydrology, physical structure and biotic structure. To provide a sound foundation for evaluating mitigation sites in this study, our mitigation site results were compared to the results from CRAM evaluations performed at 47 reference sites distributed throughout the state.

At each mitigation site we also mapped the border of the mitigation sites using GPS to evaluate acreages, and performed qualitative delineations of the sites to determine the approximate proportions of jurisdictional and non-jurisdictional habitat types that

were present. These proportions, along with the overall site acreages, were used to calculate the component acreages of "waters of the US" versus non-"waters" habitats, wetlands versus non-wetland "waters," and subsets of these habitat types. These were compared to the impact acreage values in the permits to evaluate "no net loss" from the standpoint of habitat acreages.

Results

The mitigation sites were well distributed across the state, although some regions had issued relatively few 401 permits and, thus, had correspondingly few site evaluations (Figure AB-1). Of the 129 projects that we evaluated in the field, 62% had onsite mitigation with the rest offsite. Of these projects, 75% had file-specific mitigation, while 25% had mitigation that was competed at mitigation banks, were part of other larger projects, or were completed through in-lieu fee payments.

In terms of permit compliance, the average compliance score for 401 conditions was 84% (based on 124 files with assessable 401 conditions); 46% of the files fully complied with *all* permit conditions and the average percent-met score was 73% (Table AB-1). The average compliance score based on mitigation plan requirements (a proxy for all agency requirements) was slightly lower than the 401 compliance scores (81% vs. 84%). Only 16% of the files fully complied with all mitigation plan conditions; however, 42% had scores of 90% or greater. Compliance with 401 permit conditions showed no trend over time, and there was no significant difference in 401 compliance or mitigation plan compliance among regions. Permittees usually complied with acreage requirements and third party acreage credit purchases, but there was much lower compliance with monitoring and submission requirements (Table AB-2). In general, most 401 permits contained relatively few compensatory mitigation-related permit conditions (often a single acreage-related requirement was specified); conditions regarding success and performance standards were notably infrequent.

The 129 files that were evaluated in the field had 204 discrete mitigation sites due to multiple mitigation actions (e.g., wetland creation plus riparian enhancement) that needed to be evaluated separately. Fifty three of these mitigation sites were sub-sampled because they were too large or complex for a single CRAM evaluation. Thus, a total of 321 separate CRAM evaluations were completed for this study.

Despite relatively high permit compliance, most mitigation sites were not optimally functioning wetlands. As measured by CRAM scores, mitigation sites scored lower than reference wetlands, with an overall mean score of 59% compared to 79% for reference sites (Figure AB-2). On average, sites scored better for biotic structure (e.g., plant community metrics) than for hydrology metrics (Figure AB-3). In comparison to reference sites, only 19% of the mitigation files were classified as optimal, with just over half sub-optimal and approximately one-quarter marginal to poor. There was some variation in CRAM scores among the SWRCB regions, with Region 2 exhibiting a slightly lower mean CRAM score than other regions (Figure AB-4).

The 143 Section 401 orders that were evaluated authorized approximately 217 acres of impacts (including temporary impacts) and required that 445 acres of mitigation be provided. Our analyses indicate that 417 acres of actual mitigation acreage was obtained; 72% of files met or exceeded their acreage requirements, resulting in an overall mitigation ratio of 1.9:1. When considering permanent impacts (true losses) to "creation" mitigation, our results showed that "no net loss" of acreage is being achieved (1) overall, (2) for jurisdictional "waters of the US" acreage, and (3) for wetlands themselves (Table AB-3). However, 39% of individual files resulted in net acreage losses overall, 47% resulted in a net loss of jurisdictional "waters" acreage, and 28% had net wetland losses (Table AB-4).

A simple reporting of acreage losses and gains does not provide the full picture of "no net loss." This approach assumes no existing wetland acreage was present at the mitigation site prior to any mitigation activity (not always the case), it does not address whether the habitat types mitigated were appropriate given the corresponding impacts, and it assumes that the mitigation site exhibited no wetland function prior to the mitigation activities and impacts resulted in a compete loss of function. Assessing this latter issue is challenging in an after-the-fact investigation such as the present study. However, we were able to investigate habitat correspondence in this study. Within most regions, the habitat types mitigated were appropriate given the impacts (Figure AB-5); however, approximately 50% of the mitigation acreage within Regions 4 and 5S consisted of drier riparian and upland habitats that were outside jurisdictional "waters of the US." Overall, 27% of mitigation acreage was non-jurisdictional. Vague regulatory language and a lack of clear accounting have contributed to this result; in the reporting of regulated impacts, the term "riparian" refers only to habitats within "waters of the US" while in mitigation planning, a more ecological definition of riparian has often been applied that includes the entire zone of transition to fully terrestrial habitats.

In comparing results from permit compliance, acreage requirements and wetland condition, we found little relationship between these different aspects of mitigation. Meeting acreage requirements did not ensure overall permit compliance (r^2=0.002), nor was there any relationship between percent acreage met and CRAM score for wetland condition (r^2=0.015). General compliance with permit conditions was statistically correlated with CRAM scores; however, low r^2 values indicate the relationships between the variables were not very strong (mean 401 compliance score and CRAM score, r^2=0.126 (Figure AB-6); mean percent of 401 conditions met and CRAM score, r^2=0.207; and mitigation plan compliance and CRAM score, r^2=0.150).

Taken together, the findings of this study suggest that permittees are, for the most part, meeting their mitigation obligations, but the ecological condition of the resulting mitigation projects is not optimal (Figure AB-7). The functional deficiencies and the likely failure of many projects to meet the "no net loss" goal of the Clean Water Act are largely due to shortcomings in mitigation planning and in the development of the permit conditions. The root of these shortcomings lies with a lack of explicit consideration of the full suite of functions, values, and services that will be lost through proposed impacts and might be gained through proposed mitigation sites and activities. In short, this is at least partly due to regulatory agencies approving mitigation projects that are too heavily focused on the vegetation component of wetland function, with inadequate emphasis on compensating for impacts to hydrological and biogeochemical functions and their associated services (e.g., flood attenuation, water quality improvement).

Recommendations

The results of this study have informed a large number of recommendations (Table AB5). The recommendations are separated into five main categories.

First, we present recommendations aimed at improving mitigation requirements. These recommendations concern mainly permit conditions, but also issues of the location of mitigation projects and how gains and losses associated with a project are tracked by habitat. The success of compensatory mitigation depends fundamentally on the mitigation requirements specified by the regulatory agencies. Our study found relatively high levels of compliance with mitigation permit conditions. In addition, there was no relationship between compliance with permit conditions and the condition of wetland mitigation sites. It appears that compliance with permit conditions yields no guarantee that a mitigation wetland will have high condition or function. Perhaps the most effective way to improve the success of compensatory mitigation would be to include permit conditions that lead to better mitigation projects.

Second, we present recommendations under the general heading of Information Management. The performance of this study revealed the difficulty of retrieving specific permit files. Of the 429 files we sought, we could locate only 257. The difficulty in locating files had a variety of causes, ranging from limitations in the database to the physical management of hardcopy permit files. These recommendations concern improvements to the database (either the existing database, or a modified database), improvements to permit archiving, and improvements to tracking the progress of mitigation projects.

Third, we present recommendations to improve the clarity of permits. Permit conditions should be written as clearly assessable criteria, with individual conditions for each specific criterion to be evaluated. Permit conditions should be written with a clear and direct method of assessment in mind. Our results suggest that more clearly written conditions would improve the chance of compliance. Presently, some conditions are too vague or may be presented in a way that it is not possible to assess them.

Fourth, we recommend that the goal of “no net loss” be assessed in a more effective manner. Although we were able to assess whether there has been a net loss of wetland acreage, studies of the functions of wetlands before and after construction at both impact and mitigation sites are required to evaluate the net change in wetland functions.

Finally, we present recommendations concerning coordination with other agencies. Although the Water Board has responsibility for 401 permits, the entire process of regulating impacts to wetlands and waters of the United States is closely coordinated with other agencies, especially the U.S. Army Corps of Engineers and the California Department of Fish and Game. Improved information management might improve this coordination.

Compliance Monitoring

The results of this study clearly indicate the need to evaluate the compliance of mitigation projects with their permits. Thirteen of the 257 permits we located had to be excluded because of potential compliance issues. This indicates that up to 5% of the files we reviewed may have significant compliance problems (such as the impact occurring but no mitigation being undertaken). Our analysis of discrepancies between 401 permits and information in the permit files identified additional compliance issues. For example, 8% of the 143 files we evaluated had information indicating that the actual impacts were greater than authorized in the 401 permit; overall, there appeared to be compliance issues with **42%** of the files we evaluated. We found relatively high compliance with third-party mitigation requirements, but substantial lack of compliance with nearly every other category of permit conditions we assessed. Moreover, many of the categories we assessed had a high fraction of permits for which the conditions could not be assessed; for example, we could not assess monitoring and submission conditions for more than half of the permits.

These results indicate a definite need for compliance monitoring. Without a significant compliance effort, permittees are failing to comply with a wide range of permit conditions without the Water Board staff knowing about it.

Our data allow us to identify some areas that seem most likely to have low compliance. However, in our view it does not provide a very sharp focus. Compliance issues are spread quite broadly across all aspects of the 401 program, so compliance monitoring will also need to be spread quite broadly. The areas identified as having lower compliance might warrant a particular emphasis during compliance monitoring, but compliance was not so high for most other areas (with the possible exception of third-party mitigation conditions) that it would be safe to assume high compliance with them.

Although monitoring requirements were regularly included as 401 permit conditions, and evaluated for compliance when appropriate, the relative scarcity of monitoring reports in the permit files we reviewed suggest that compliance with the monitoring requirement is checked infrequently. Our compliance assessment indicated that conditions requiring mitigation monitoring were met only about 53% of the time; it was unclear whether any enforcement actions were undertaken in response to the absence of monitoring reports. While we were conducting our study for the Los Angeles Regional Board (Ambrose and Lee 2004), that region was compiling lists of permit files without monitoring reports and contacting permittees to obtain the reports. This seems like a relatively cost-effective area on which to focus compliance monitoring efforts.

We make two specific recommendations concerning compliance monitoring. First, we recommend that mitigation monitoring reports should be streamlined and focused around demonstrating compliance with an established list of permit conditions. Second, we recommend that regulatory agencies establish a multi-agency cooperative to monitor compliance and track wetland losses and mitigation success across the State.

Table AB 1. Summary of compliance scores based on 401 and mitigation plan evaluations including average scores and scores for the percentage of conditions met to 100% satisfaction. Successful included files with compliance scores greater than 75%, partially successful included files with scores between 25% and 75%, and failure included files with scores less than 25%.

	N	Score	Successful	Partially Successful	Failure
Average 401	124	84.3%	76%	20%	4%
Average 401 percent-met		73.3%	57%	40%	13%
Average mitigation-plan	81	80.7%	68%	32%	0%
Average mitigation plan percent-met		67.6%	48%	35%	6%

Table AB 2. Compliance breakdowns for 401 compliance grouped by compliance condition category (N=143 files). Condition scores that were not able to be determined were labeled ND, or Not Determinable.

Condition Code	Condition Category	401			
		Total # Conditions	Average # Conditions	Average # ND	Average Score
1	Third Party	58	1.5	0.1	99.3
2	Acreage	158	1.8	0.2	81.5
3	Site Implementation	411	6.0	2.7	84.8
4	Site Maintenance	49	1.6	0.8	76.0
5	Site Protection	66	1.5	0.6	81.3
6	Success & Performance Standards	199	3.9	1.5	76.4
7	Monitoring & Submission	254	3.6	2.0	59.5
8	Invocation of Other Agency Permits	126	1.7	1.1	N/A
9	Other	35	1.3	0.6	96.1
3 - 6	Site Implementation, Maintenance, Protection, Success/Performance Standards	725	3.2	1.4	79.6

Table AB 3. Permanent impacts and created mitigation acreage, including waters of U.S. and non waters of U.S., and wetland, non wetland waters.

	Permanent Impact	Created Acreage	Proportion Obtained	Net Acreage Gain	Gained/Loss Ratio
Overall Acreage	165.8	270.9	NA	105.1	1.6
Waters of U.S.	162.7	223.1	82.4	60.4	1.4
Non Waters of U.S.	3	47.8	17.6	44.8	NA
Waters of U.S.:					
Wetlands	106.3	146.7	66.4	40.4	1.4
Non Wetland Waters	54.9	74.2	33.6	19.3	1.4

Table AB 4. Permanent impacts and created mitigation acreage, including waters of U.S. and non waters of U.S., and wetland, non wetland waters.

	% Files w/Gains	% Files Gained=Lost	% Files w/Loss
Overall Acreage	41	20	39
Waters of U.S.	36	17	47
Non Waters of U.S.	24	76	1
Waters of U.S.:			
Wetlands	40	32	28
Non Wetland Waters	17	37	46

Table AB 5. Summary of administrative and regulatory recommendations.

	Improving mitigation requirements	Information management	Improve permit clarity	Assessment of "no net loss"	Coordination with other agencies
Permit conditions should ensure complete compensation for the full suite of wetland functions and services lost	X				
Ensure that mitigation projects compensate for losses in water quality (pollution) improvement services	X				
There should be a better accounting of the habitat types lost and gained	X				
Mitigation projects should have appropriate landscape context	X				
Offsite mitigation should be within the same catchment, or at least the same watershed	X				
Improvements to Database		X			
Improve permit archiving		X			
Improve tracking the progress of mitigation projects		X			
Important permit information should be clearly delineated in tables			X		
Permit conditions should be written so that the extent of efforts must match the intent of the condition to be in compliance			X		
Every mitigation plan and permit should include a table of requirements upon which compliance will be judged			X		
Permits should be clear about the meaning of enhancement, restoration and creation			X		
Performance standards should be clear about the goal of invasive species control			X		
Proof of inundation or saturation appropriate for wetland development should be required for mitigation wetlands			X		
Pre- and post-construction functional assessments of impact and mitigation sites should be required				X	
Improve incorporation of final permit information into Water Board files					X
Consider developing an integrated permit					X

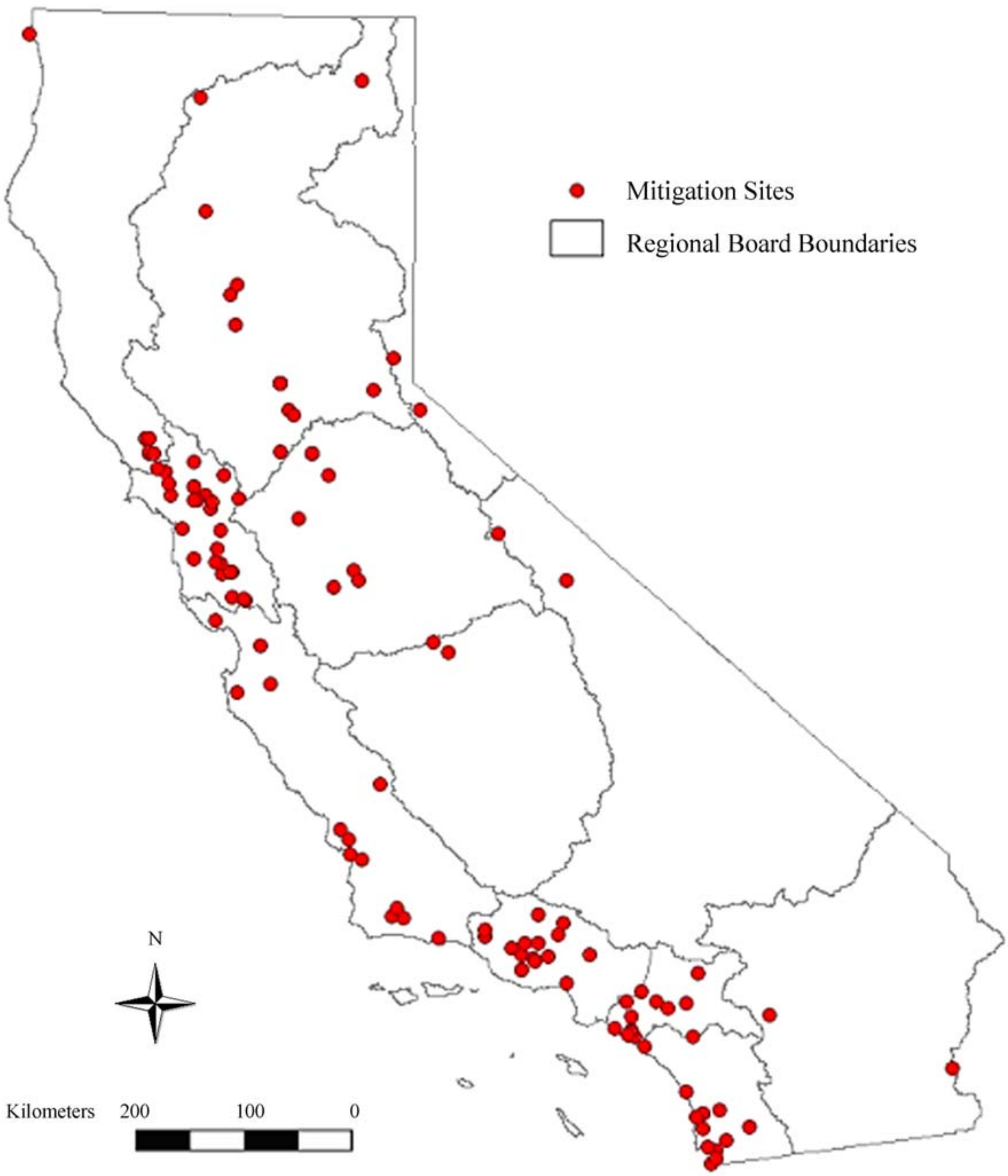

Figure AB 1. Statewide distribution of the assessed mitigation sites associated with the 143 permit files. Several of these sites, especially those in the central valley (Region 5) involved a collection of shared mitigation banks which resulted in fewer than 143 mitigation sites. Points represent each assessed mitigation site rather than multiple sites per file.

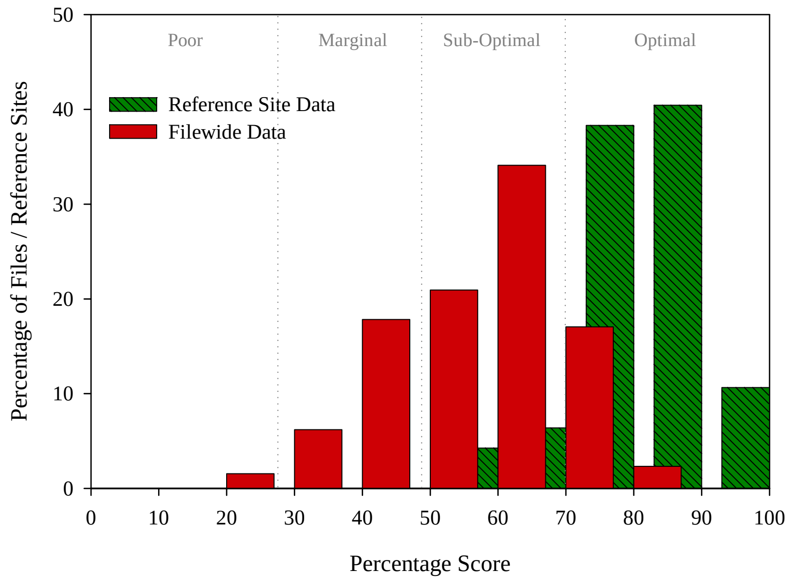

Figure AB 2. All CRAM data combined into a single overall wetland condition success score for each of the 129 files and 47 reference sites evaluated using CRAM.

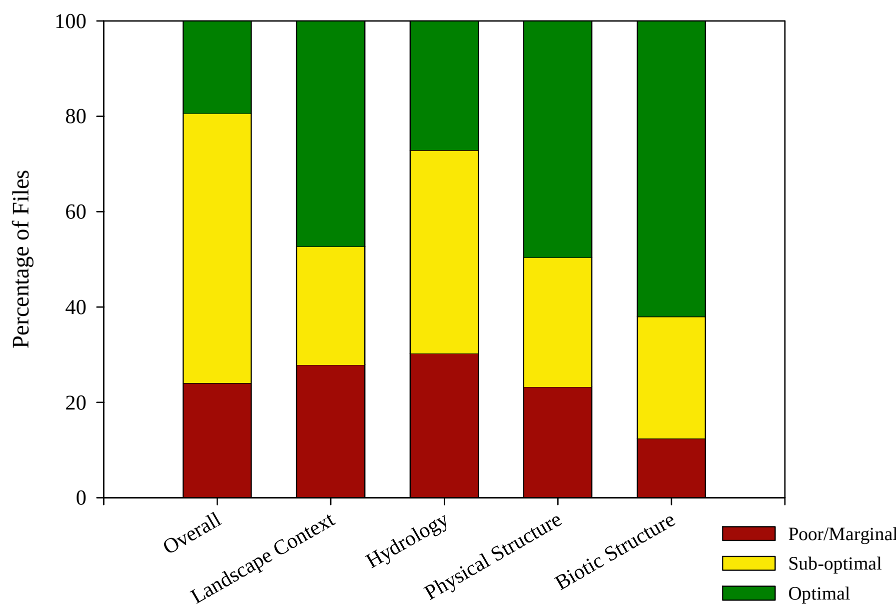

Figure AB 3. Percentage of files in CRAM success categories for overall CRAM scores and the four main attributes. For overall CRAM scores, optimal was considered 70 to 100 percent, sub-optimal was 49 to 70 percent (lower and upper bounds not inclusive), and marginal to poor was 28 percent and below. For buffer and landscape context, optimal was considered 74 to 100 percent, sub-optimal at 52 to 74 percent and marginal to poor 52 percent and below. For hydrology, optimal was considered 76 to 100 percent, sub-optimal at 53 to 76 percent and marginal to poor 53 percent and below. For physical structure, optimal was considered 53 to 100 percent, sub-optimal at 38 to 53 percent and marginal to poor 38 percent and below. For biotic structure, optimal was considered 47 to 100 percent, sub-optimal at 34 to 47 percent and marginal to poor 34 percent and below.

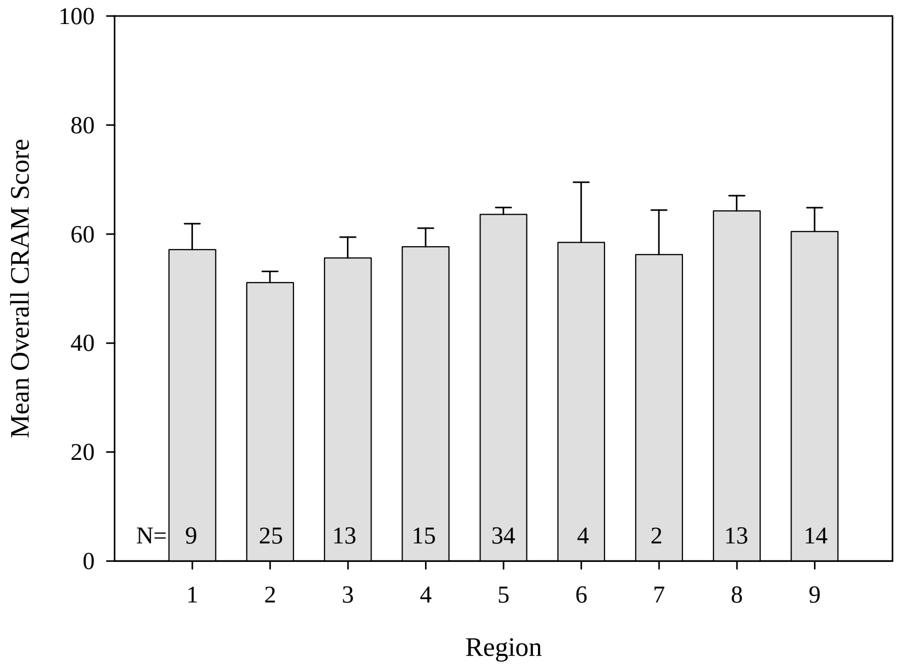

Figure AB 4. Filewide mean Total-CRAM percentage scores by State Board region (N=129 files).

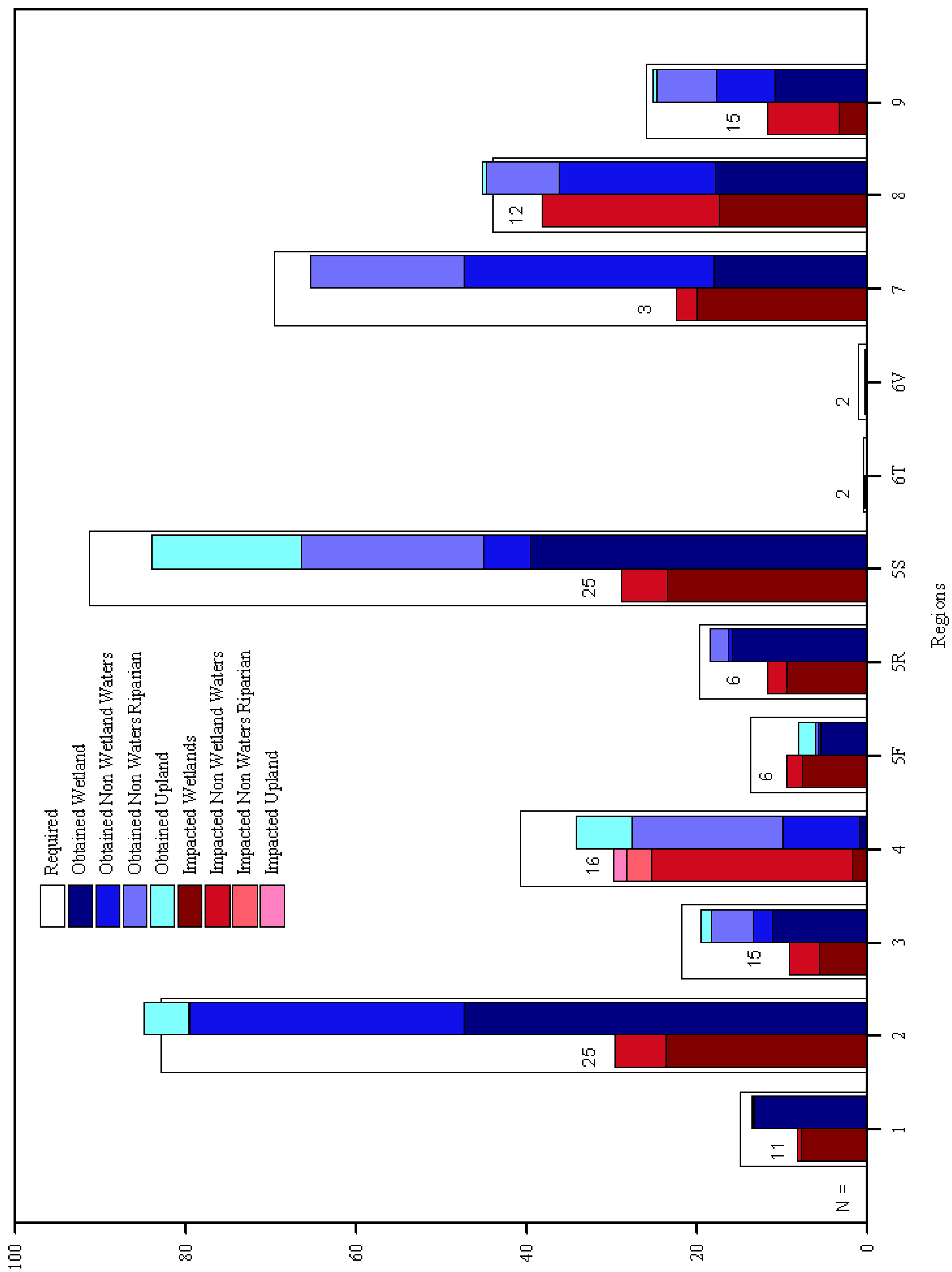

Figure AB 5. Total acreage impacted and obtained proportioned into Wetland, Non-Wetland Waters, Riparian and Upland jurisdictional habitats by state board region. Total required acreage per region is also displayed. N displayed = number of files assessed per region for both impacted and obtained. Total N=138 files (There are five files for which wetland acreage was not specified for waters of the US).

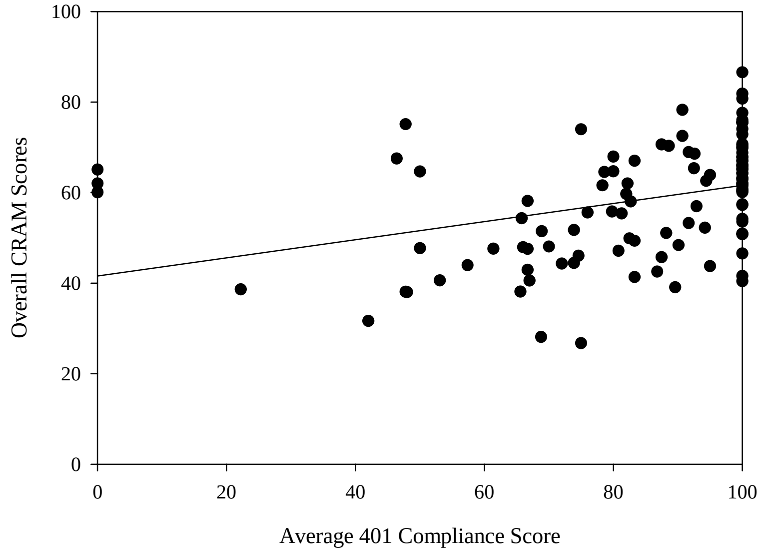

Figure AB 6. Correlation analysis between average 401 permit compliance score and overall filewide CRAM score (N= 110 files).

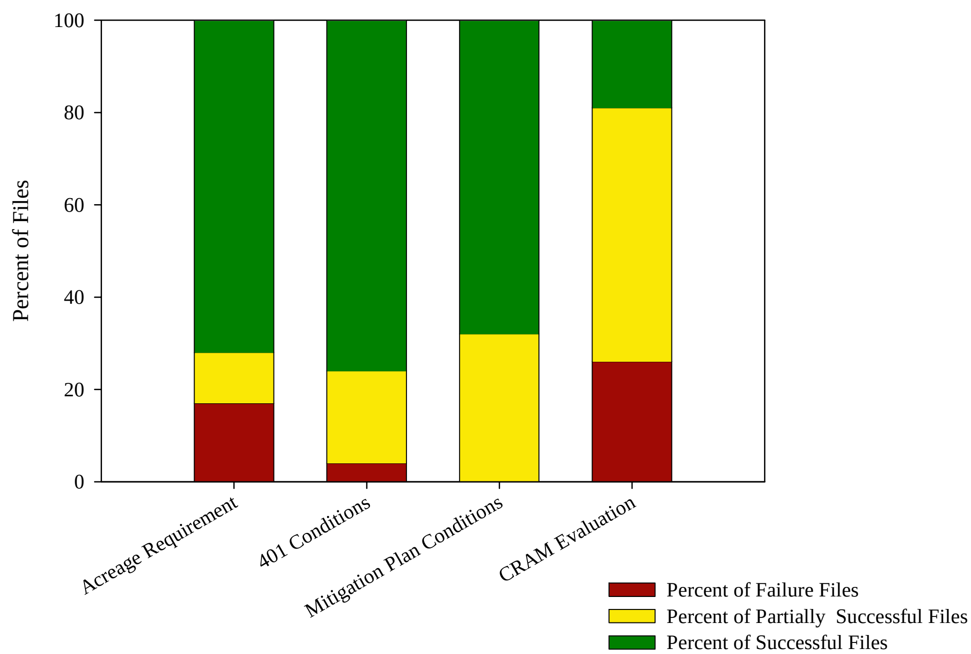

Figure AB 7. Mitigation success by permit file for each evaluation category: acreage requirement, 401 conditions, mitigation plan conditions, and wetland condition. Data shown for acreage and compliance are percentages out of a total number of 143 permit files. Wetland condition data are % of a total number of 129 files. For the acreage requirements, success was considered 100%, partial success was considered 75-100% (lower and upper bounds not inclusive), and failure was 75% and below. For the 401 and MP compliance evaluation, success was considered 75-100%, partial success was considered 25-75% (lower and upper bounds not inclusive), and failure was 25% and below. For the CRAM evaluation of wetland condition, success was considered 70-100%, partial success was 49-70% (lower and upper bounds not inclusive), and failure was 28% and below.

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1. Introduction

For about the last quarter century, the principle regulatory mechanism for the protection of wetland habitats has been Section 404 of the Clean Water Act (CWA). Every applicant for a 404 permit must also obtain state CWA Section 401 certification that the proposed discharge will not violate state water quality standards. In California the State Water Resources Control Board issues certifications for multi-Regional projects, and Regional Water Quality Control Boards issue certifications for projects entirely within their jurisdiction. In addition, if the work will involve impacts to a streambed, a Streambed Alteration Agreement must be obtained from the State Department of Fish and Game (DFG), and if there are threatened or endangered species issues, the US Fish and Wildlife Service and /or DFG may issue permits under the federal or State endangered species acts. Since about 1990, these regulatory agencies have pursued a State and National goal of "no net loss" of wetland acreage and function. Given this goal, any wetland losses that do occur must be offset through compensatory mitigation actions.[1] Within the regulatory framework, a strong emphasis has been placed on the avoidance and minimization of proposed impacts. However, the majority of CWA Section 404 proposals are ultimately approved (NRC 2001), making mitigation for permitted wetland impacts essential for the protection of wetland function.

1.1. Scope and Objectives

Recognizing the importance of compensatory mitigation in achieving "no net loss" and, more generally to assure compliance with regulatory mandates, the SWRCB contracted with the University of California, Los Angeles to conduct this study. The scope and objectives of the contract were:

> Beneficial uses of wetlands and riparian area in California have been heavily impacted by a variety of projects, with more than 90% of California's wetlands and riparian areas lost. California's *Wetland Conservation Policy* establishes a "no net loss – long term gain" goal for wetland quantity, quality, and permanence (Executive Order W-59-93). The main tool used by the State Water Resources Control (State Board) and the Regional Water Quality Control Boards (Regional Boards) to protect wetlands and riparian areas is the Clean Water Act (CWA) §401 Water Quality Certification (WQC) Program. Section 401 WQC is associated with CWA §404 permits issued by the US Army Corps of Engineers (USACE). A principal means to achieve the "no net loss" goal is the requirement for compensatory mitigation when unavoidable impacts to wetlands and riparian areas occur.
>
> Successful compensatory mitigation is technically complex, usually takes years to achieve, and can be expensive. Thus there is a real danger of failure, and a financial incentive for dischargers to avoid or minimize the necessary costs. These considerations argue for an effective compliance

[1] Compensatory mitigation is the creation, restoration, enhancement, or occasionally, preservation of wetland resources either onsite or offsite to offset permitted losses in wetland acreage and/or function.

mitigation program for compensatory mitigation projects. However, due to staffing constraints, the Regional Boards perform little or no such compliance monitoring. A second concern is that regulatory conditions, even if complied with, may not assure reestablishment of beneficial use quality or permanence. The National Academy of Sciences, in a 2001comprehensive review of wetland compensatory mitigation in the U.S. found that the national “no net loss” goal is not being met because (1) there is little monitoring of permit compliance, and (2) the permit conditions commonly used to establish mitigation success do not assure the establishment of wetland functions. The San Francisco Estuarine Institute and the Southern California Coastal Water, working with other concerned State and federal agencies, have developed a California Rapid Assessment Method (CRAM) for assessment of wetland condition. A third concern is that, because we have not integrated compliance monitoring into our routine regulatory practice, the State and Regional Board’s administrative and regulatory procedures may not adequately support effective and efficient compliance monitoring of compensation sites.

The objectives of this project are to: (1) determine project-specific and regional compliance with regulatory requirements, (2) assess wetland function and condition at the compensatory mitigation sites, (3) improve administrative and regulatory practice for establishing and monitoring conditions to regulate compensatory mitigation, and (4) determine the need for ongoing compliance monitoring.

Compensation sites in the North Coast, San Francisco Bay, Central Coast, Los Angeles, Central Valley, Lahontan, Santa Ana, Colorado Basin, and San Diego Regional Board jurisdictions will be considered for the study.

The purpose of this project was to evaluate the compliance and wetland condition of compensatory wetland mitigation projects associated with §401 Water Quality Certifications throughout California. This was done by selecting, reviewing and performing field evaluations for nearly 150 permit files distributed across the 12 Water Board regions and sub-regions of the State. For each permit file we assessed the extent to which permittees complied with their mitigation conditions, including acreage requirements, whether the corresponding mitigation efforts resulted in optimal wetland condition, and if the habitat acreages gained through compensatory mitigation adequately replaced those which were lost through the permitted impacts.

The Water Boards’ 401 Program was established in 1990. During the period from which permits were evaluated (1991-2002) and continuing to the present, the 401 Program has evolved. A major change was the adoption of new Program regulations, which became effective on June 24, 2000. The new regulations specified the information to be included in an application for certification, eliminated the possibility of waiving certification, identified standard conditions to be included in all certifications, and generally systematized the processing of applications. In addition, regulatory practice has evolved as field staff have acquired experience with the Program. This study presents analysis of data representing historical practice over the study period.

1.2. Previous Studies

Wetland mitigation has been the focus of many critical studies (see Race 1985, Zentner 1988, Kentula *et al.* 1992, Holland and Kentula 1992, DeWeese and Gould 1994, Miller 1995, Mitsch and Wilson 1996, Zedler 1996, Race and Fonseca 1996, Gilman 1998, Breaux and Serefiddin 1999, Gwin *et al*. 1999, Ambrose 2000, Brown and Veneman 2001, Kelly 2001). In 2001, a panel convened by the National Academy of Sciences completed a comprehensive review of compensatory wetland mitigation in the U.S. (NRC 2001).

The work reported here follows from a number of previous studies focusing on Section 404 permits. Mary Kentula and her colleagues have conducted a series of studies exploring the effectiveness of Section 404 permitting in the United States (Kentula et al. 1992, Holland and Kentula 1992, Sifneos et al. 1992a, 1992b), including California. These studies relied solely on office reviews of permit files. In general, these studies have reported that Section 404 permits have not prevented the continued loss of wetland habitat in the U.S. However, office reviews of permit files are necessarily limited to the intent rather than actual implementation of mitigation. To remedy this limitation, a number of studies have assessed actual compliance with permit conditions in the field (see NRC 2001). In California, for example, DeWeese and Gould (1994) found 50% of the projects evaluated achieved at least 75% compliance with stated permit conditions, while Allen and Feddema (1996) identified a compliance rate of 67% in Southern California. Several studies have suggested that increased enforcement of mitigation permits would improve compliance with permit conditions (Holland and Kentula 1992, Sifneos et al. 1992a, DeWeese and Gould 1994).

A few studies have gone beyond compliance assessment to evaluate ecological condition or functions of mitigation sites. The NRC report summarizes 11 of these studies. The most relevant for our work was conducted by Mark Sudol in southern California (Sudol 1996, Sudol and Ambrose 2002). Sudol reviewed Section 404 and Section 10 permits for Orange County and conducted field assessments of each mitigation site to evaluate its compliance with permit conditions as well as how well the wetland performed certain functions (as indicated by the Hydrogeomorphic Assessment Methodology (Brinson 1993)). Sudol found 18% of the mitigation sites complied fully with their permit conditions, but that none of the sites had appropriate levels of wetland function. The joining of an office review of permits with field assessments of permit compliance and wetland function/condition is a powerful combination (Sudol and Ambrose 2002), and provided the model for the approach adopted in this study.

Most of these previous studies have focused on mitigation success solely with respect to the Section 404 permit conditions, without considering the contributions of other agencies involved in the greater regulatory process. In particular, few have investigated the successes and failures of mitigation projects with respect to the permit conditions of the Section 401 Water Quality Certification orders. Breaux et al. (2005) studied mitigation success for 20 projects near San Francisco Bay which had been regulated under the 401 and 404 programs by the local Regional Water Quality Control Board and Corps district, respectively. They found that most projects were in compliance with their permit conditions and were realizing their intended habitat functions. They reported increased habitat functional success at larger sites and argued that regulators should favor regionally integrated mitigation banks because of their improved benefits to wildlife. In a similar study commissioned by the Los Angeles Regional Water Quality Control Board, Ambrose and Lee (2004) investigated this issue within the Los Angeles/Ventura area by evaluating the mitigation projects associated with approximately 55 Section 401 permits issued by that Regional Water Board. For those projects, they found that the assessable 401 permit conditions were mostly being complied with, yet very few mitigation projects could be considered optimally functioning wetlands. About half of the total mitigation acreage consisted of drier riparian and upland habitats that were outside of jurisdictional waters of the United States; about two-thirds of the projects did not fully replace the functions lost, and, thus, “no net loss” was not being achieved. The present study would help determine if the findings of Ambrose and Lee (2004) are unique to the Los Angeles/Ventura Region, or if they reflect mitigation success statewide.

2. Background

2.1. Definitions and Characteristics

Definitions of wetlands and riparian areas vary widely among different groups and for different purposes. A recent NRC panel defined a wetland as below, based not on regulatory requirements but a consensus of wetland scientists; this definition provides context for the important benefits that wetland ecosystems provide:

> An ecosystem that depends on constant or recurrent, shallow inundation or saturation at or near the surface of the substrate, and the presence of physical, chemical, and biological features reflective of that regime, such as hydric soils and hydrophytic vegetation (adapted from NRC 1995).

In general, wetlands are characterized by the presence of biophysical gradients between aquatic and terrestrial habitats and include freshwater marshes, tidal salt marshes, riverine floodplains, riparian wetlands, mangroves, and several types of depressional wetlands. These can be grouped into estuarine (tidal salt marshes), riverine (floodplains and riparian areas), lacustrine (lake affiliated), or palustrine (freshwater marshes and bogs) wetlands. The biological communities present at the various wetlands can take many forms, but one of their predominant characteristics is the presence of hydrophilic (water-loving) vegetation.

While the preceding characterization of wetlands reflects an ecological perspective, more restrictive definitions are used for regulatory purposes, with the specific definition depending on the regulatory agency. Of most relevance for this study, wetlands as defined by the U.S. Army Corps of Engineers (USACE) must generally meet a three-parameter test, having appropriate hydrology, hydric soils, and wetland vegetation. According to the USACE, wetlands are defined as:

> those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

(More discussion of jurisdictional habitats under the Clean Water Act is given later; see page 25) Many of the activities requiring Section 401 and 404 permits also affect habitat adjacent to jurisdictional wetlands, including non-wetland riparian habitats. Although non-wetland riparian habitat is regulated under the California Department of Fish and Game's Streambed Alteration agreements, it is outside the jurisdiction of the Corps of Engineers and the Regional Water Quality Control Boards.

Riparian habitats are defined in a non-regulatory sense as those areas that are transitional between terrestrial and aquatic ecosystems and are distinguished by gradients in biophysical conditions, ecological processes, and biota (NRC 2002). They are areas through which surface and subsurface hydrology connect waterbodies with their adjacent uplands (NRC 2002). Riparian areas include those areas that are adjacent to perennial, intermittent, and ephemeral streams, lakes, or estuarine-marine shorelines. These habitats often line the margins or banks of streams and lakes and are characterized by the presence of low-growing hydrophytic herbs, shrubs, and tall woody trees. Much of the difference in the regulatory versus ecological definitions of wetlands that we have encountered in this study relates to variations in the definition of riparian areas.

2.2. Functions and Services

Human activities have encroached on wetlands and river systems. Vast, low-lying riverine floodplains and coastal wetlands have been key targets for human development because of the relative ease of reclamation and because of their associated fertile soils. These complex drainage systems have often been reduced to straightened channels with tall constructed banks or levees, designed to contain high flood waters. In addition, isolated wetlands have commonly been drained and filled, or converted to livestock watering areas. The result of these impacts has been the diminishment of the beneficial services that these wetland habitats provide (NRC 1995; NRC 2001; NRC 2002; Leibowitz 2003), and humans are now beginning to recognize the consequences of their loss. As a result, much of the focus of concern about the loss of wetland habitats revolves around the loss of functions and services they provide.

The functions and services[2] that wetlands and riparian areas provide fall into three broad categories: hydrology and sediment dynamics, biogeochemistry and nutrient cycling, and habitat and food web support. Each wetland type performs characteristic functions; no particular wetland performs all possible functions. A brief description of wetland functions and services follows; this is a simple overview and not a detailed catalog of all functions and services performed by wetlands.

[2] "Functions" refers to natural processes occurring in wetlands; "services" refers to processes or attributes of wetlands that are useful to humans.

2.2.1. Hydrologic Functions

Water flowing along the surface of the earth naturally flows downhill towards lower areas of the terrain and begins to accumulate in rills, rivulets, streams, and ultimately river channels as it makes its way to the ocean. Water infiltrating into the earth will also flow down-gradient through the interstitial spaces in the soil or rock, eventually emerging back at the surface in topographically lower areas. These areas where the ground water table emerges are commonly adjacent to or within stream channels. The hydraulic connectivity between precipitation source areas and re-emergence areas results in increased groundwater contributions to streams following storm events, though there is usually a modest time lag and great modulation of flow. The combined flow from overland runoff and emerging groundwater following a storm event results in a pulsed stream discharge pattern with peak flood levels occurring some time after the point of maximum precipitation. Sediment is also a significant proportion of storm runoff as soil eroded from adjacent hillsides enters the stream along with the storm water (Knighton 1998). The destructive force of the storm flow reaches the maximum at the peak of discharge, and these peak flows are what human management strategies have tried to accommodate through the construction of tall levees and often-straight concrete channels. The general philosophy has been to move the water to the ocean as fast as possible, to minimize flooding during peak flows.

But the natural geomorphology of river channels has developed to accommodate these peak flows with appropriately wide floodplains and adjacent wetlands, which serve to modulate high water flow through the short term storage of water and sediment (Knighton 1998). During high flow events, water flows over the banks of the natural channel and spreads out over floodplains, where the velocity is reduced and the sediment settles out. Water percolates into soils and sediments within floodplains and riparian areas, where it is stored until the flow recedes. Then the water slowly flows back out during periods of low flow, helping to maintain baseflow conditions during the dry season. Isolated depressional wetlands collect some of the water that would otherwise flow directly to the stream, thus contributing to the moderation of storm flow and the recharge of ground water. In addition, the vegetation that occurs on floodplains and in riparian zones provides mechanical flow reduction and energy dissipation of high flow, and riparian trees, shrubs, and grasses contribute to the stabilization of the stream banks. Often, the absence of riparian vegetation on the banks can lead the destabilization of the banks and their subsequent erosion and incision, though the presence of riparian trees may contribute to bank erosion in other circumstances (Lyons et al. 2000).

2.2.2. Biogeochemical Functions

Biogeochemical functions in wetlands and riparian areas include the retention and removal of substances from the water, sediment accumulation, and nutrient cycling, among others. All of these result in the overall maintenance of water quality. For example, a riparian buffer zone located between an agricultural area and a stream channel can absorb much of the nutrients leaching from a nearby agricultural field through either surface flow or through the groundwater (NRC 2002). These nutrients can become adsorbed by hydric riparian soils or may be assimilated by riparian vegetation, thus minimizing their transport to the stream. In many agricultural areas, the absence of a riparian buffer may result in direct inputs of nutrients to the stream, in which case instream wetland conditions become very important with respect to improving water quality. Many biogeochemical reactions are redox dependent. That is, certain reactions occur in the presence of oxygen while others require the absence of oxygen. Many of the beneficial reactions that contribute to the improvement of water quality require the absence of oxygen and are common in anaerobic wetland soils.

2.2.3. Ecological Functions

Wetlands are extremely important habitats for migratory birds, which use them for resting and feeding areas as they travel from place to place or for breeding. Wetlands and riparian areas are also important to many other species of plants and animals, including threatened and endangered species, and can be areas of notably high biodiversity. For example, riparian habitats in the Santa Monica Mountains cover less than 1% of the land area yet are the primary habitat for 20% of the higher plant species (Rundel 2002). In today’s heavily fragmented landscape, riparian areas can be extremely important corridors for the movement of animals. Many isolated wetlands that become dry during part of the year means cannot support fish species, making them important habitats for reptiles and amphibians that would otherwise be preyed upon by fish (Gibbons 2003). Further, riparian trees and other vegetation perform important shading functions, providing significant thermal regulation for the community by keeping water and air temperatures cool during warm dry periods.

2.3. The Protection of Wetlands

When Europeans first arrived in North America, the vast amount of dense woodland and wetland habitat constituted substantial impediments to the settlement of the land (Hawke 1989). Throughout most of our nation’s history, the federal government actively encouraged the conversion of wetlands for useful purposes and for disease abatement, as evidenced by legislation such as the Federal Swamp Land Act of 1850, which promoted their conversion to agricultural land (NRC 1995). The notion that wetlands perform functions or services that can be beneficial to the greater human society has only taken root within the last several decades. Among the suite of landmark environmental laws passed in late 1960’s and early 1970’s was the Clean Water Act, which had the ambitious goal “to protect the physical, chemical and biological integrity of the nation’s waters” (NRC 2001).

While the main focus of the Clean Water Act was to prevent water pollution, some aspects of this law extended protection to wetlands, and these remain the most important federal protections for wetlands today. Wetland protections came primarily under Section 404 of the CWA, in which the U.S. Army Corps of Engineers was made responsible for regulating the discharge of dredged or fill material into “waters of the United States,” including wetlands, under the general oversight of the EPA. Under CWA Section 404, restoration and creation practices were to be employed to compensate for impacts to wetlands. Wetlands are often located wholly or partially on privately owned land. This aspect of wetland regulations have made them some of the most contentious elements of environmental law to date (NRC 1995), and the resulting protection of wetland habitat has fallen short of the goals set forth in the Clean Water Act (NRC 2001).

By the mid 1980's, wetland declines had resulted in approximately 117 million acres of wetland had been lost nationwide, about half the original amount (NRC 1995). In California, declines were much more severe with losses estimated to be about 90%.(Dahl 1990) Recognizing this problem, and given the refined understanding of the importance of wetland functions, the EPA called for a National Wetlands Policy Forum in 1987 and asked the participants to make national policy suggestions for the future of wetland protection. The central recommendation of the panel was to create a policy of "no net loss" of remaining wetlands which would be emphasized in the Corps' Section 404 permitting program. In 1990, the first Bush administration adopted this policy of no net loss. Later that year the Corps and EPA produced a guidance document that instructed regulatory personnel how to implement compensatory mitigation requirements (see below) within their 404 permit program such that "no net loss" would be achieved (NRC 2001). The implementation of this policy goal, along with a stronger emphasis on compensatory mitigation practices to offset wetland losses, took effect in 1991.

2.4. Clean Water Act Section 404

Section 404 of the Clean Water Act prohibits the discharge of dredged or fill material such as sand or soil into waters of the United States, unless a permit is issued under the regulatory authority of the U.S. Army Corps of Engineers. The great majority of permit applications are ultimately approved (NRC 2001). While some projects must be evaluated and permitted on an individual basis, others may fall into more general categories, such as bank stabilization or the maintenance of bridge over-crossings. Numerous regional or nationwide permit categories are available for such projects, which can help to streamline the approval process. In all cases, the Corps personnel must follow a standard three-step sequence in their decision making process. They must first determine if different strategies could be employed in which all or some of the proposed impacts might be avoided or minimized. Given the national goal of "no net loss," any remaining impacts must be compensated for by creating, restoring, or preserving wetlands or waters in another location (NRC 2001). This is termed *compensatory mitigation*.

With respect to compensatory mitigation, agency guidance documents and regulatory personnel have traditionally preferred nearby, in-kind mitigation to offset losses. However, recognizing the shortcomings of some permittee-responsible mitigation, some regulators have begun favoring the use of alternative third-party strategies such as *mitigation banks* and *in-lieu fee programs* where mitigation is likely to be off-site (NRC 2001).

Mitigation banks are sites where a large restoration, creation, or enhancement project, is undertaken to provide compensatory mitigation in advance of projects that will create wetland losses.[3] Credits from these projects can be used to offset losses (debits) permitted under Section 404 on an acreage basis. Mitigation banks may be established by entities that anticipate having large numbers of future permit applications, or by third parties that wish to sell their credits for a profit. Although there is a formal process for

[3] Of course, there are many variations on this general description, a common variant being allowing credits from a mitigation bank before it is completed and demonstrated to be successful.

establishing mitigation banks, some of the mitigation banks used by permittees with a large number of permits are only informal banks, having never been established through the formal process but nonetheless being used by the permittee and regulatory agencies as a bank. In-lieu fees are payments made to natural resource management entities for implementation of either specific or general wetland development projects.[4] Mitigation banks have the benefit of avoiding temporal losses of wetland habitat that occur between the time the actual loss occurs at the impact site and the point where complete function is restored at the mitigation site. In-lieu fee programs may or may not avoid temporal losses. Both of these third-party approaches have the potential to restore large areas of relatively high quality contiguous wetland habitat that may be better situated in a landscape context than individual mitigation projects, being placed in proximity to existing functional wetland habitat. However, banks and in-lieu fees often result in off-site mitigation, with potential negative effects due to spatial shifts in habitat distributions and loss of wetlands within some regions. In addition, the values wetlands provide often are dependent upon their location in the landscape, such as their position relative to one another, to adjacent waters, and to the human population that would benefit from the services provided (Brow and Lant 1999).

Most often, the amount of mitigation required is not a simple one-acre mitigated for one-acre lost ratio (NRC 2001). The additional acreage is intended to account for temporal losses and incomplete replacement of function. Therefore, mitigation ratios of 2:1, 3:1, or greater are sometimes required.

Before a 404 permit can be issued, the applicant must also obtain: (1) A *state water quality certification* required under CWA Section 401, which, in California, is administered by the State Water Resources Control Board and its nine Regional Water Boards.[5] This document certifies that the project will not adversely impact water quality, or if it does, those impacts will be mitigated. (2) A California Department of Fish and Game (DFG) *streambed alteration agreement*, which ensures that a project does not adversely impact the local fish and wildlife, or if it does, those impacts are mitigated. These mitigation requirements are distinct from those required by the Corps. Once all approvals are either met or waived, the Corps can issue the 404 permit.

2.5. Assessing mitigation success

After a permit is issued, monitoring of the mitigation site is almost always required; however, there is generally little regulatory follow up evaluating what happened at either the impact site or the mitigation site. This is, in part, because there are so few regulatory staff and so many permit applications (NRC 2001). Mitigation reports typically are required to be submitted by the permittee throughout the five-year certification period, but it is not clear how often this is done or how often regulatory staff review them. In addition, record keeping has been identified as an impediment to

[4] In the past, in-lieu fees were not necessarily restricted to natural resource management, and as a result became a controversial form of mitigation.
[5] The administration and implementation of CWA Section 401 varies from state to state; California is among those states with more developed 401 programs.

assessing mitigation practices, with incomplete files and inadequate database tracking systems being a common regulatory problem (NRC 2001, Ambrose and Lee 2004).

Few determinations of the regulatory success of compensatory mitigation projects occurred during the first decade of their existence (NRC 2001). Determining mitigation compliance can be difficult. Assessing permit compliance entails an initial permit review and site visit to determine if the project was undertaken, if the actual acreage matched what was proposed, and if the specified performance standards were met. In planning and executing a compensatory mitigation project, the permittee's focus usually is to satisfy permit conditions. As long as the permittee can demonstrate that the performance standards set forth in the permit have been met, their obligations have been fulfilled. As yet, aspects of wetland function have not been adequately incorporated in performance standards (NRC 2001, Ambrose and Lee 2004), in part because of the legal difficulties in assigning specific targets for function (NRC 2001). Some performance standards that have been developed are intended to be proxies for function, but given the challenges of measuring functions directly, assessments of hydrological, biogeochemical, and ecological function have remained elusive.

Data reported by the Army Corps of Engineers indicate that the goal of "no net loss," as measured by acreage shifts, is not only being met but is being exceeded. According to the Corps, from 1993 through 2000, approximately 24,000 acres of wetland losses were permitted, while 42,000 acres were created through compensatory mitigation (NRC 2001). Thus an average mitigation ratio of 1.8:1 was achieved. However, these statements of mitigation success and the achievement of no net loss were based solely on the acreage of mitigation *required in the permits*, not on field evaluations of wetland acreage or function present at mitigation sites. In addition, they may have not included existing acreage of wetlands at mitigation sites. Furthermore, they have not addressed functions provided at mitigation sites. One recent study that employed functional assessment methods to evaluate the success of the Section 404 permitting program, conservatively estimated that only 55% of mitigation sites met permit conditions, while only 16% of the sites could be considered successful in terms of function (Sudol and Ambrose 2002). Another study, Ambrose and Lee (2004), found that the majority of mitigation projects met their mitigation acreage requirements and most were in compliance with permit requirements overall, yet few (4%) resulted in optimally functioning wetlands and, with respect to a structured qualitative assessment of the beneficial services lost versus those gained through the mitigation project, 66% failed to achieve "no net loss." These data suggest that the success of the Clean Water Act and the "no net loss" policy has not succeeded in preserving our nation's remaining wetlands. It is impossible, however, to determine the extent of wetland losses that would have occurred in the absence of the Section 404 program.

3. Methods

3.1. Project Management

This statewide study was conducted by two research groups: a University of California, Los Angeles (UCLA) research group consisting of Dr. Richard Ambrose (principle investigator), two full-time research technicians, three shorter-term technicians, and one graduate student/project coordinator (Steven Lee), and a University of San Francisco (USF) research group consisting of Dr. John Callaway (principle investigator), three graduate student researchers working full-time and one shorter term technician.

The Principal Investigators maintained oversight over the entire project, including project conception and design and completing the final report. UCLA had primary responsibility for contract administration and project management, project coordination and management, the initial SWRCB database review, regional apportionment and selection of permit files for review, Freedom of Information Act (FOIA) coordination, and progress report generation. The permit review and field efforts for this project were roughly equally divided between the USF and UCLA groups, with USF responsible for the northern half of the state and UCLA the southern half. Considerable effort was spent ensuring consistency between USF and UCLA data collection procedures. Members of the UCLA group participated in the initial file review for the north-central portion of the State and joined the USF group for a number of their field reconnaissance visits and site evaluations, and a member of the USF group participated in some site evaluations conducted by UCLA. After the fieldwork was completed, UCLA was responsible for data management, data analysis and presentation, and producing the initial draft of the final report. UCLA carried out most of the QA/QC procedures and, after finding a range of data and consistency problems, helped the USF group resolve these issues. The USF group incorporated the site GPS coordinates into GIS base maps to create regional and statewide maps showing the distribution of our mitigation site assessments. In addition, the USF group completed an analysis of mitigation banks (see Appendix 9) and a supplemental assessment of wetland condition (the Wetland Ecological Assessment, or WEA) at a subset of their sites and carried out all analyses and reporting of those data (see Appendix 10).

3.2. Permit File Selection and Review

For this study, our goal was to evaluate the mitigation actions associated with at least 100 Section 401 permit files issued in California between 1991 and 2002. The projects were to be distributed across the 12 regions and sub-regions of the State Water Resources Control Board (SWRCB) in proportion to the total number of 401 permit actions issued within each region (Figure 1). For instance, if a particular region had issued 10% of the total statewide 401 permits in this timeframe, then 10% of our evaluations occurred in that region. The regional targets were exceeded for all regions except for Redding (5R) and Lake Tahoe (6T), for which we met the targets exactly. For those regions with small proportional targets (Region 7 and sub-Regions 5F, 6T, and 6V), we attempted to add more files to increase the sample sizes, but this only was achieved for sub-Region 5F.

Files were selected using the SWRCB's permit tracking database. We used the version dated October, 2004, obtained directly from the State Board. To ensure statistically reliable information, projects were chosen randomly from this database. Initially, we expected to select all projects based on the database fields that indicated compensatory mitigation was required. However, we discovered that the database did not reliably indicate a compensatory mitigation requirement for permits issued before 1998; for these files, a physical inspection of a large number of files at the State Board office was necessary in order to find the appropriate number of projects requiring mitigation. To account for the difference in information in the database as well as ensure an equal distribution between older and more recent permits, half of the projects were from 1991-1998 and half were from 1998-2002. The permit projects included in our study included 401 permits with explicit mitigation conditions as well as permits without conditions but with implicit or explicit requirements that the mitigation conditions of other regulatory agencies be followed. The permit projects were reviewed through multiple visits to the SWRCB, each of the three Army Corps of Engineers district offices (Los Angeles, San Francisco, and Sacramento), and various Regional Boards. There were many complications that had to be resolved in selecting files for this study; a full accounting of the selection process is provided in Appendix 1.

3.3. Office Review and Assessment

After the initial permit review at the Corps and/or Regional Board offices, the relevant file materials were photocopied and retained for further review and for reference during field visits. Prior to the field visit, each file was subjected to an extensive office review to verify that the project occurred, to gain a general understanding of both the project impact and the expected mitigation activities, and to extract all relevant permit conditions for the ensuing compliance evaluation. To this end, all available documentation was consulted, including any pre-project planning information, the 401 order, 404 permit, streambed alteration agreement, mitigation plan, monitoring reports, and any other information reflecting changes in the planned actions since the permits were issued. Often, correspondence with regulatory personnel, the permittee, the permittee’s consultant, or the in-lieu fee recipient was necessary to resolve site access issues, to determine if the impact or mitigation projects were undertaken, or to verify fee payments.

Office evaluations were a significant element of the condition assessment methodology (discussed below); the information gained from this evaluation improved the understanding of the landscape context of the site, including the surrounding land uses and the stressors associated with those land uses and helped to identify the boundaries of the assessment area. One important component of the office review was the acquisition of web based aerial photographs (http://terraserver.microsoft.com/), which provided landscape context and aided in the location of project sites.

As we performed the office reviews, some files were deemed un-assessable and were excluded from further study. Reasons for such exclusion varied but included confirmation that the impact and/or mitigation project never happened and denial of access to the project site.

3.4. Site Visits

Given the broad geographic scope of this statewide study, combined with the time limitation imposed by the contract and the protracted permit review process, logistics and efficiency were critical aspects of the field phase of the project. Early site visits and methodological refinements occurred close to the home bases of the two research groups; more distant sites were assessed later. Once the assessment procedures were established and the initial list of permit files was obtained, the project locations were marked on state and regional maps and organized into local or multi-day research trips based on the proximity and clustering of the sites. Next, seasonal and other factors were considered, and the trip clusters were prioritized and scheduled. In advance of a trip, the relevant files were reviewed, the permit conditions extracted, data forms were generated, access issues were anticipated and pursued, and other logistical arrangements were made.

Upon arrival at the general project area or the mitigation site location, we looked for evidence of mitigation activities such as plantings, irrigation systems or disturbed earth to confirm the presence of mitigation activities. The permit paperwork and aerial photographs were helpful in establishing the presence of the mitigation site and determining its boundaries. For each of the fully assessed files, a considerable amount of time was spent onsite deciphering the language of the permit file paperwork to understand the nature of the impacts, to identify all discrete mitigation projects involved, to identify and map the boundaries of those discrete projects. A site was considered onsite if it was on the same property as the impact, and this determination was relative to the scale of the greater project area. For a large development project, two mitigation actions located a kilometer or more apart could both be considered onsite, while the mitigation site for a small utility crossing might be considered offsite even if separated by just 100m.

Occasionally, we found that the impact project was currently under construction and the mitigation activities had not yet been initiated, or there was no evidence that the impact or mitigation project occurred. It was also common, especially with the newer permits, that the impact project had occurred, but the construction of the mitigation site was still under way. There were a few instances where the impact project had been completed, but we found no evidence that the required mitigation had occurred. In each of these cases, the file was excluded from further consideration in this study. A list of all such files with the reasons for exclusion has been provided separately to the SWRCB. In addition to these excluded permit files, there were 14 files for which compliance evaluations could be made, but where wetland condition evaluations were not performed either because of ambiguities inherent in the mitigation banking and/or in-lieu fee process or for logistical reasons. These files, provided in Appendix 2, are included in our compliance results but not the results of our condition evaluations. We refer to these 14 files as “compliance only” files, while files that were evaluated for permit compliance, acreage, and wetland condition (CRAM) are referred to as “fully assessed” files.

3.5. Acreage Determinations using GPS

The acreages of mitigation sites were determined by mapping the perimeter of each site. After initial site reconnaissance, we walked the site perimeter using a mapping grade GPS to establish the outline of the site. GPS data were collected with a Trimble Pro XR GPS receiver and a TSCE handheld interface. Many permits (70 of the 129 permit files we assessed) involved multiple mitigation sites. In these cases, we surveyed and evaluated the discrete mitigation sites separately.

Although simple in concept, the actual acreage determinations were complex. The reasons for this are varied. In many permits, there were ambiguities in the identification of mitigation habitat types and no site positioning information. The boundary between mitigation wetlands and adjacent existing wetlands was often not easily discerned. Many mitigation project sites blended together several different habitat types (e.g., wetlands, alluvial scrub, riparian areas, etc.). In addition, multiple mitigation strategies were often used (e.g., creation, restoration, enhancement, and preservation) and were difficult to distinguish. Even where site boundaries could be determined, they were usually not clearly delineated as they transitioned into the surrounding landscape. GPS coordinates of mitigation sites were almost never available in the permit files, and stakes, flags or other survey markers were seldom present. We attempted to be as accurate as possible in our surveys of site perimeters, but we erred toward overestimation rather than underestimation of site area. That is, we walked the widest boundary possible as determined by disturbed earth, irrigation systems or obvious vegetation plantings to provide a “best case” acreage estimate.

We were sometimes unable to determine even the approximate boundaries of a mitigation site. (See Section 6.2.1.7 for a recommendation to address this problem.) This was common for older sites and for re-vegetation projects in active channels or floodplains. When the evidence of mitigation activities was scant or absent, and when these activities blended into the surrounding landscape, it was not possible to delineate the perimeter of the project site. We attempted to confirm the general location of the mitigation site from evidence of mitigation activities at the expected site location and/or through information gleaned from the permit files. If it was possible to confirm a general location for the mitigation site, a single GPS point was taken to identify the approximate location of the site and our corresponding evaluations.

After field mapping, GPS data were downloaded to office computers and managed using Trimble’s Pathfinder Office Version 3.0 software. GPS data were differentially corrected (yielding sub-meter accuracy) using data collected from the base station provider nearest to the mitigation site, as determined by an automated internet search. The acreage values were obtained from the corrected files within Pathfinder Office. Occasionally small perimeter adjustments were made to these files or polygon fragments were added or subtracted using the measuring tool function in that program. Acreage values were recorded and compared to the permit requirements to determine acreage compliance. There may have been a number of discrete mitigation sites associated with a file, and there were mapped separately. However, permit requirements generally included only a single acreage requirement per file (or per habitat type), so we combined the acreages of separate mitigation sites to determine compliance.

In situations where the site perimeters were clear and unambiguous, we always reported our survey values as the obtained acreage. However, where the site perimeters were less clear, and especially where single GPS points were taken, a judgment had to be made to determine whether there was compliance with acreage requirements. In such cases, we considered all available information, including visible features of the site and information from the permit file such as acreage values reported in mitigation plans and monitoring reports, to judge whether the acreage requirement was met. Ultimately, a decision regarding acreage compliance was made for all files with acreage requirements. It should be noted that the target acreage outlined in the mitigation plan is intended to compensate for all agency requirements (including the Army Corps, and CA Dept. of Fish and Game), and often exceeds that required by the 401 permit alone.

For every file, a single representative GPS coordinate was selected and recorded in Pathfinder as the best description of the location of the mitigation sites (Appendix 4). Also included in this appendix is a compact disc containing all GPS-related computer files associated with this project.

3.6. Compliance Evaluations

In theory, permit compliance would be determined by considering each of the specific and general conditions listed in an agency's permit, assessing whether each condition had been met or not met, and then assigning an overall compliance score based on the percentage of conditions met. In practice, a third party assessment of permit compliance, especially one that attempts to follow the standard conventions of scientific rigor, is complicated by the idiosyncratic nature of regulatory permits.

Most of the conditions listed in 401 orders were administrative in nature or involved impact avoidance measures to be implemented during the construction phase of the impact and mitigation projects. This was especially true of the standard conditions that are often attached to the 401 order, but many of the special conditions fell into this category as well. Most of these conditions were impossible to assess in an after-the-fact review, such as the present study, because one would need to be present during the construction phase or have detailed post-construction compliance reports documenting how each condition had been satisfied. While compliance monitoring reports were often required, they were infrequently available.

Since the focus of this study was on the success of compensatory mitigation projects, the conditions we considered in our compliance evaluation were limited to those dictating the mitigation actions to be taken, any performance standards meant to ensure the success of the mitigation project, and any submission requirements for mitigation-related documents. The 401 permits we reviewed included relatively few conditions in these categories. The most commonly encountered were descriptions of the proposed mitigation actions and acreages, submission requirements, references to the mitigation plan or specific phraseology that the plan be followed, and conditions invoking the permit requirements of other regulatory agencies (e.g., the 404 permit issued by the U.S. Army Corps of Engineers, the Streambed Alteration Agreement issued by the California Department of Fish and Game (DFG), and occasionally, other agency requirements such as those specified in the U.S. Fish and Wildlife Service (FWS) Biological Opinion).

Our determinations of 401compliance included all mitigation conditions specifically outlined in the 401 permit order, plus any additional compliance goals or conditions found in the mitigation plan and other agency permits when the 401 permit included explicit statements requiring that those documents be followed. With respect to the mitigation plan, if the 401 permit contained a submission requirement or included language indicating that the plan had already been obtained and reviewed by the Regional Board prior to permit issuance, we considered it to be implied and enforceable that the plan be followed as a condition of the permit. We did not consider other agency requirements as implied and enforceable conditions of the 401 permit unless there was specific language mandating that those permits be followed. At the same time, we recognized that during the mitigation planning process, the permittee must consider all agency requirements (not just the 401), and that the mitigation plan represents a blending together of these conditions into a single project. Therefore, we completed a second compliance evaluation that considered how well the assessable goals and performance standards of the mitigation plan were met. In addition, in the field we assessed compliance with all agency conditions contained in the file, even for permits not explicitly invoked by the 401 order. Due to time limitations and the fact that these latter analyses were beyond the contractual scope of this project, they are not included in this report.

As part of our general office assessment, each permit file was subjected to a thorough review during which all appropriate mitigation requirements were extracted from the available paperwork. Beginning with the 401 order, each regulatory permit was carefully read to allow for a full understanding of the project requirements and to distinguish mitigation-related conditions from the other conditions of the permit. All relevant conditions were entered into a Microsoft Access database and tracked according to the source permit. Many of these conditions were entered verbatim, but it was often necessary to paraphrase or dissect the permit text because the permit requirements were written in an ambiguous fashion or not amenable to a direct assessment of compliance. (See Sections 6.3.2 and 6.3.3 for recommendations the deal with this issue.) For example, a single line-item condition including two or more discrete requirements that could not easily be assessed or scored together would be separated into assessable conditions. In other cases, long passages were condensed down to the essential compliance elements. All relevant mitigation-related conditions were entered, even conditions that would likely be un-assessable.

In addition to the regulatory permits, the mitigation plan, if present, was carefully read to extract the essential compliance elements. Though it may implicitly or explicitly be mandated that the mitigation plan be followed as a condition of the permit, there is no simple prescription for assessing mitigation plan compliance. Mitigation plans are not written as lists of assessable conditions; both permit-mandated and permittee-initiated objectives, actions, and success criteria are blended together and presented diffusely throughout the pages of the mitigation plan. (See Section 6.3.3 for a recommendation addressing this issue.) This complication required that we establish criteria for extracting discrete compliance elements from the mitigation plans. A full accounting of these conventions and lists of typical conditions extracted are presented in Appendix 6. All relevant objectives, actions, and success criteria taken from the mitigation plans were entered into our Access database and recorded as coming from the mitigation plan.

Prior to the field visit, lists of conditions by source were printed as data sheets and permit conditions were assessed for compliance though a combination of field and office assessments. There are at least two equally justifiable methods of assessing permit compliance. The first is to score each condition as either met or not met, and to calculate an overall compliance score as the percentage of conditions met. This approach is consistent with the regulatory perspective and has been used in other studies of mitigation compliance (Sudol 1996). The approach employed in this study departed from this met-not met perspective because we recognized that permittees may attempt to meet a particular condition even if they fall short of the success criterion needed to meet that condition to 100% satisfaction. In other words, a *not met* score does not allow the distinction between a permittee who obtained 95% of the required mitigation acreage and a permittee who made no mitigation attempts at all. Since our goal was to understand the critical factors influencing compliance success, we were interested in incorporating this distinction. Thus, we scored each condition as a percentage on a scale from 0% (no attempt to comply) to 100% (condition fully met).

In most cases, compliance was assessed within five scoring categories: 100%, 75%, 50%, 25%, and 0%. A 100% score was assigned if the condition had been clearly met or exceeded. The 75% scoring category was applied if the condition fell short of being fully met, but had been mostly met. If the condition was about half, or partially met, it received a 50% score. The 25% category was used if some level of compliance effort had been made, but the outcome fell far short of expectations, and the condition was mostly not met. Finally, a 0% score was assigned if there was clear evidence that the permittee made no effort to comply with the condition. These broad categories were used to distinguish different degrees of compliance with a particular condition but avoid difficulties that could arise from trying to distinguish between fine-scale categories (e.g., 85% versus 90% compliance).

For some conditions, the score could readily be calculated as a percentage relative to the desired outcome. For instance, if the target mitigation acreage was 0.75 acres but our surveys revealed that only 0.50 acres had been obtained, then the compliance score would be 67% (0.50/0.75). Acreage compliance was almost always calculated in this way. This approach was used for other variables that were continuous in nature (such as survivorship or percent cover), but only when our assessments could be made with a high degree of certainty. Otherwise, the condition was assessed using the above scoring categories.

In scoring compliance, we were careful to distinguish between compliance with the explicit verbiage of the condition and the ecological outcome that the condition was directed towards. For example, if a condition required that “non-natives be removed prior to planting,” then as long as we found evidence that this task was done, the condition would be assigned a high score, even if the site was currently dominated by non-natives. However, if the condition required that “non-natives be eradicated from the site,” then a site dominated by non-natives would yield a low score.

A large number of mitigation conditions could not be assessed because there was not enough evidence to confirm or deny that a required action had been taken. In such cases, we had no choice but to score the condition as “not determinable.” These conditions were not included in our analyses of overall compliance score. Many of these conditions could not be assessed because one would have had to be present during project implementation or have access to detailed information verifying compliance. For example, it is commonly required that any non-native species be removed prior to restoration, stripped or exposed areas be hydroseeded with native grasses, and mulch applied around plantings. Sites rarely contain evidence of such activities a few years after construction, so without photo-documentation or written verification, none of these conditions can be assessed in an after-the-fact review such as the present study. A full accounting of the compliance issues we experienced, along with our resolutions and scoring conventions, is provided in Appendix 6.

3.7. Evaluations of Wetland Condition

3.7.1. California Rapid Assessment Method (CRAM)

Permit compliance alone may not guarantee that mitigation actions result in ecologically functional wetlands or riparian habitats. To evaluate existing wetland condition, we performed the California Rapid Assessment Method (CRAM; Collins et al. 2005) at all assessable compensatory mitigation sites associated with our permit files. CRAM is a semi-quantitative method for the rapid assessment of wetland and riparian condition. The following excerpts from the CRAM 3.0 manual (Collins et al. 2005), with some paraphrasing, provides the basic conceptual framework of this methodology:

> The objectives of CRAM development are to provide a rapid, scientifically defensible, and repeatable [assessment of wetland condition] that can be used routinely in wetland monitoring and assessment programs, [notably in the] evaluation of wetland restoration project performance under the Coastal Zone Management Act, Section 1600-1607 of the California Fish and Game Code, Sections 401 and 404 of the Clean Water Act, and local government wetland regulations, [and in the] assessment of restoration or mitigation progress relative to ambient conditions, reference conditions, and expected ecological trajectories.
>
> The CRAM methodology consists of scoring wetlands of any of several different classes based on four attributes: hydrology, biotic structure, physical structure, and buffer/landscape context. Within each of these attributes are a number of metrics that address more specific aspects of wetland condition. Each of the metrics is assigned a score based on either narrative or schematic descriptions of condition, or thresholds across continuous, numerical values. Scores assigned are aggregated up to the level of attributes as well as into a single, overall score. In addition to assessing wetland condition, CRAM provides the practitioner with guidelines for the determining the types of stressors that may be affecting a given wetland, and may therefore help explain low condition scores.

During our previous study of mitigation success (Ambrose and Lee 2004), we used an earlier version of CRAM (CRAM Version 2.0; Collins et al. 2004) to evaluate wetland condition at mitigation sites in SWRCB Region 4 (Los Angeles/Ventura). At the time of that study, CRAM was in an intermediate stage of development and some aspects of the method had not been resolved. We made a number of modifications to that version of CRAM to improve its utility for evaluating mitigation wetland sites, many of which were subsequently incorporated into CRAM. By the beginning of the present study, a new draft version of CRAM was available and ready for field calibration. Early in the project, the UCLA and USF research groups participated a calibration meeting that included several field tests of the revised method. Issues identified during that calibration meeting were incorporated into the new version (Version 3.0, Collins et al. 2005), which was distributed to the CRAM calibration teams for further field testing. As we entered the fieldwork phase of this study, we began using CRAM 3.0 in our site evaluations. During the course of this study, a few additional modifications were proposed by members of the CRAM development team and an unofficial revision of CRAM (termed Version 3.5) was implemented. We adopted the proposed modifications and incorporated them into our remaining site evaluations; we also rescored all previous evaluations to ensure consistency among all mitigation site assessments.

Despite changes to CRAM incorporated after our study for Regional Board 4, the delineation of the assessment area still required modification or adaptation. CRAM was designed to evaluate complete wetland systems, including larger estuarine or depressional wetland complexes or for riverine sites, the entire riparian zone consisting of the stream channel and the vegetation along both banks. However, mitigation sites are rarely complete wetland systems. For example, it was very common for riparian mitigation projects to occur outside the active channel and to involve plantings along only a single bank, or within an area above the bank that previously was upland habitat. While CRAM has rules for establishing the limits of the assessment area (including the appropriate reach length and the lateral limits of the riparian zone), our assessment areas had to conform to the boundaries of the mitigation sites. Thus, if the mitigation efforts occurred on a single bank, most of our ecological evaluations (such as plant cover) would be limited to that bank area alone. However, several aspects of the riverine CRAM evaluation were dependent upon the characteristics of the main stream channel. Specifically, the assessment criteria for all three hydrology metrics (water source, hydroperiod, and upland connection), two of the abiotic structure metrics (abiotic patch richness and topographic complexity), and two of the biotic structure metrics (biotic patch richness, and interspersion and zonation) were focused on channel and floodplain characteristics. If CRAM was applied strictly, assessment areas that did not include the stream channel would always score poorly for those metrics. Consistent with the approach used by Ambrose and Lee (2004), the convention we adopted was to consider the channel as part of the assessment area for these metrics, provided that the mitigation site was in direct proximity to, and hydrologically connected with, the stream channel. As a result, mitigation sites or portions of sites that occurred higher on the banks, and were clearly not wetlands, received relatively high scores for these metrics. While this may have inflated the CRAM scores for some mitigation sites, we adopted this convention to allow mitigation sites adjacent to a stream channel to be assessed as part of the entire riverine system, even if the mitigation action did not alter the channel. Mitigation sites not directly associated with a channel, such as “riparian” plantings in upland areas above and beyond the banks, were not scored based on a (distant) channel; such sites were given the lowest scores for channel-dependent metrics. Aside from this convention for including channel characteristics in the evaluation of riparian sites, all other aspects of CRAM related solely to the actual site of the mitigation actions.

For every file, we determined whether the permit requirements resulted in one or more mitigation projects that could be assessed appropriately using CRAM through our permit review, site reconnaissance, and compliance investigations. Restoration, creation, and enhancement projects that were post-construction and for which the initial vegetation efforts had been made were evaluated using CRAM. As a convention, we did not perform CRAM at any wetland preservation or conservation sites because there was no mitigation *action* to assess. Such files were evaluated for compliance only (e.g., payment of fees).

When a permit file contained a single discrete mitigation site, a single CRAM evaluation was made. Many files, however, included two or more distinct sites involving fundamentally different habitats or mitigation strategies. For example, the mitigation requirements of a given file might include a depressional wetland creation project and a riparian restoration project, or the file might include two separate “riparian” sites, one of which involved the reconfiguration and planting of a stream bank while the other involved “riparian” plantings in a separate location that was beyond the stream banks in an upland area. As another example, a file might involve mitigation bank payments for both tidal wetland and seasonal wetland credits. Separate CRAM evaluations were done for each of these distinct mitigation sites.

When an individual mitigation site was small and homogeneous, we assessed the entire site with a single CRAM evaluation. If the site was larger and more complex but a central location appeared to be representative of the entire site, we performed a single CRAM evaluation in the central location. However, there were many mitigation sites that were so large and/or complex that we needed to perform two or more CRAM evaluations in different locations in order to characterize the entire site. Decisions about how to subsample were dictated by the physical and biological features of the sites. For example, if a site consisted of a series of excavated wetland depressions occurring diffusely throughout the site or in groupings across the general mitigation project area, we would assign numbers to each of the depressions and randomly select two or more individual sites to evaluate. Alternatively, we would break the site into like groupings and randomly subsample one depression per grouping. As another example, for a long and complex stream/riparian system that was too extensive to integrate into a single CRAM evaluation, we might perform three separate evaluations, one at each end and one in the middle of the reach. Often, up to five or more evaluations were performed for a single mitigation site. In all cases where multiple CRAM assessments were made for a single mitigation site, the CRAM scores were averaged to arrive at a single CRAM per site.

One change that occurred between the earlier version of CRAM used in Ambrose and Lee (2004) and CRAM 3.0 was an increased emphasis on assessing the vegetation community at the site. The greater level of detail required for the identification of individual plant species and determining the relative percent cover for each of those species added considerable time to the field evaluations, demanded increased expertise regarding the statewide flora, and created numerous complications in the assessment of the percent invasive plant species, and native plant species richness metrics. The consistent identification of plants to a given taxonomic level was problematic for such a large study. In general, we tried to identify all plants to the species level, but for some individuals, we were only able to reach the genus or family level. During our field visits across the state, the diversity of flora encountered often required that we photograph or collect plant samples so they could be later identified and/or categorized. Cover estimates for those unidentified individuals were made in the field, however. Grasses were particularly challenging in this regard. As with other plants, we attempted to identify grasses to the species or genus level, but given the great morphological and ontogenetic variability of grasses, this task often exceeded our collective expertise. As such, we commonly combined individuals of questionable division into a generic "grass spp." category, or where individual species could be discerned, they were arbitrarily named (e.g. grass sp. 1; grass sp. 2, etc.). These grasses were categorized as native or non-native, given the best information available to us regarding the local flora.

We also had to adapt CRAM guidelines for the timing and seasonality of assessments. CRAM was designed to be performed during the growing season, which for different wetland types in different locations might occur at different times of the year. However, the timing of this project required that our field evaluations be made during the summer and early fall of 2005, when many annual plants had already senesced for the season. To reduce the effect of this off-season sampling, we departed from the written CRAM methodology and included senesced annual plants in our cover estimates. Such individuals were identified to species where possible, any unidentified individuals were combined into larger unidentified categories according to our best judgment of native/non-native status, and cover estimates were made. Although we tried to identify all species that would have been included if the site had been assessed during the growing season, some herbaceous plants undoubtedly had decomposed or were unrecognizable at the time of our site evaluations.

As indicated earlier, Ambrose and Lee (2004) modified the previous version of CRAM by superimposing a numerical scale over the CRAM letter grades and developing algorithms for combining metric scores into scores for each of the four attributes plus a Total-CRAM score for the entire file. For CRAM 3.0, the CRAM development team opted against the 1-12 scoring scale used by Ambrose and Lee (2004) and adopted a modified system of letter grading instead. This system allowed for the application of "+" and "–" designations to add refinement to the existing letter grades. For most metrics, which are scored on an A-D scale, this system is analogous to the 1-12 scale. However, a few of the CRAM metrics are limited to an A-C scale and one has been expanded to an A-E scale. The CRAM developers intend that these letter grades be combined into a single CRAM score, but a convention for doing so has not yet been developed. For our site evaluations, we followed the new protocol and scored the CRAM metrics as letter grades, adding + or – designations as appropriate. Once all CRAM data were finalized, entered and checked for quality control, we converted these letter grades to numerical scores for analysis. The majority of the metrics, which were on a D- through A+ range, were converted using a corresponding 1-12 scale. Metrics with a C- through A+ scale were converted using a 1-9 scale, and E- through A+ metrics were converted using a 1-15 scale. Details regarding our conversion conventions are provided in Appendix 7. To normalize these scores so they could be combined, the scores were converted to percentages (e.g. 9/12 = 75%) so that all metric scores would be on the consistent 0-100% scale.

CRAM scores were combined in three stages. First, a single score was determined for each metric. For mitigation sites with a single CRAM, no further adjustments were needed. For CRAM evaluations that were subsamples for a large or complex mitigation site, a mean metric score was calculated by averaging each of the separate metric scores. For example, if three depressional wetlands were randomly selected and assessed within a larger complex of depressions, then these would be averaged together at the metric level in order to arrive at a single set of CRAM scores for that mitigation site.

Next, the individual metric scores were combined to arrive at a single CRAM score for the mitigation site. To do this, the metrics were first combined by attribute (e.g. buffer/landscape context and hydrology) and then into a single CRAM score fore each mitigation site. For the hydrology and physical structure attributes, the metric scores were treated as equal and independent, so they were simply averaged. The buffer/landscape context and biotic structure metrics were more complicated and were treated differently. For biotic structure, the two plant community metrics (percent invasive plant species and native plant species richness) were clearly related to one another (high non-natives usually meant low natives). Therefore, before averaging with the rest of the biotic structure metrics, a geometric mean was calculated for these two scores. Within the landscape context category, the percent of the assessment area with buffer and the average width of buffer metrics jointly determined the general buffer extent, and these in combination with buffer condition, reflected the overall buffer quality. To clarify this point, it is possible to have a very high quality buffer that is adjacent to just a small portion of a site. Conversely, most of a site may have extensive buffer areas that are of very low quality. To account for the complex relationship among these three metrics, we first took the geometric mean of the percent of assessment area with buffer and the average width of buffer metrics to determine general buffer extent, then took the geometric mean of this result and buffer condition. Once we determined this overall buffer score, it was averaged with the remaining landscape context metric, connectivity, to determine the landscape context category score. The four attribute scores were averaged to obtain an overall Total-CRAM score.

Finally, a single CRAM score was calculated for each permit file. For files with a single mitigation site, the final CRAM score for the file was the same as the score for the site. For files with multiple mitigation sites, a final CRAM score was calculated using a weighted average of the scores for the individual mitigation sites. The individual CRAM scores were weighted by the area of the mitigation site. Weighting the CRAM scores by acreage prevented a small mitigation site from having a disproportionate effect on the score for the file. For example, if a file had a very small wetland creation site that received a high CRAM score and a very large wetland restoration site that received a marginal CRAM score, a simple average of these two CRAM scores would not reflect the combined wetland condition because of scale differences between the component sites. To account for this, we multiplied the individual CRAM scores by the proportional acreage of each mitigation site.

Determining the acreages for each mitigation site required a careful review of the permit files, which we accomplished after all sites had been assessed. There was no simple procedure for making the acreage determinations since the permit files are complex and each poses a unique set of circumstances concerning the component site acreages. In some cases these acreages were taken from our GPS data, sometimes they were obtained from the permit file paperwork, and sometimes both sources of information were used. As an example, suppose a file involved 1.0 acre of onsite riparian enhancement and a payment for 0.25 acres of vernal pool creation credits at a 10-acre mitigation bank. We might have used the GPS to delineate the boundaries of the riparian site and measured an area of 0.95 acres. We considered how confident we were in our GPS surveys before deciding whether to apply the expected or the measured acreage. If there was a very clear perimeter to the site and we had good satellite coverage, we would use the measured value; otherwise, we would use the expected value from the permit paperwork. For the mitigation bank, even if we had done a series of CRAM evaluations at the mitigation bank to represent the 10 acre site, and these were later combined for a single score for that site, we would still use only the 0.25 acres of credit for our acreage proportions because that was the fraction of the entire site that related to the permit file. Had we applied the expected riparian acreage from the permit file, then the total file acreage would be 1.25 acres, which would yield acreage proportions of 0.8 and 0.2 to be multiplied by the respective riparian and vernal pool CRAM scores. Using a similar procedure, we established the acreages associated with every mitigation site, which were then used to weight the CRAM scores for each mitigation site in order to calculate a single CRAM value for each permit file.

3.7.2. Reference Sites

As part of CRAM development, CRAM was to be calibrated through extensive sampling of a range of wetlands within each wetland class, including high quality reference sites. Without some calibration of wetlands in optimal condition, the appropriate target for judging mitigation sites was not clear. Performing CRAM at reference sites and viewing the resulting distribution of scores would help define the appropriate target range for mitigation success. Unfortunately, the CRAM calibration effort had not yet been done before our field assessments had to be completed; it was scheduled to take place concurrently with this project. In our previous mitigation study, Ambrose and Lee (2004) assigned numerical cutoffs for optimal, sub-optimal, marginal, and poor wetland function/condition based on the quartiles of the scoring scale and on the findings of Sudol (1996), who established similar numerical limits through the use of the Hydrogeomorphic Method (HGM) at reference sites. To provide a sound foundation for evaluating mitigation sites in this study, we performed CRAM at a series of reference sites distributed throughout the state.

In general, we took an opportunistic approach to finding reference sites, sampling reference sites that were close to mitigation sites as time allowed. Discussion with local agency staff, environmental consultants, or private citizens were helpful in identifying potential reference sites, but we also consulted maps or aerial photographs and conducted internet searches to identify wetland sites in preserves or other open space areas of limited human influence. We sought reference sites that reflected the best attainable conditions for the various wetland classes in a particular region. We explicitly did not search out the best possible wetland sites in the state; although this would be useful for CRAM calibration, they would not necessarily be the best standard for comparing to mitigation sites. For this study, we wanted to use reference sites of comparable condition to natural wetlands in the area (and, presumably, similar to the conditions of the wetland sites that were impacted). Thus, our sites were relatively unimpacted by human activities compared to other wetlands in a region, but were not pristine. We generally avoided wetlands with distinct development in the watershed, but some reference sites certainly had been influenced by human activities. For example, in the southern Central Valley, there is essentially no portion of the lower valley floor that has not been modified in some way by human activities, yet this is where most of the permitted impacts occur and where most mitigation sites are located. With respect to vernal pools, there are relatively pristine sites occurring on the higher table lands of the western Sierra Nevada Mountains, but these are fundamentally different from the vernal pools being impacted and mitigated on the valley floor and so would not have been appropriate for comparing to vernal pools on the valley floor.

The UCLA group sampled 22 reference sites throughout the state, including 5 high gradient riverine, 11 low gradient riverine, 2 lacustrine, 2 vernal pool, 1 depressional, and 1 seep/spring wetland (Table 1). Three of these sites were in northern California, but most occurred in the southern half of the State. The USF group planned to sample a similar number of reference sites in the northern half of the State, but they were unable to do so because of time limitations. To provide data for reference sites in the northern half of the state, we used data from the CRAM calibration teams, who had completed their calibration field work by the end of the field season. Their calibration trials involved just two wetland classes: estuarine and riverine. The CRAM calibration evaluations were done for a wide range of wetland conditions, from high quality sites to lower quality sites. To select appropriate reference sites from this data set, we used the qualitative assessments of overall wetland condition made by the calibration teams to select sites that were relatively unimpacted by human activities. The CRAM calibration teams provided us with data for 7 estuarine sites and 18 riverine sites (Table 1), resulting in a total sample of 47 reference CRAM evaluations (Figure 2). All reference CRAM data were incorporated into our Access database, subjected to standard QA/QC procedures, and analyzed for comparison with our mitigation site data.

3.7.3. Wetland Ecological Assessment

In our previous mitigation study for SWRCB Region 4, Ambrose and Lee (2004) performed an alternative condition assessment methodology called the Wetland Ecological Assessment (WEA), developed by Breaux and Martindale (2003) to assess mitigation sites in Region 2. We performed a separate WEA assessment for every mitigation site evaluated in Region 4 to compare to the CRAM assessments. We found a strong correlation between the WEA scores and the corresponding CRAM scores, with WEA yielding slightly higher condition scores. In the present study, we decided not to repeat a WEA/CRAM comparison for the southern California sites, but the USF group performed WEA at their sites in northern California. The WEA evaluation is presented in Appendix 10.

3.8. Mitigation Habitats Analysis

Evaluating wetland condition at compensatory mitigation sites through CRAM provides some measure of mitigation success. However, taken alone, these assessments do not indicate whether the mitigation actions resulted in “no net loss” of wetland acreage and function. In order to understand “no net loss” of wetland function, one would need to perform an assessment at the mitigation site before and after the mitigation actions were made to understand the true functional *gains*, and before/after evaluations of the impact site would be necessary to understand any functional *losses*. Indeed while some mitigation projects convert upland habitats to wetlands, most mitigation actions are undertaken at locations that already include some wetland acreage and exhibit some degree of wetland function. Clearly, before/after evaluations of wetland function are not possible in a study like this because the projects have already occurred.

In our previous study of mitigation success, Ambrose and Lee (2004) investigated this “no net loss” question by performing qualitative assessments of the beneficial wetland services gained through mitigation activities, compared to what was lost through project impacts. We were unable to perform similar assessment in the present study. However, we were able to expand another aspect of the Ambrose and Lee (2004) study, the jurisdictional habitats evaluation, which allowed us to investigate “no net loss” with respect to individual types of wetland habitat.

3.8.1. Jurisdictional Habitat Assessment

While wetland delineations at proposed impact sites are a required step in the permit process, there is seldom a requirement that similar wetland delineations be performed at mitigation sites to ensure that adequate acreage of jurisdictional habitat is created, restored, or enhanced. (For a definition of these terms, see Section 6.3.4.) Performing full legal wetland delineations at mitigations sites was beyond the scope of this contract. However, at each mitigation site we made a qualitative assessment of the approximate proportions of jurisdictional and non-jurisdictional habitat types that would have been recorded had such wetland delineations been made. In this assessment, the first distinction we made was between that portion of the site that was within the ordinary high water mark of the water body, including adjacent wetlands (federal waters), and the remaining portion of the site. The “non-waters” area was apportioned into riparian habitats and upland habitats. The “waters of the US” area was apportioned into wetland habitats and non-wetland waters. These jurisdictional habitat categories are listed in a hierarchical fashion in (Table 2).

Our wetland estimates did not conform exactly to the three parameter test (hydrology, hydric soils, and hydrophytic vegetation) because for younger sites, we factored in the potential for future development of soils and plants, provided that the hydrology was appropriate. Therefore, our data likely represent a slight to moderate overestimate of jurisdictional wetland habitat, since some of these sites might not develop hydric soils. In many cases, the established site vegetation was used to delineate wetland perimeters. However, for other sites with more sparse vegetation, site topography and hydrological indicators aided our boundary determinations.

In both 401 and 404 permits, non-wetland waters are often, but inconsistently, described in more specific categorizations such as “streambed,” “open water streambed,” “unvegetated streambed” and “vegetated streambed” habitats, but are sometimes simply referred to by some other description such as “riparian waters.” We followed this same approach in subdividing the non-wetland waters category, but in a hierarchical way that would enable grouping in an unambiguous way. Non-wetland waters categorized as “other” were almost exclusively those riparian waters habitats that were within the ordinary high water mark of the water body, but beyond the channel or adjacent wetlands. The clearest definition of “riparian” specifies those areas “…adjacent to perennial, intermittent, and ephemeral streams, lakes, and estuarine-marine shorelines” (NRC 2002). But in regular use, and in the permit files, there is substantial ambiguity in the application of “riparian,” with reported impacts to riparian waters that may or may not include the channel itself. This ambiguity makes it difficult for us to compare our riparian waters category to those from the permit files.

3.8.2. Habitat Acreage Analysis

Many of the 401 permits that we analyzed were issued early in the regulatory process, before aspects of impact and mitigation planning were finalized. As we carried out the early phases of this project, we noticed that the impact acreage and mitigation requirements reflected in the 401 orders frequently did not agree with the impact, required, and obtained acreage that ultimately occurred through project implementation. This lack of agreement would be manifested in the SWRCB database as well, since those data are derived from the information in the 401 orders. To determine the extent of this difference between the 401 order and actual implementation, we conducted a formal comparison.

After all the fieldwork was completed, we performed another review of all “fully assessed” and “compliance only” files to extract the most accurate information available regarding acreage losses and gains. We considered all relevant information, including all regulatory permits, the mitigation plan, monitoring reports, correspondence reflecting planning adjustments, and the dates of all such documents. The final acreages for project impacts, permit requirements, and the “obtained” acreage values determined through our study were recorded. For the impact acreage data, permanent versus temporary impacts were distinguished. In addition, acreage data were further categorized into their respective jurisdictional habitat categories (see Table 2) to analyze the individual habitat types lost versus gained. As with the more general information mentioned above, the impact and required data were obtained through our acreage analysis permit review, and the values for each habitat type were classified as permanent or temporary impacts. The “obtained” acreage data for the site were either taken from the permit files or from our GPS surveys, depending upon which values were deemed the most accurate. As mentioned earlier, when the site perimeters were clear and unambiguous, the data from our GPS surveys would be used, but when the exact perimeter of the site could not be delineated, judgments were necessary to decide whether to accept the acreage value reported in the permit files. Once the appropriate mitigation site acreage value was determined, it was sub-divided into its component habitats multiplying it by the jurisdictional habitat proportion values from our jurisdictional habitat assessment. These data were further divided into created versus enhanced acreage to distinguish acreage *gains* from habitat enhancements.

3.9. Digital Photographs

Digital photographs were taken at all of the mitigation sites. Our objective in taking these photos was to capture the essential features of the site at the time of our site visit. In many cases, only a few photos were necessary to accomplish this, while many photos were needed at other sites. It was difficult to cover some sites adequately because of the sheer size or complexity of the site. In addition to the general site photos, close up pictures of individual plants were taken for the purposes of subsequent identification, or for other reasons. The digital images were organized within computer folders labeled with the appropriate file identification number. All digital images are provided in Appendix 13 of this report, on DVD media.

3.10. Data Management and Analysis

All permit review, compliance, CRAM, and supplemental data were entered into a series of Microsoft Access databases developed for this project. The UCLA and USF groups maintained separate databases for their respective files, and these were later combined into a single version. The CRAM data were entered into a database obtained from the CRAM developers to ensure that the results of this study could feed back into the ongoing CRAM development process. As indicated earlier, CRAM version 3.0 was used, but with certain interim modifications implemented by the CRAM development team (unofficially termed version 3.5). Data extracted from queries of the Access databases were typically imported into Microsoft Excel for processing, graphed using SigmaPlot, and statistical analyses performed in Systat v.11.

Most of the data analysis procedures have already been discussed in earlier portions of this Methods section. In general, the data in this report are organized and analyzed in two distinct ways: (1) by file, and (2) by individual mitigation site. As stated earlier, a number of permit files consisted of two or more discrete mitigation sites that could not appropriately be combined into a single evaluation. Thus, separate functional evaluations and habitat analyses were made for each of these sites to yield a total sample of 204 individual mitigation site evaluations for the 129 assessable permit files included in our study. Individual CRAM scores were combined into a single overall Total-CRAM score by factoring the proportional acreage of each respective mitigation site. The permit requirements transcended these individual mitigation actions, and thus, a single compliance evaluation was performed per file. Where necessary, the CRAM and "habitat" results are presented by mitigation site with a sample size of n=204. In other cases, such as comparisons between CRAM and compliance, they are given by file with a sample size of n=129. While the compliance date were collected exclusively by file, but in certain analyses, they are combined with the "compliance only" files (where no CRAM evaluation could be conducted but compliance could be assessed) with the larger sample size of n=143.

3.11. Quality Assurance/Quality Control

The quality assurance and quality control (QA/QC) measures required for this project were uniquely complex. This was mainly due to the interface between our needs regarding scientific rigor and objectivity and the inherently non-scientific regulatory practices we are studying. While several previous studies have investigated wetland mitigation success, the geographic scope and multi-agency aspects of this study were without precedent, and much of our methodology had to be developed and adaptively managed as the project progressed. Timing limitations were a factor here since we had just a single field season to implement what was originally conceived as a three year study. Given the extensive decisions and interpretations that were required in this study, splitting the effort between the UCLA and USF research groups compounded the QA/QC challenges. For many ecological studies, the QA/QC procedures simply involve checking for mathematical and data entry mistakes by reviewing 10% or so of the data sheets and calculations. For this project, the QA/QC procedures spanned the entire effort, from the earliest aspects of our permit review to data analysis. Many of these procedures have already been discussed in the above portions of this Methods section, but several more specific aspects of our QA/QC are provided here.

Throughout the permit file selection process, we developed and refined a series of rules and conventions for determining which files to pursue and which to consider outside the scope of this mitigation study. After our list of prospective files was generated, we went back through the original source list to ensure consistency. After all files were reviewed and categorized, we made sure that our conventions for excluding files were consistent. Several files ended up being excluded because of an incorrect interpretation of the permit file paperwork.

The task of extracting the relevant mitigation compliance requirements from a permit file was exceedingly complex and difficult to standardize. While the permits usually follow a standard format, most permit conditions are not clearly delineated but are mentioned diffusely throughout the text of the permits, mitigation plans and other documents. Our rules and conventions for extracting these requirements evolved considerably throughout the course of the study. After the initial lists of conditions were developed and entered into the database, they were modified repeatedly as each permit file was subjected to subsequent reviews. In some cases, conditions that had been included were removed when we determined they were really procedural in nature or had to do with minimizing impacts during project implementation. In other cases, relevant conditions were added after they were missed in an earlier review, sometimes because they were in obscure portions of the file paperwork. Many permit conditions that were extracted verbatim were later divided when we determined they involved two or more distinct assessable conditions. The rules for scoring the permit conditions were also developed and refined throughout the course of this study and many site evaluations had been completed before the methods were finalized. Later in the project, after all data were collected, every condition of every file was reconsidered to ensure a consistent scoring approach.

Despite attempts in CRAM development to reduce decision-making in the field and to improve scientific defensibility, there remained instances where differences in interpretation could lead to differences in data collection. Our previous experience with CRAM (Ambrose and Lee 2004) helped reduce these interpretation and decision-making issues substantially, as did the early field trials with members of the CRAM development team. After all the CRAM data were collected, we went back through all of the data sheets for every file to ensure that we had followed a consistent approach in all the evaluations. Numerous changes were made through this process, most in relation to the vegetation data and for the physical and biotic patch types. The plant community data are particularly noteworthy, as many species identification and consolidation issues were resolved through this process. For example, it was mentioned earlier that grasses and senesced annual plants presented unique challenges in our CRAM assessments. Through our QA/QC of the CRAM data, we discovered that the UCLA and USF groups diverged in their approaches to these issues and in their level of taxonomic resolution. The UCLA group had taken a more general approach to grass identification and had not included senesced annual plants in their evaluation. To maintain consistency, they went back through their data sheets and used site photos and other information to increase their resolution regarding grasses and senesced annual plants. The current version of CRAM included a provision that + or - modifiers be added to each of the letter grades; however, no rules for this procedure had been developed. After all other CRAM issues were resolved, we revisited our scoring decisions for every metric of every file to ensure that these grade modifiers were applied consistently.

The outcome of the CRAM evaluation was profoundly influenced by the correct interpretation of the assessment area. As discussed earlier, the CRAM methodology was designed to assess complete wetland systems, and conventions had to be established regarding the application of CRAM for the evaluation of discrete mitigation sites. A considerable amount of time was spent ensuring that our project researchers understood these conventions. After the field season, the habitat acreage analysis forced us to go back through every file to carefully consider the actual acreage losses and gains that occurred through project implementation. One objective of this analysis was to assign a proportional acreage value to each CRAM evaluation within a particular file. During this procedure, numerous inconsistencies were discovered in the way our established CRAM conventions were applied. For example, a particular mitigation action might have involved restorative plantings on or above the stream banks, yet the channel itself was included in the assessment area. Alternatively, the CRAM evaluation for this project may have involved the correct mitigation site assessment area, but a second CRAM evaluation was done just for the channel. As we reconsidered these issues for every permit file, several changes were made, ranging from simple data adjustments to entire permit files being moved from the “fully assessed” category to the “compliance only” category or being excluded altogether.

Measures were also taken to ensure that the data for our habitats analysis were consistent throughout. Understanding how to apportion a particular mitigation site into its component habitat types required some understanding of regulatory jurisdictions and wetland delineation. Fortunately, at least one member from each research group had taken a course in wetland delineation and we had intensive internal discussions regarding the jurisdictional framework of the regulatory agencies. Yet during the habitat acreage analysis that we performed after the field season, several inconsistencies were discovered in these jurisdictional habitat data. While some of these errors were related to the apportioning of individual habitat elements, most were caused by the same misinterpretations of assessment area that beset our CRAM evaluations. One consistent misinterpretation of particular relevance to this habitat assessment was the restricting of the assessment area to the *wetland* portion of the site. As a hypothetical example, if the permit requirements and mitigation planning documents indicated that a 1-acre wetland site would be created, then our assessments should include the mapped boundaries of that 1-acre creation site, even if only one half of that area was actually wetland. While the purpose of the jurisdictional habitat assessment was to address this specific issue, many sites had been erroneously delineated as 100% wetland, even though the entire 1-acre site had been mapped. As we went back through every file to review the CRAM assessment area issues, we also resolved these jurisdictional habitat inconsistencies and then carried out the remaining portions of the habitat acreage analyses.

After the field data collection phase was complete, the paper data sheets were scrutinized by the field team to ensure that all information was filled in correctly, consistently and legibly. Any calculated values (e.g., acreage or percentage calculations) were double-checked with a calculator, and then the data were entered. In order to reduce human error during data entry, the CRAM Access database was designed to only allow data entry in the appropriate format specific to that data table. For example, one electronic CRAM data form only allows the entry of letter grades A, B, C, D, etc. when entering data into this form. Each research group entered the data for their respective field evaluations.

Once all data were entered, all computer files were double-checked against the paper data sheets to ensure that no errors occurred. Initially, 10% of the files were randomly selected and all data from those files were reviewed for completeness and accuracy in data entry. Through this process, enough errors were detected to warrant checking 100% of the files. This involved checking the data in our Access database both visually and using queries to ensure that there were no duplicate entries, blanks, or improper values (e.g., data that were out of the allowed range), and that data were completely entered into all relevant tables. These QA/QC procedures extended beyond our Access database and included a thorough review of all data relating to our GPS surveys. The GPS data were treated separately from the remainder of the field data and were not included in the Access database. The QA/QC measures taken with respect to the GPS data include ensuring adequate satellite geometry, maintaining a PDOP value around 2.00, differentially correcting the data using the nearest base station provider, and keeping a record of all base stations used in the differential correction of all files. In the end, every datum from every field form was double-checked against the databases, and all mistakes discovered were corrected. We are confident that the resulting dataset is free from significant data management errors.

As mentioned above, ensuring consistency between the UCLA and USF research groups was challenging. Early in this project, both teams participated in a CRAM calibration meeting that involved field testing of the method to ensure user consistency. Then, to ensure that both groups were employing a consistent approach, a member of the USF team joined the UCLA group for the first round of mitigation site field visits, and the project coordinator from UCLA later joined the USF group for two separate weeks of field work at northern California sites. Extensive phone and email correspondence also helped in this regard. After the field season, both groups were responsible for the QA/QC of their respective permit files. Then, after the majority of the QA/QC procedures were completed, members of the UCLA group traveled to USF to help them finalize their remaining data tasks. During that visit, enough data errors and inconsistencies in approach were discovered to warrant a second round of QA/QC procedures between groups. Through this process, every USF file was subjected to a thorough re-review, which involved rechecking all aspects of the data for consistency, including the permit review, permit compliance, CRAM, habitat acreage analysis, and GPS data. Once all data modifications were complete, they were re-entered into the computer databases and all relevant files were checked one last time to make sure that every datum was correct.

4. Results

This section presents results for the four principal components of the study: (1) permit review, (2) permit compliance evaluation, (3) evaluation of wetland condition, and (4) habitat acreage analysis. A final section combines elements from the individual sections to provide a synthesis of some of the study's results.

4.1. Permit Review

As noted in the Methods section, we experienced numerous difficulties in selecting, identifying, and locating an adequate number of permit files distributed by region and year. The details of these complications are provided separately in Appendix 1.

Between 1991 and 2002, a total of 9,924 CWA Section 401 permit orders were generated by the 12 SWRCB regions and sub-regions. The greatest numbers of 401 permits were issued in Region 2 and sub-Region 5S, followed by Regions 4, 9, 3, 8, and 1 (Figure 1). Our initial goal was to assess at least 100 permit files across the state, apportioned by region according to the percentage of the total state 401 orders that each region had issued. The percentage values displayed in Figure 1 reflect the proportions of files issued within each region; these regional proportions were used to calculate the target number of files to be assessed by region, given our initial goal of 100 assessed files. In the end, we assessed 143 permit files (Table 3). Narrative descriptions of each assessed project are provided in Appendix 12. Of these, 129 were fully assessed for compliance, habitat acreage and condition, while 14 were assessed for compliance only (e.g., fees paid). In addition, we identified 13 permit files with either clear compliance shortcomings (i.e., impacts occurred but mitigation project was never undertaken), or expected shortcomings suggested by denials of site access. A list of these files has been provided to the State Board.

Of the 429 permit files randomly selected and pursued at either the Corps or Regional Board offices, a large percentage (40%) could not be positively identified in the agency databases or located in the file archives (Table 3). Many files that *were* located (104 files) were excluded after further review because they did not have assessable mitigation projects. We had difficulties finding assessable files in all regions, but particularly in Region 9, Region 7, and the two sub-regions of Region 6 (the reasons for this are discussed in Appendix 1). Files that were potentially assessable but were not assessed for lack of time are included in this table for completeness, as are two multi-regional files that had been issued directly by the State Board.[6]

Mitigation sites were more heavily concentrated in portions of the state with greater development pressure over the past 10-15 years (Figure 3), particularly the San Francisco Bay area, north of Los Angeles, Orange County, and San Diego. Several sites, especially those in the Central Valley (Region 5) involved a collection of shared mitigation banks, so there are fewer than 129 mitigation points on the map. Most regions had some “compliance only” files (Figure 4), with no particular pattern among regions except Region 4 having a somewhat larger number than the other regions. Surprisingly, the projects regulated by the various Regional Board offices (see regional tallies in Table 3) did not always fall within the boundaries of those regions. For example several of the 401 permits located in the southern portion of sub-Region 5R were issued by the Sacramento office (5S); two in the southern portion of sub-Region 5S were issued by the Fresno (5F) office and the San Francisco office (Region 2) permitted some of the projects within areas designated as Region 1. Alternatively, the perimeters of the regions and sub-regions, as indicated by the SWRCB GIS base maps, might not reflect their true jurisdictional boundaries. For the purposes of this study and our respective analyses, such permit files remained associated with the issuing regional office.

The 143 assessed permit files involved 204 distinct mitigation sites or actions (Table 4). Of these, 62% (127 sites) were within or immediately adjacent to the greater project boundaries (onsite), while the remaining 38% (77 sites) were offsite. There was no obvious geographic pattern to the offsite mitigation sites (Figure 5). While the majority of permit files involved independent, file-specific mitigation projects, others involved third-party mitigation strategies such as mitigation banks or in-lieu fee payments. Some mitigation projects included both onsite file-specific mitigation and offsite payments for mitigation bank credits. In total, about 75% of the mitigation actions were file-specific, while the remaining 25% purchased or applied acreage credits at some larger restoration, creation, or preservation site. Of these latter actions, 30% involved the application of acreage credits within informal permittee-controlled mitigation banks. For the remaining 70%, a third-party approach was employed that included credit purchases at formal mitigation banks or in-lieu fee programs. Payments for acreage at formal mitigation banks recognized by the Corps and/or FWS made up the majority of these credit purchases, while three mitigation actions involved in-lieu fee payments to invasive species eradication programs. While several regions applied such strategies, the use of mitigation banks was especially prevalent in Region 5 (Figure 5). Of the 24 fully assessed files in Region 5S, 17 involved credit purchases at five mitigation banks. One of these mitigation banks was used by 13 files. Further details on mitigation bank projects are given in Appendix 9.

[6] These two files were obtained inadvertently since multi-regional projects were not part of our file selection/regional apportioning methodology. Even though the files were potentially assessable, the files were excluded from our study because they were not selected in accordance with our selection protocol.

The files we assessed included both older and newer mitigation projects (Figure 6). The number of 401 orders issued by the SWRCB gradually increased from 1991 to 1998, declined through 2000, and then increased again through 2002. We had initially selected a roughly even distribution of files throughout the years, except for the early years prior to 1995 for which fewer 401 orders were issued. The distribution of assessed files roughly followed the distribution of certifications, but with disproportionately more 1996-1998 and 2000 files, and disproportionately fewer 1992 through 1995 and 2002 files. We did not assess any files with 401 orders issued in 1991, which is not unexpected given the low number of files available from that year. As is discussed in Appendix 1, we had a difficult time obtaining assessable files from the earlier years (1991-1994) due to the prevalence of unconditioned waivers issued during that period. For these 401 actions, the compensatory mitigation requirements of other regulatory agencies were often explicitly or implicitly invoked by the Regional Boards, but such requirements were not clearly indicated in the 401 certification orders, or in the SWRCB database. It is not clear why our sample included so many 1997 and 2000 permit files; for some unexplained reason, files from these years were more easily located and more frequently contained assessable mitigation projects. The reason that proportionally few 2002 files were included might be because many mitigation projects had not yet been undertaken.

Nearly half (46%) of the 143 files we assessed represented permits given to developers (Figure 7). Municipal permits comprised almost a quarter of the files (24%). The California Department of Transportation (Caltrans), industry, private, and state/federal agencies each comprised 6-9% of the total number of files. Caltrans was distinguished from other state and federal permittees because of the large number of permits they received and the uniformity in the types of projects involved (mostly bridge crossings).

In the following paragraphs we provide an analysis of assessed files by habitat type, impact type (permanent or temporary), and several aspects of the impact and required mitigation acreage. The data used in this analysis are not simple extractions of 401 permit information taken directly from the SWRCB database or the 401 permits. Instead, they were derived from detailed reviews of all project-related information found in the permit files, including the 401 permit, the 404 permit and other agency permits, all mitigation planning documentation, and post-construction monitoring reports. Taken together, this information provided us with the most complete picture possible of the "as built" impacts and mitigations that occurred under the 401 program. During our permit reviews we discovered that the information obtained in this way frequently differed from the corresponding information taken directly from the 401 permits or the SWRCB's permit tracking database. Through a specific analysis performed to understand the nature of these discrepancies, we found that the source of the differences ranged from simple data management issues to more substantive issues of potential regulatory concern. The results of that analysis are presented below, near the end this section.

Wetlands were the habitat type impacted by the most files (Figure 8), although there were substantial impacts to habitats classified as "riparian" and "streambed," as well as combinations of these three. A few files had impacts to non-streambed open waters, such as, lake and ocean habitats. Some files reported impacts to a single habitat type while others impacted multiple habitat types. For several files, the impacts were not well specified. Some of these listed impacts to unspecified "waters of the U.S." while others did not provide any specificity for the impacts.

For the overall acreage impacted and required, data from the files were consolidated and displayed by logarithmic size categories as appropriate for the wide range of acreages involved (Figure 9). These figures show that most files involved impact and/or required acreage values in either the 0.1 to 1 acre range or in the 1-10 acre range. However, a substantial number of files had acreages in the 0.01 to 0.1 acre range and, overall, the acreages involved ranged from 0.002 to 60 acres. The total acreage impacted and required for these 143 projects, as determined by our detailed file review, were 216.8 and 445.2 acres, respectively. Permanent impacts, totaling 166 acres, far outweighed the 51 acres of temporary impacts (Figure 10).

In most years, more acres were required for mitigation than were allowed to be impacted (Figure 11). Ten percent of the projects (14) had fewer acres required for mitigation than were allowed to be impacted. The overall mitigation ratios were particularly large in 1996, 2000, and 2002. When the required mitigation ratios were calculated on an individual project basis and averaged by year, there also was no consistent temporal pattern in mitigation ratios through the years (Figure 12). The higher mean mitigation ratio in 1994, 2000, and 2002 were largely due to single files in each of these years with relatively large ratios (23:1, 70:1, and 123:1, respectively).

The Regions differed in the amount of impacts and mitigation included in the permits we reviewed. Among the well represented regions (those with greater numbers of file assessments), the combined acreages of impact were relatively high in Regions 2, 4, 5S and 8 while the combined impacts within Regions 1, 3, and 9 were relatively low (Figure 13). Regions 2, 5S, and 7 required the highest total mitigation acreage. Region 2 also reflects the highest mean mitigation ratio, whereas Regions 5S and 7 had mitigation ratios that were similar to other regions. When considering the mean mitigation ratios required across the State, the regional patterns appear differently (Figure 14). For example, the mean mitigation ratio for Region 4 is the second highest, despite the fact that the total acreages impacted and required suggest a lower ratio similar to other files.

The results for Region 7 (Figure 13) are notable in that the disproportionately high amount of impact and mitigation acreage occurred through just three permit files. This was primarily due to a large restoration project initiated by the United States Fish and Wildlife Service, wherein twenty acres of wetlands adjacent to the Colorado River were to be dredged to form a deepwater lake. The mitigation for this project was to include 40 acres restoration (invasive removal and riparian plantings around the lake), plus the lake conversion itself (20 acres). Although it was discussed in the 401 permit, the wetland acreage lost was not specified as impacts by the Regional Board and was thus not included in the SWRCB database. Even though there was no impact acreage listed, the permit (and database) included the 20-acre lake conversion as compensatory mitigation. The 40 acres of required restoration were not recorded as compensatory mitigation in the permit or database.

4.1.1. Discrepancies between file information and SWRCB database

As indicated above, we discovered numerous discrepancies between the information obtained through our detailed file reviews and the corresponding information found in the 401 permits and the SWRCB database. Two examples illustrate such discrepancies: (1) for approximately 25 files, the database indicated wetland or streambed impacts that either did not occur or occurred in combination with other habitat impacts that were not recorded in the database; (2) according to the database, the selected files involved a little over 2 acres of temporary impacts, while we determined that, in fact, there were over 50 acres temporarily impacted. In addition, there were approximately 34 fewer acres of permanent impacts than reflected in the database. Data entry errors at least partially influenced these results. In the SWRCB database, there are data entry fields for habitat impacts (e.g. “Wetland,” “Riparian,” etc.), and temporary impacts (e.g. “WTEMP,” RTEMP,” etc.). According to the written conventions of the SWRCB, the former data fields are to be analogous to “total impacts,” and the latter fields are supposed to include the subset of the total impacts that are temporary. In practice, the ambiguity that is inherent in these data entry labels has led to substantial inconsistency in data entry. While we did not do a file by file analysis of this issue, our file information reviews identified numerous examples where the permanent and temporary acreage data were entered separately such that the sum of these data fields would equal the total impact acreage.

There were considerable differences between the impact and required acreage values reflected in the database and the corresponding acreages that were ultimately involved. According to the SWRCB database the total acreage impacted and required for these 143 permit files was 198.9 and 241.0 acres respectively, while the corresponding values reported above were 216.8 and 445.2. Several files for which zero impacts were indicated did involve clear impacts. To understand how these differences varied among the files, we subtracted both impacted and required acreage values obtained through our detailed file review from the corresponding database values and plotted the resulting distributions (Figure 15). Of the 143 projects, approximately 48% (68 projects) had impact acreage differences between our file review and database. Twenty-one percent had fewer impacts indicated in the files than the database and 27% had greater impacts. The differences for most projects were below 1 acre, but the differences exceeded 1 acre for 10 projects. For required acreage, 63% (90 projects) had differences between the file review and database. For 53% percent of the projects (76 projects), information in the file indicated that more mitigation acreage was required than was indicated in the SWRCB database, while less acreage was required for 10% of the projects. For most of the projects, the discrepancy in acreage requirements was less than 1 acre. The discrepancies exceeded 1 acre for 31 projects.

In order to understand the nature and source of these variations, a comprehensive acreage discrepancy analysis was performed. Every file for which our reported impact and/or required mitigation acreage differed from the database values was thoroughly reviewed. Impact and mitigation acreage data were extracted from each document in the file, including the 401 permit, 404 permit, streambed alteration agreement, biological opinion, and mitigation plan, plus monitoring reports and correspondence. The relevant dates were noted and the text of each document was read, in detail, for context. Based on the review, the final impact and mitigation acreage values were confirmed (our reported values), and a brief narrative was written for each file to explain the source of the discrepancy. Then the files were categorized according to the type of discrepancy. Files commonly contained two or more discrepancy categories.

The complete results of this acreage discrepancy analysis, including narratives, are provided in Appendix 3. The main findings are summarized in Table 5. Among the 143 randomly selected 401 permit files, discrepancies between our reported values and the SWRCB database values occurred in 101 files (71%). For 9 files (6.2%), the discrepancies were due to simple rounding issues and were inconsequential. For 26 files (18.2%), the discrepancies were caused by data entry or interpretation errors when the 401 permit information was entered into the SWRCB database. Data interpretation errors were usually the result of unclear permit language and the lack of unambiguous acreage fields; other data entry errors included inputted values that were incorrect by a factor of 10 (e.g., 0.07 acres instead of 0.7 acres). While database entry issues are troublesome, it is the content of the 401 orders that the Regional Boards rely on for compliance considerations. In comparing our results to the information extracted directly from the 401 orders, discrepancies were still found for 60% of the files (86 files). For 19 files (13.4%), another regulatory agency simply required more mitigation acreage than the Regional Board, and we reported this greater acreage; these discrepancies are not errors, but simply reflect differences among agencies. These above categories amount to relatively minor quality assurance and quality control (QA/QC) issues.

For 27 files (18.9%), the discrepancy was due to an accounting difference. For example, the Regional Board may have only considered wetland or permanent impacts while the project included impacts to non-wetland waters and temporary impacts, respectively. For 24 files (16.8%), the information in the 401 orders contained transcription, typographical, or interpretation errors indicating impact or mitigation acreage values that were clearly different from the planning documents available prior to 401 issuance. Both of these categories reflect inconsistencies in the writing of 401 permits and indicate that under the 401 program, the SWRCB may not always be regulating the full suite of jurisdictional impacts that are occurring. The extent to which these inconsistencies are understood and intentional is not known.

Legally, it is the 401 permit, as written, that defines the regulatory scope of the SWRCB and the permittee must comply with the terms of that permit. Realistically, planning changes regularly occur following the issuance of the 401 permit, and we observed that the 401 permits did not always reflect the most current information regarding the project impacts and mitigation. Substantive changes in project planning or implementation that occurred after the 401 was issued resulted in discrepancies in 40 (30%) of the files. For 12 of these files (8.4% overall), the impacts were not altered but there were changes in the context or acreage of the mitigation project. For five of these files, another agency approved modifications that resulted in greater mitigation acreage, but for the other seven, the approved changes resulted in lower acreage or a fundamentally different mitigation strategy (e.g., offsite purchase vs. onsite creation; riparian enhancement vs. wetland creation). *These latter files would seem of regulatory* *concern to the SWRCB*. The other 28 files involved changes in impact acreage. For three of these files (2.1%), the project impacts were reduced after the 401 was issued but the mitigation stayed the same. For another 13 files (9.1%), lower impacts were accompanied by a change in mitigation required by other agencies. Of these latter files, most had lower mitigation acreage than required in the 401 permit as a result of decreased impacts. However, at least two files contained a fundamentally different mitigation strategy. If the mitigation acreage undertaken was lower than that specified in the 401 permit, then *this may be of concern to the SWRCB*. However, if the lower mitigation was the result of impact avoidance understood and approved by other regulatory agencies, then such departures from the written 401 requirements might be judged less important. For the remaining 12 files (8.4%) out of the 28 files involving changes in impact acreage, changes during project planning or implementation resulted in greater impacts than reflected in the 401 permits and SWRCB database. *Such files would seem of regulatory concern by the SWRCB.*

In all cases where the 401 permit information did not reflect later impact and/or mitigation adjustments, the planning modifications were approved by another regulatory agency (i.e., Corps, Fish and Game, or Fish and Wildlife Service). For most projects, we could find no evidence that the Regional Board was consulted or copied on the modifications; while one or more of the other agencies were regularly addressed on correspondence, listed on the documents as responsible parties, or included in copy-to lists, the Regional Board seemed to be largely omitted from the decision-making process after the initial 401 review. Note that our review was often based on files from the Corps rather than Regional Board files, so we might not have seen some correspondence. However, the Regional Board should nonetheless have been named on copy-to lists and other documents. These examples indicate that communication between the Regional Board and the permittees, consultants and other agency staffs involved in ongoing project planning and implementation occurring after 401 issuance could be improved.

Among the 40 files with substantive changes in project planning or implementation after the 401 was issued, there were a few for which the Regional Board *was* copied on the changes, but these did not result in a modified 401 order. When modified 401 orders are created, they supersede the original order and the SWRCB database is to be updated with the revised impact and mitigation acreage information (also, the term "CERTMOD" is to be included in the notes field). We have found that this database updating is regularly done correctly. However, through the acreage discrepancy analysis, we found that for 7 of the 143 randomly chosen permit files (5%, or 17.5% of the 40 files we reviewed that had changes after the initial 401 certification), the information from these revised certification orders (dates, acreages, etc.) was erroneously recorded redundantly in the database as separate records.

The sources of the acreage discrepancies we found fall into three broad categories: (1) data management and QA/QC issues; (2) inconsistencies in the writing of 401 permits; and (3) deficiencies in communication and follow-up after 401 issuance. Discrepancies falling into the first group, while notable, do not raise substantive regulatory/compliance concerns, while those from the other groupings may or may not raise regulatory concerns. To understand the extent of the regulatory/compliance issues indicated by the discrepancies, we performed a specific analysis considering the context and nature of the discrepancies for every file, judging whether they represented a substantive regulatory/compliance concern for the RWQCB/SWRCB. If the source of the discrepancy was limited to (1) a minor rounding error, (2) a database entry error, (3) another agency requiring greater mitigation acreage, or (4) reduced impacts with either no change in mitigation acreage or increased mitigation, then the discrepancy was not deemed a regulatory/compliance concern. However, if the source of the discrepancy fell within any of the other categories of Table 5, then the project was deemed of regulatory/compliance concern. The guiding principle that we employed here was whether the 401 order would have differed if the 401 manager had (1) seen, correctly interpreted, and correctly transcribed all the impact and mitigation information we found through our file review, and (2) employed an approach consistent to that of other managers regarding the accounting of temporary versus permanent impacts and wetland versus non-wetland waters impacts. Through this analysis, we judged that there *was* a regulatory issue for 60 files (42%). While some of these files involved transcription, interpretation, or accounting issues involving information available prior to 401 issuance, the discrepancies for 38 files were caused by 401 permits that did not reflect planning and/or implementation changes that occurred after 401 issuance. This highlights an important fact: because the Corps requires proof of 401 certification (or waiver) prior to issuing the 404 permit, permittees seek their 401 certification early in the regulatory process before some avoidance and minimization of wetland impacts occurred and before the mitigation planning is finalized. In such cases, communication and follow-up between the Regional Board and permittees, consultants and other agency staffs is essential if the project changes, and our results indicate that it often was insufficient. When the 401 order is issued based on preliminary planning information, the order (and the corresponding database information) could become outdated unless the Regional Board maintains an active role in the remaining aspects of regulatory planning and modifies the 401 certification if necessary. Our definition of “regulatory/compliance concern” assumes that the SWRCB would wish to regulate and track all wetland and riparian impacts (permanent and temporary) that occur within its jurisdiction. The permit files we documented with impacts exceeding those approved by the 401 permit would surely be of concern to the SWRCB; some of the other cases may be less important because, ultimately, it is the text of the 401 permit that the permittee must comply with in order to remain in compliance with the terms of the permit.

4.2. Status of Regulatory Compliance of Compensatory Mitigation Sites

Thirteen of the 257 permits we located had to be excluded because of potential compliance issues. This indicates that up to 5% of the files we reviewed may have significant compliance problems (such as the impact occurring but no mitigation being undertaken).

For the files we were able to evaluate, the majority met most of their permit requirements (Figure 16), although fewer met all conditions to 100% satisfaction. Of the 143 assessed permit files, 19 did not have any assessable 401 conditions (the 401 permit could not be located for 13 of these, although enough information was available from the Corps to locate and assess the site; whether these would have had assessable conditions is not known). For the remaining 124 files, the average 401 compliance score was 84% (Table 6). As described in detail in the methods, the average 401 compliance score (hereafter, average 401 score) was calculated as the mean of the compliance scores for all of the permit conditions; the potential scores for each of these conditions ranged from 0 to 100%. Almost half (46%) of the files achieved perfect (100%) average 401 scores, indicating that they were in full compliance with all 401conditions; 57% had an overall score of 90% or greater, and 77% had average 401 scores of 75% or more. Three files received average 401 scores of zero.

Compliance was also assessed by determining the percentage of permit conditions that were met completely (100% score) for a particular file (hereafter, average 401 percent-met score). This approach to measuring compliance with 401 conditions is more consistent with regulatory evaluations, even though it is a more difficult standard with which to comply since the permittee is not given any credit for partially meeting permit conditions. According to this approach, on average 73% of a file's 401 permit conditions were fully complied with (Table 6). Forty-eight percent of the files fully met more than 90% of their conditions, and 57% completely complied with at least 75% of their conditions (Figure 16). Seven files did not meet any of their conditions to 100% satisfaction.

Characterizing these files in terms of success or failure for compliance is not straightforward. For some files, the 401 requirements may have involved a single mitigation condition, such as an acreage requirement. Other files might have multiple conditions, including highly specific planting requirements and performance standards if the 401 permit had included a condition to follow the mitigation plan. There is no simple prescription for determining which aspects of the mitigation plan to include as assessable conditions; these documents are not organized in a way that makes this tractable. The "conditions" extracted from these plans were often difficult to assess and for many, the 100% compliance criterion is unrealistic; nonetheless, we judged these to be in full compliance only if they were completely met. We placed near-misses in the 75% (mostly met) scoring category; therefore, we defined the lower limit of this category as the cutoff for "success." Likewise the cutoff for "failure" was defined by the upper limit of our 25% (mostly not met) scoring category. Given this convention, 76% of the permit files were considered successful according to the average 401 score and 4% were considered failures (Table 6). The remaining 20% were partially successful. According to the average 401 percent-met score, 57% were successful, 40% were partially successful, and 13% were failures. Although a simple success/failure evaluation is not as informative as the numeric evaluations given in the previous paragraphs, we made success determinations to facilitate a simple summary of the compliance results.

Although compliance with mitigation plans was included in the 401 compliance assessment if the mitigation plan was invoked (directly or indirectly) by the 401 permit, we also conducted a separate compliance evaluation for mitigation plans, since they can be viewed as a proxy for all agency requirements for file-specific mitigation projects. The majority of projects (57%, or 81 of the 143 permit files) contained mitigation plans. Mitigation plans were not included in the remaining files for a variety of reasons. For some files, plans were not required (e.g., mitigation bank credits purchased); for others, the plan was not in the agency's file, presumably because it was misplaced or never submitted. Of the mitigation plans that were reviewed, some were relatively simple documents that described the general mitigation strategies; 16% of the 81 files had fewer than five conditions. The majority (84%) of the mitigation plans were detailed documents containing implementation plans and mitigation goals from which we extracted more than five conditions. The mitigation plan conditions for most (63%) files (44 of the 70 files for which we had conditions from both 401 permits and mitigations plans) had been invoked by the 401 permit and were included in the above 401 compliance evaluation. The mitigation plan conditions for the remaining 37 files are unique to this analysis.

The average mitigation plan scores for these 81 files (Figure 17) were somewhat lower than the 401 compliance scores for the total sample of 124 files (Figure 16). The average mitigation plan score was 81% (Table 6), only slightly lower than the average 401 score of 84% for all 124 files. However, only 16% of the files had perfect scores (all conditions 100% met) compared to 46% for the 401 permits; 42% had scores of 90% or greater. On average 68% of a particular file's mitigation plan requirements were fully complied with. In comparing the distributions, the files scored significantly lower for mitigation plan compliance than for 401 compliance both for the average scores (Kolmogorov-Smirnov 2 sample test, $p<0.001$) and for average percent-met scores ($p<0.001$). It would seem that mitigation plan conditions are more difficult to fully comply with than 401 permit conditions. This may be true; however, part of this discrepancy is due to the large percentage of the 401 permits with just one or two permit conditions (e.g., acreage requirements or credit purchases) with which compliance was relatively easy. Seventy of the files for which we had mitigation plan scores also had 401 scores, so we could compare their scores by both of these measures. The average mitigation plan scores for these 70 files were significantly lower than the average 401 scores (Wilcoxon signed-rank test, $p=0.030$), but the average percent-met scores were not significantly different ($p=0.252$). Of the 81 files with mitigation plans, 68% were considered successful for mitigation plan compliance using the criteria established above, 32% were partially successful, and none were considered failures (Table 6). The average mitigation plan percent-met score was 68%. A total of 18 files (22%) had scores of 90% or higher. Two files did not meet any of the permit requirements to 100% satisfaction. Using this approach, 48% of the files were successful, 35% were partially successful, and 6% were failures (Table 6).

For the 124 files evaluated for 401 compliance, on average 30% of the permit conditions were not determinable (Figure 18). All permit conditions could be determined for 40 files (32%). Eighty-four files had at least some conditions that could not be determined, with an average of 45% non-determinable conditions per file. When mitigation plan compliance was considered separately, 30% of mitigation plan conditions were non-determinable (similar to the 401 compliance result). All conditions could be assessed for only 12 out of 81 (15%) files (Figure 19). Sixty-nine files had at least some mitigation plan conditions that could not be determined, with an average of 35% non-determinable conditions per file. The results from these two figures are indicative of the differences between the types of conditions listed in the 401 orders versus typical mitigation plan conditions. Aside from invocation conditions (those requiring that the mitigation plan or other agency permits be followed), the mitigation conditions specified in the 401 permit often consist of a single acreage requirement. Those containing more mitigation conditions often include a range of other requirements that, like acreage, tend to be addressed in a yes/no fashion or are not determinable (e.g., revegetation requirements, and monitoring and submission requirements). Mitigation plans include many more specific “conditions,” such as requirements for site preparation, implementation, and performance standards. While such conditions are less frequently complied with at the level of 100% satisfaction, they are also more frequently assessable in an after-the-fact assessment, such as the present study.

One might expect compliance with 401 permit conditions to have increased through the years as the regulatory practices evolved; however, we did not find this to be the case (Figure 20; r^2=0.000, p=0.845). There was no significant difference in 401 permit compliance by year (ANOVA, p=0.959). Mitigation plan compliance was more variable through the years (Figure 21), and the correlation between compliance and year also was not significant (r^2=0.030, p=0.119). As with 401 permit compliance, there was no significant difference by year (ANOVA, p=0.357). The scatterplot in Figure 21 suggests a general increase in compliance through 1999 or 2000, followed by no further improvement. However, the leveling out after 2000 appears to be due to “maxing out” at 100% compliance, so the only way to have continued improvement in compliance would be to have fewer low-compliance files. In any case, any temporal trend, if it exists at all, is slight, since there is no significant difference between the early files (1992-1997) and the more recent files (1998-2002) in 401 compliance (Mean±SE= 84.9±2.9 for 92-97 and 84.0±2.7 for 98-02; t=0.223, P=0.824) or mitigation plan compliance (78.6±2.9 for 92-97 and 82.4±2.7 for 98-02; t= -0.944, P=0.348).

Overall, there was no significant difference in 401 compliance among regions (Figure 22; ANOVA, p=0.882). Similarly, there were no significant differences among regions for mitigation plan compliance (Figure 23; ANOVA, p=0.198).

Average 401 permit compliance did not differ significantly by 401 certification type (Figure 24; ANOVA, p=0.159). Section 401 orders fell into four general categories: certifications, certifications with conditions, waivers, and conditional waivers. Regulatory practice evolved over the study period, and after June 24, 2000, issuance of waivers was no longer authorized by the State Board. Some of the regulatory orders also comprised waste discharge requirements (WDRs), either standard WDRs, conditional WDRs, WDR waivers, or conditional WDR waivers. We treated these as equivalent to the corresponding 401 certification categories and grouped them accordingly. In terms of a Regional Board’s level of involvement in the mitigation planning, one would expect certifications to include more involvement than waivers, and conditional orders more than standard orders. In practice, we found that the number of conditions from the various order types varied widely. From this study, it is unclear which certification category represents greater involvement by Regional Board staff.

There were notable differences in the frequency of use of the various categories of permit conditions (Table 7). In general, the majority of mitigation requirements dictated the actual tasks to be completed during the preparation and construction of the mitigation site (i.e., site implementation tasks). For 401 compliance, site implementation tasks comprised the most conditions (30%), followed by monitoring & submission requirements (19%), success & performance standards (15%), and acreage requirements (12%). While acreage requirements comprised 12% of the conditions, only one or two such conditions were necessary for any particular file. Of the 143 permit files, 89 (61%) included at least one acreage requirement. For other condition categories, a given permit file may have had 10 or more conditions per category, especially when the mitigation plan was invoked by the 401 order. Fifty percent of the 401 orders invoked the requirements of other regulatory agencies or required that the mitigation plan be followed. Conditions involving mitigation site maintenance and the protection of the site from degrading influences, plus third party requirements (mostly credit purchases), made up a relatively low percentage of the conditions. For mitigation plan compliance, most of the “conditions” involved site implementation (39%), success & performance standards (21%), monitoring & submission requirements (16%), and acreage requirements (9%). Excluding the miscellaneous “other” category, the average number of conditions per category ranged from 1.4 to 6.0 for 401 compliance, and 1.6 to 7.9 for mitigation plan compliance.

Compliance across the condition categories was variable. Third party requirements were almost always complied with fully (Figure 25). Monitoring and submission requirements had considerably lower compliance (about 60%), although this could be due to the fact that some monitoring documents were submitted but were not located in our review. The other categories had compliance scores of 75-85%. Except for third-party requirements, the percent-met scores were considerably lower than the 401 scores. Acreage and credit purchasing conditions could usually be determined, while the conditions for other categories more frequently could not. Relatively few of the conditions in the success and performance standards category were non-determinable. Monitoring and submission requirements were more frequently non-determinable than other conditions, which is interesting since this category also had the lowest compliance scores when we could assess it. The patterns of compliance and non-determinability were similar for compliance with mitigation plan, although for mitigation plans, there was somewhat less variability among the categories (Figure 26).

Because many of the permit, and even mitigation plan, conditions include purely administrative requirements (such as submitting reports) or actions that are only peripherally connected to the ecological functioning of a mitigation site, we analyzed compliance for a combination of condition categories deemed most relevant to the success of the actual mitigation project. These categories, shown in the last line of Table 7, include the Site Implementation, Maintenance, Protection, and Success/Performance Standards categories. For this grouped category, the mean compliance scores were about 80% for both 401 and mitigation plan compliance. The mean percent-met score was considerably lower, 63% for 401 compliance and 66% for mitigation plan compliance.

All of the above 401 compliance results included the conditions found in mitigation plans and other agency permits that had been explicitly or implicitly invoked as a requirement of the 401 permit. In order to understand the contributions of the Regional Boards *per se* to the outcome of mitigation projects, we considered only those conditions specifically required by the 401 permits. A single mitigation-related permit condition was required for 27% of 401 permits (Figure 27). Another 18% percent of the permits contained two mitigation conditions, and 15% had three conditions. Ten permits (8%) specified 7-12 conditions, while eleven permits (8%) did not contain any mitigation-related permit conditions. These data do not include the eleven permit files for which no 401 permit was obtained. Among the 12 Regional Boards, Regions 6T and 6V required the most mitigation requirements per 401 order (Figure 28), but there were just two permits for each of these sub-regions. Of the regions with larger sample sizes, Regions 2 and 4 included relatively more mitigation conditions per file while Regions 5S and 8 included relatively few.

Of the mitigation conditions included in 401 permits, the majority involved acreage and third party acreage credit requirements, site maintenance requirements, and monitoring and submission requirements (Figure 29). Relatively few conditions specified the actual mitigation tasks to be implemented, protective measures, or success and performance standards. These data represent the conditions found in all 132 permit orders combined. When mitigation conditions from a given category were included in the permit order, there was, on average, between one and two conditions of that category per order (Figure 30). When present, there were close to two site maintenance and two monitoring and submission conditions on average per order, close to 1 site maintenance condition per file, and for acreage requirements, third party acreage credit requirements, and success and performance standards, there were approximately 1.5 conditions each per order.

As indicated above, most 401 permit orders included 1 to 3 mitigation-related conditions. When a single condition was included, it involved a simple acreage or acreage credit requirement almost 90 percent of the time (Figure 31). Three single-condition orders contained site maintenance requirements and one contained a monitoring and submission requirement. Similar breakdowns are provided in Figure 31, for 401 orders with up to four mitigation-related permit conditions. As the number of conditions increased, the proportion of maintenance and monitoring/submission conditions increased. Site protection, site implementation, and success and performance requirements were always a minor proportion of the conditions. These data demonstrate that most 401 permit orders included in this study contained relatively few permit conditions dictating the actions to be taken at the mitigation sites, or the success criteria upon which those sites would be judged. Instead, most permits specified the mitigation acreage requirements, included some site maintenance requirements, and mandated that mitigation and monitoring related documents be submitted.

As we reviewed the files, extracted the relevant permit conditions, and consolidated the various agency conditions for our compliance analyses, we noted substantial overlap between the 401 conditions and the conditions required by other regulatory agencies. We performed a separate analysis to understand the extent of these redundancies. The conditions extracted from each relevant agency's permit were aligned with those extracted from the 401 permit orders. Each 401 condition was scrutinized for equivalency with the other permit conditions. Some were verbatim copies of other agency conditions, while others were different in verbiage but equivalent in context. In all cases, our test was whether the greater mitigation responsibilities would have differed had a particular condition not been included in the 401 order. Overall, 62% of 401 conditions were either redundant or invoking (Figure 32). Thirty-eight percent of the 401 conditions were unique to the 401 permit. Those conditions unique to the 401 permit included all 401 conditions involving monitoring and submission requirements, which were 25% all 401 conditions. Excluding these since other agencies had their own submission requirements as well, about 13% of all 401 conditions were unique requirements of the 401 program. A breakdown of redundant and invoked conditions by region is given in Figure 33. Regions 6T, 6V, and 7 had the lowest percentage of redundant and invoked conditions, but these regions had very small sample sizes. Among the other regions with larger sample sizes, Region 2 included a relatively greater percentage of unique conditions in their 401 orders. Region 8 was unique among these latter files as having a relatively low percentage of invoking conditions.

Considering the full set of conditions explicitly specified in the 401 orders, the mean permit compliance score was 84% (Figure 34). This score is identical to the overall mean compliance score given earlier (including invoked conditions from other permits). In addition, the distribution of scores is essentially the same as the earlier distribution. Because of these similarities, no further analyses were performed on these 401-specific conditions.

4.3. Function and Condition of Compensatory Mitigation Sites

CRAM evaluations were completed for 129 of the 143 permit files (14 files included in the above compliance evaluations did not contain assessable mitigation projects). These 129 files had 204 discrete mitigation sites due to multiple mitigation actions (e.g., depressional wetland creation plus riparian enhancement) that needed to be evaluated separately (Figure 3). Fifty three of these mitigation sites were sub-sampled because they were too large or complex for a single CRAM evaluation. These resulted in a total of 321 separate CRAM evaluations for this study. In addition, we performed CRAM evaluations for 22 reference sites across the State and added 25 more reference sites from the CRAM development team for a total of 47 reference site evaluations (Figure 2). CRAM results are presented below in two ways: one is by mitigation site with a sample size of 204, and the other is by file with a sample size of 129; for the latter, the scores of multiple mitigation sites were combined into a single overall score per permit file. Additional CRAM results that were too detailed for inclusion in the main report are provided in Appendix 7.

The 204 mitigation sites were largely represented by low gradient riverine (46%) and depressional (36%) wetland classes (Figure 35). The remaining 18% of assessed mitigation sites, in decreasing order of occurrence, were vernal pool, estuarine, lacustrine, seep and spring, high gradient riverine, and lagoon wetland classes. Although mitigation sites were distributed throughout the state, the occurrences of each wetland class vary by region (Figure 36), with vernal pool and seep and spring mitigation sites only present in central to northern portions of the State. Similarly, estuarine sites were primarily in the north, though two estuarine sites were located on the south coast of California. While depressional and low gradient riverine sites were common throughout the state, depressional sites were more prevalent in the north, and low gradient riverine sites dominated in the South.

4.3.1. Total-CRAM Scores

The total-CRAM scores for the 129 permit files assessed had a mean±SE of 59%±1.1, with a median of 61% (Figure 37; Table 8). In comparison, the total scores for the 47 reference sites had a mean±SE of 79%±1.4, with a median of 82%. Based on the distribution of reference site CRAM scores, we classified sites in categories of wetland condition. The vast majority of the reference sites (89%) had total-CRAM scores of 70% or greater. For this reason, we established a 70% score as the cutoff for “optimal” wetland condition. We evenly distributed the remaining attainable CRAM scores into the three remaining categories. Thus, we defined the “sub-optimal” cutoff at 49%, and distinguished “marginal” from “poor” categories at 28%; in most cases, we have combined these categories and refer to them collectively as “marginal to poor.”

Using these criteria, *only 19% of the mitigation files were optimal*, just over half were sub-optimal, and approximately one-quarter were marginal to poor (Table 8). Files with optimal and sub-optimal scores were distributed throughout the state, though there was a prevalence of marginal to poor files in northern California around the greater Bay Area (Figure 38) [see Appendix 5 for detailed mapping of mitigation and imact locations by region]. In our previous study of mitigation success in SWRCB Region 4, Ambrose and Lee (2004) found that just 2% of the files assessed had optimal wetland condition. However, in that study, optimal condition was defined as an 80% or above CRAM score. We established that criterion based on the quartiles of the 1-12 scoring scale, since reference site evaluations were not available for that study. The reference site evaluations included here suggest that the 80% criterion used in that study may have been too high; more of the permit files included in that study would have been considered optimal had a standard of 70% been applied.

There was no relationship between CRAM score and certification year (Figure 39; r^2=0.005, p=0.415). Given evolving regulatory practices, one might expect more recent permit files to have mitigation sites with higher CRAM scores if more recent regulatory practices resulted in more successful mitigation projects. Alternatively, older sites have had more time to develop, so higher scores might be expected of these sites. Neither of these expected trends can be discerned for the actual relationship, with one possible exception. The CRAM scores for 2002 do not range as high as earlier years, which could be because these younger sites did not have enough time to develop sufficiently to score highly on CRAM.

There were significant differences in Total-CRAM scores by region (ANOVA: F = 2.642; p = 0.005) with relatively low median scores in Regions 1, 2, and 6V, and relatively high scores in Regions 8, 9, and sub-Regions 5F, 5S, and 6T (Figure 40; Table 9). Sub-Regions 6T and 6V had the highest (74%) and lowest (43%) median scores, respectively; however, these sub-regions had only two permit files each. When combined, the overall Region 6 score was comparable to the other regions (64%). A Tukey post hoc analysis revealed the differences between the low scores in Region 2 and the relatively high scores in sub-Region 5S (p = 0.006) to be responsible for the overall differences among regions. Region 2 had the highest percentage of marginal to poor files (52%), while Region 9 and sub-Region 6T had the highest percentage of optimal files (sub-Region 6T had only two permit files, both of which had optimal condition) (Figure

41). Neither Region 7 nor sub-Region 6V had any optimal files, but they had very few files. Sub-Region 5R did not have any marginal to poor files, and the percentage for sub-Region 5S was low, even with a large number of files. However, the majority of files for these sub-regions had sub-optimal rather than optimal condition. The results for sub-Region 5S are notable due to the high percentage of those files that used formal mitigation banks. The standard error of scores from this sub-Region was low (Table 9) and this likely influenced the significance region effect. However, 17 of the 24 fully assessed permit files from this sub-region used 5 mitigation banks (13 files used a single bank; see Figure 5), and so the CRAM scores of those banks were repeated across these files.[7] A more in-depth analysis and discussion of mitigation banks is provided in Appendix 9.

4.3.2. CRAM Attribute Scores

We determined "optimal" cutoffs for each of the four CRAM attributes with the same criteria that were used to establish the overall "optimal" cutoff. Because the overall "optimal" cutoff contained 89% of reference sites above that score, we set each of the four attribute "optimal" cutoffs to the score with approximately 89 percent of reference sites above that score. For each attribute, we established the three remaining categories by evenly dividing the remaining attainable CRAM scores by three. Thus, for buffer and landscape context we established an "optimal" cutoff at 74%, "sub-optimal" at 52% and distinguished "marginal" to "poor" at 30%. We established a hydrology "optimal" cutoff at 76%, "sub-optimal" at 53% and distinguished "marginal" to "poor" at 30%. Physical and biotic structure attribute cutoffs were markedly lower than the overall CRAM cutoffs. Physical structure had an "optimal" cutoff at 53%, "sub-optimal" at 38% and distinguished "marginal" to "poor" at 23%, while biotic structure had an "optimal" cutoff at 47%, "sub-optimal" at 34% and distinguished "marginal" to "poor" at 21%.

4.3.2.1. Buffer and Landscape Context

The mitigation sites scored better for buffer and landscape context than for Total-CRAM. The median landscape context score for the 129 files was 72% (mean 66%) with a distribution that was skewed towards higher scores (Figure 42, Table 8). Similarly, reference sites scored well on landscape context with a mean score of 87% and a median of 90%. Most files had optimal scores, while roughly a quarter of files each were in the sub-optimal and marginal to poor categories. Region 7 and sub-regions 5S and 6T scored particularly well in the landscape context attribute while files for Region 1 and sub-Region 6V scored lower (Table 10). Overall, five of the regions had the majority of their files with optimal scores, and four regions (Region 7 and sub-Regions 5R, 5S, and 6T) did not have any files scoring in the marginal to poor category for landscape context. Despite criticism that mitigation projects are too often placed in proximity to development, these results indicate that the mitigation projects we assessed have been undertaken at sites that were reasonably well positioned in a landscape context.

[7] Rather than report the score for a particular mitigation bank site just once, the score was assigned to all files that purchased credits from that bank since the functional losses from those projects were to be offset by mitigation bank site function.

4.3.2.2. Hydrology

Hydrology attribute scores for the mitigation sites had a mean and median score of 63% (Figure 43, Table 8). In contrast, the reference sites scored well in hydrology with an overall median of 91%. Most (43%) permit files had sub-optimal scores, while 27% had optimal, and 30% had marginal to poor scores. The Total-CRAM scores for sub-Regions 6T and 6V were reflected in their hydrology scores with the highest (81%) and lowest (36%) scores of all regions (Table 11), but these two regions had only two files each so these extreme values are likely a consequence of the small sample size. Two sub-regions of Region 5 (5F and 5R) also had higher scores, but when these were combined with large number of files from sub-Region 5S, the overall Region 5 hydrology mean was similar to other files. Regions 3 and 4 had the lowest hydrology scores, as Region 3 had the majority of files being sub-optimal and no optimal files, while 80% of Region 4 files were evenly split between sub-optimal and marginal to poor for hydrology.

Improper hydrology has often been cited as the major shortcoming of mitigation project design (NRC 2001). The mitigation sites sampled during this project had lower hydrology scores than the reference sites, yet when compared to other CRAM attributes the site hydrology scores were not disproportionately poor. However, approximately 50% of the assessed mitigation projects were classified and evaluated as riverine wetlands, and our conventions for employing CRAM were quite liberal with respect to stream-associated mitigation. Many of the riverine/riparian projects we evaluated did not include the channel itself. Instead, they occurred along the sloping banks of stream channels, frequently extending some distance away from the top of the banks. Others began at the top of the banks and extended outward from there, with even less connection to the channel. If the site was in direct proximity and seemingly hydrologically “connected” to the stream channel, the channel-dependent aspects of CRAM were scored as if the channel was part of the assessment area. Hence, many riverine sites that largely lacked wetland hydrology on the site were given more favorable scores for hydrology than the restoration site alone would have warranted. If we had taken a more narrow scope in defining the CRAM assessment area, hydrology scores would have been much lower. This is an important point regarding the utility of CRAM in evaluating mitigation sites, and it will be necessary to establish a standard approach for identifying assessment areas for future riverine mitigation reviews.

4.3.2.3. Physical and Biotic Structure

Mitigation sites yielded relatively low scores for both the physical structure and biotic structure attributes, with mean and median scores just above 50% (Table 8). However, the reference sites also scored lower for these two attributes and had wide variability in their scores (Figure 44 and Figure 45). For reference sites, the median physical structure score was 79% (mean 76%) and the median biotic structure score was 68% (mean 67%). The overall low physical structure scores were mainly driven by low scores in the physical patch richness metric, while vertical biotic structure and biotic patch richness scores lowered the overall biotic structure attribute. Most files scored optimally in physical structure, with approximately a quarter of files in the sub-optimal and marginal to poor categories. The majority of files were optimal for biotic structure, about one quarter were sub-optimal, and only 12% were marginal to poor. As with hydrology, certain aspects of the physical and biotic structure attributes were channel-dependent. That is, the metrics were designed around physical and biological aspects of the stream channel. In cases where a hydrological link between mitigation site and channel existed, the channel was treated as part of the assessment area for those metrics.

Region 2 had the lowest median score for physical structure (40%), with 48% of its files considered marginal to poor (Table 12). Similarly, only 25% of sub-Region 5F files were optimal, while neither of the Region 7 files was optimal. In contrast, Region 8 had the highest mean score for physical structure (67%) and this region was joined by Regions 3, 4, 9, and sub-Region 5S in having a larger percentage of optimally scoring files.

Regions 2, 3, 4, 7, and sub-Regions 5R and 6V all had a median biotic structure scores lower than 50%, with the two Region 7 files having particularly low scores (Table 13). Region 2 and 4 had only 40% of files score in the optimal category, while 9 of the remaining 10 regions and sub-regions had the majority of their files score optimally. Similar to physical structure, Region 8 scored comparatively high for biotic structure, with a median score 65% with the vast majority of its files scoring optimally.

With respect to physical structure, these results are not surprising. Most mitigation sites do not emphasize topographic complexity and physical patch types as design elements. However, the results for biotic structure are interesting given that most mitigation activities seem to focus on habitat improvement, namely the enhancement, creation, restoration, or preservation of plant communities. The focus of the biotic structure metrics was on these plant communities, requiring time intensive investigations into the diversity and cover of native and non-native plant species. These poor results from the reference sites for biotic structure suggest that CRAM is not calibrated to these design goals. (CRAM calibration efforts were being conducted at the same time we were assessing mitigation sites, so the results of those efforts could not be incorporated into our analyses.) However, even lower scores at mitigation sites indicate that they are falling short of design goals in this regard. The following sections highlight the main findings with respect to each of the 15 individual CRAM metrics.

4.3.3. Individual CRAM Metrics

The distribution of scores for individual CRAM metrics scores varied widely. For example, the percent of assessment area with buffer metric had a median score of 92%, while physical patch richness, biotic patch richness, vertical biotic structure, and native plant species richness had a median of only 42% (Table 14). In general, the majority of metrics had mean scores between 60 and 70%. The mitigation sites scored lower than the reference sites for all 15 individual CRAM metrics (Figure 46). Differences were most pronounced for the average width of buffer, buffer condition, water source, hydroperiod, hydrologic connectivity, and physical patch richness metrics. There was less difference between mitigation and reference sites for the six biotic structure metrics, percent of assessment area with buffer, and organic matter. However, the reference sites scored relatively low for the six biotic structure metrics and physical patch richness. This indicates a problem with CRAM calibration for those metrics, which will likely be resolved after CRAM is recalibrated. In the meantime, the relatively small difference between mitigation and reference sites for the biotic structure metrics could be either because the mitigation sites are doing relatively well in these areas or that the CRAM metrics are not sensitive to differences in condition that may be present at mitigation sites (perhaps because the reduced range of reference scores). We cannot distinguish between these two possibilities from the data.

The 15 individual CRAM metrics scores varied by SWRCB region (Figure 47). Region 7 shows a particularly distinct pattern, perhaps due to the low sample size (only two files). Although it scored high (similar to the reference sites) for connectivity, percent of assessment area with buffer, and average width of buffer, it scored low on all biotic structure metrics. Region 2 scored particularly low in topographic complexity (46%) compared to the eight other regions, which averaged between 63 and 71%. Although Region 9 did not score especially high in the overall biotic attribute, it did remarkably well in the two plant metrics, exceeding the reference sites scores.

4.3.4. Wetland Class

The overall Total-CRAM scores varied widely within most wetland classes (Figure 48). Although CRAM was developed for use in a variety of wetland classes, it has not yet been calibrated for all wetland classes. Even the recent calibration effort focused on only two wetland classes, riverine and estuarine. Thus, it is not clear whether differences among wetland classes are due to differences in mitigation success among classes, or differences in how CRAM scores difference wetland classes. Since CRAM has been tested most extensively for riverine wetlands, we expect wetland condition to be most accurately reflected for this class. Appendix 8 discusses differences in CRAM scores for different wetland classes in more detail.

4.4. Habitat Acreage Analysis

The 143 Section 401 orders authorized approximately 217 acres of impacts and required that 445 acres of mitigation be provided; our analyses indicate that 417 acres of actual mitigation acreage was obtained (Figure 49). Overall, 94% of the required mitigation acreage was met. For the individual files, 72% met or exceeded their acreage requirements. Twenty percent (28 files) of the files exceeded their acreage requirements. For 52% of the files (73 files), we determined that the acreage requirements had been met exactly. Twenty-eight percent (40 permit files) of the files did not meet their acreage requirements. As noted in the methods, the obtained acreage values were based on GPS survey of sites where possible, review of files for mitigation bank purchases and other evidence of acreage met, and a combination of field visits and file review where GPS survey of sites was not possible. Roughly one third of acreage determinations were based on each of these approaches.

There was no clear temporal pattern in how well the required acreage was met. The cumulative acreage requirements were shy of being met in most years with the exception of 1992, 1993, and 2001 (Figure 50). In 2001, the acreage requirements were exceeded by 3%, and the acreage requirements were met for the few 1992 and1993 files. These data are comparing total acreage obtained to total acreage required. When the average required mitigation ratios were compared to the average obtained ratios (gain/loss) by year, the results were more variable (Figure 51). The data in this figure represent the averages, by year, from one file to the next, whereas the previous figure showed the total sum of acreages by year. For about half the years the average gains exceeded the requirements, while for the other half they did not. There were two years (1992 and 1993) that met the requirements exactly. Although there were some differences from year to year, there was no general trend, such as earlier years achieving less than the required ratio or later years exceeding it, nor was there ever a very large difference between required and obtained mitigation ratio.

Regions 2 and 8 exceeded their acreage requirements by 2 and 3%, respectively (Figure 52). All other regions fell slightly short of their acreage requirements, meeting from 38% (Region 6V) to 97% (Region 9). The regions that met the lowest percentage of their acreage requirements were Regions 6T and 6V which each had only two files—the lowest sample sizes of all the regions.

While the mitigation acreage fell short of meeting the permit requirements, the regulatory process nonetheless yielded an apparent "gain" of 200 acres on 217 acres of impacts, which is an overall mitigation ratio of 1.92**:**1 (Table 15). However, this simple ratio is based on the assumption that mitigation sites included no existing wetland acreage before the mitigation project was undertaken. In fact, many mitigation actions consist of site preservation or simple vegetative enhancement to existing habitats without any changes in site hydrology; these types of mitigation actions cannot be considered acreage "gains" because there is no increase in wetland area. Since the simple mitigation ratio includes mitigation actions that do not actually increase wetland area, the ratio overestimates the contribution of compensatory mitigation towards achieving a goal of no net loss of wetland area. Details regarding acreage gained versus lost for particular projects are provided in Appendix 11. Also provided in this appendix are the raw habitat proportion data collected for each individual mitigation site.

4.4.1. Riparian Jurisdictional Issues

In addition to the problem of including mitigation actions that did not increase wetland area as a wetland "gain," losses in certain habitat types were often compensated for by "gains" in other habitat types, and it was not always clear that the difference was an intended regulatory outcome. In this section, we separate the acreage losses and gains by their component jurisdictional and non-jurisdictional habitats, and attempt to distinguish true losses and gains in area from simple alterations of habitat.

A substantial issue in evaluating acreage shifts is the consideration of riparian habitats that may not necessarily be jurisdictional wetland habitats. While essentially all impacts considered in the wetland regulatory process were to jurisdictional "waters of the United States" (two projects contained mitigation requirements for a combined total of 4.40 acres of upland habitat), 27% of mitigation acreage consisted of drier "riparian" and upland habitats that were outside jurisdictional "waters" (Figure 53). Our "obtained" acreage assessments focused on mitigation habitats and did not include obvious buffer acreage or large conservation tracts that were built into the mitigation requirements. For individual files, part of this non-jurisdictional mitigation acreage may have been unanticipated by regulatory personnel (i.e., site location or mitigation action was different than proposed). However, the majority of this acreage involved site locations and actions that were proposed and subsequently approved. Of the acreage required to compensate for jurisdictional losses directly (buffers excluded), only 64% clearly involved jurisdictional mitigation acreage. Of the remaining acreage, 14% was to include creation, restoration, enhancement, or preservation of upland habitats and the other 22% was ambiguously listed as “riparian” mitigation without distinguishing whether jurisdictional or non-jurisdictional habitat was intended.

It should be understood that “riparian” can be defined from an ecological or regulatory perspective. In determining riparian *impacts*, a regulatory definition is employed that considers only those riparian habitats within the ordinary high water mark (OHWM) defining “waters of the U.S.” (Under state law, the jurisdiction of DFG is extended to the outer drip line of the riparian vegetation.) However, in considering riparian mitigation, permittees and their consultants often use an ecological definition of riparian, which includes the entire zone of transition to fully terrestrial habitats. The lateral limits of “riparian” under this definition are vague and can include extensive areas that are beyond jurisdictional “waters.” When the mitigation requirements include the ambiguous term “riparian,” it is unclear whether the habitats mitigated were intended to be jurisdictional or non-jurisdictional riparian habitat. It should also be mentioned that impacts listed as “riparian” usually involved the entire riverine zone, including the channel itself and the portion of the floodplain and banks deemed within the OHWM. This usage does not conform to the most widely accepted definition of “riparian,” defined as the area between fully aquatic and fully terrestrial habitats and not including the actual riverine channel. Additionally, the term *riparian wetland* has been applied loosely and has often referred to both three-parameter wetlands and/or non-wetland waters habitats within the OHWM. Our determinations of “riparian waters” were limited to those *non-wetland* portions of the banks and floodplains between the channel and the OHWM.

Aside from the non-jurisdictional acreage found in our site evaluations, the remaining mitigation acreage yielded a net “gain” of jurisdictional acreage with an overall gain/loss ratio of 1.43:1 (Table 15). Given the breakdown of habitat types, the mitigation associated with these 143 permit files resulted in overall net “gains” in both wetland and “non-wetland waters” acreage (Figure 54). There were 181 acres of wetland mitigation compared to 121 acres of wetlands impact, resulting in a net “gain” of 60 wetland acres and a gain/loss ratio of 1.50:1. There were 75 acres of non-wetland waters impacted and 105 mitigation acres mitigated for a total gain of 30 acres (mitigation ratio of 1.40:1). The replacement ratio for “non-wetland waters” acreage was slightly lower than that of wetland acreage, but this might be expected given that the “no net loss” goal is focused on *wetland* habitats. Of the non-jurisdictional mitigation acreage, 70% was identified as non-waters riparian habitat and the remaining 30% was upland. While the acreage associated with these latter habitat types seems inconsistent with “no net loss” goals, the overall acreage of non-jurisdictional habitats was over and above net “gains” in jurisdictional wetland and non-wetland waters habitat. It is possible that some amount of this additional habitat was due to the increased jurisdictional requirements of the DFG; too few *streambed alteration agreements* were present in the permit files to test this. However, mitigation ratios are often proposed as a buffer, a way to account for uncertainty in the success of wetland creation or restoration, or to accommodate temporary losses occurring between impact and the completion of the mitigation project, and other sources of uncertainty. The inclusion of non-jurisdictional habitat in acreage considerations obscures the amount of buffer being incorporated into mitigation requirements.

4.4.2. Permanent vs. Temporary Impacts

To better understand acreage loss and gain, we distinguished permanent from temporary impacts and mitigation involving creation or restoration from preservation areas and habitat enhancements that did not increase the acreage of wetlands or waters. Comparing permanent impacts (true losses) to creation mitigation (closer to true gains), there was a net gain in overall acreage, and in the acreage of jurisdictional “waters” habitat (Table 16). In total, 76% of the impact acreage was permanent and 24% was temporary. In contrast, 65% of the total mitigation acreage was “created,” 24% involved habitat enhancement, and 11% was preservation (Figure 55). We did not include any large upland conservation/preservation areas associated with these permit files since these were usually required by FWS for impacts to endangered species and were tangential to the wetland impact/mitigation requirements. For jurisdictional “waters,” the overall gain/loss ratio was 1.37:1. For creation projects, the majority (82%) involved jurisdictional acreage. The jurisdictional acreage proportion was lower for enhancement projects (58%) and preservation areas (48%).

Considering permanent impacts and creation mitigation, both wetlands and “non-wetland waters” habitats experienced gains of acreage (Figure 56). The overall replacement ratio for permanent wetland impacts was 1.38:1 while the ratio for non-wetland waters was 1.35:1. These data suggest that at least for overall acreage, mitigation required by the SWRCB and other regulatory agencies appears to be resulting in net gains of wetland acreage across the State. However, there is a caveat: many sites categorized as “creations” were in fact enlargements of existing wetlands, with both the created and pre-existing waters included in the reported mitigation acreage.

It also is not clear how well “no net loss” of acreage is being achieved by individual mitigation projects, or if large gains from certain projects are compensating for net losses in others. In fact, 20% of the permits resulted in net losses (Table 17). Seventeen percent of the projects met their acreage requirements exactly, and 64% had net acreage gains. Thirty-three percent of the projects had net acreage losses in jurisdictional “waters,” while 22% had losses for wetlands. When permanent impacts (true losses) were compared to creation mitigation, only 41% of the projects yielded acreage gains while 20% met their acreage exactly and 39% resulted in net losses of acreage (Table 18). Almost half of the projects indicated net losses of jurisdictional “waters” habitats, and over one quarter of the projects (28%) resulted in net losses of wetlands. To determine if the projects with disproportionately large acreage gains or losses were skewing the results, we removed the five projects with the biggest acreage gains and the five with the biggest acreage losses from the analysis. Following this step, net acreage gains were still found with an overall gain/loss ratio of 1.67:1. For jurisdictional waters, the gain/loss ratio was lower (1.35:1), but for wetlands it was higher, at 1.68:1. While there were substantial deficiencies in habitat acreage for 20% of the projects, the large mitigation ratios required by the regulatory agencies have been successful in achieving overall net gains in wetland acreage within California.

4.4.3. Regional Comparisons

In our previous study, Ambrose and Lee (2004) found that net gains in overall acreage and in wetland acreage had been obtained within SWRCB Region 4. The results from this project indicate that these findings were consistent across the State. However, in that Region 4 study, Ambrose and Lee found an overall net loss in jurisdictional acreage, with roughly 50% of the mitigation acreage consisting of drier riparian and upland habitats that were outside "waters of the U.S." This finding was not consistent across the State. When separated by the 12 Regions and sub-Regions of the SWRCB, our habitat acreage data show that most regions yielded net gains in both overall and jurisdictional acreage (Figure 57). Consistent with Ambrose and Lee (2004), Region 4 experienced a net loss of jurisdictional "waters of the U.S.," with over half (53%) of the mitigation acreage consisting of non-jurisdictional habitat. Sub-Region 5F and the two sub-regions of Region 6 also had net losses in jurisdictional acreage, though Region 6 included just four files, and the loss for six projects of sub-Region 5F would not be apparent if all three sub-regions of Region 5 were combined. Sub-Region 5S was similar to Region 4 in that approximately 50% of the mitigation acreage (46%) was non-jurisdictional. However, unlike Region 4, Regional 5S had a net gain in jurisdictional acreage. For Region 7, 28% of the mitigation acreage was non-jurisdictional; however, like sub-Region 5S, this was in addition to net jurisdictional gains. Region 2, for which we assessed more permits than any other region, experienced the greatest "gain" in jurisdictional acreage. Sub-Region 5S had almost the same number of assessments as Region 2, and nearly as many impact acres. However compared to Region 2, sub-Region 5S had relatively low jurisdictional gains. This region also has the largest number of mitigation bank projects, and had a mean required mitigation ratio lower than Region 2 (Figure 14). Regions 5S and 7 achieved the highest cumulative gain/loss ratio of all the regions (2.91:1 and 2.90:1, respectively). Region 4 was also unique in requiring mitigation for impacts to non-"waters" habitat (coastal sage scrub and alluvial fan scrub uplands).

For three of the southern California regions, wetland acreage made up a relatively low percentage of the regulated impacts and mitigated "gains" (Figure 58). The impacts in Region 4 were mostly to "non-wetland waters" habitat (79%). In Regions 8 and 9, wetlands comprised just 45% and 29% of impacts, respectively. On the other hand, wetland habitats comprised 9%, 49% and 61% of the respective jurisdictional "gains" in Regions 4, 8, and 9. Nearly all impacts in Region 1 were to jurisdictional wetlands, and these were compensated almost entirely through comparable wetland mitigation. Region 9 had the highest overall gain/loss ratio (3.20:1), while Regions 4 and 7 and sub-Regions 5F, 6T, and 6V all experienced net losses of wetland acreage. While all Regions except 7, 5R, and 6T had some amount of upland mitigation acreage, Regions 2, 4, and sub-Region 5S were notable in this regard.

4.5. Combined Acreage, Compliance and CRAM Results

Throughout the preceding sections, we have condensed our results into simple summaries of success, partial success, and failure. Although these summaries do not reflect the richness of the full results, they simplify comparisons across different aspects of the project. Most (72-76%) of the assessed permit files were successful in meeting their acreage requirements and other responsibilities related to permit compliance, but few (19%) were considered optimal in terms of wetland condition (Table 19). Thus, permittees are largely following their permits (although one-quarter to one-third of the time these are not met), but the permit conditions that are being met are not resulting in compensatory mitigation projects that are similar to natural wetlands.

Since acreage and overall permit compliance are normally used as the primary indicators of regulatory mitigation success (i.e., post-mitigation functional evaluations are rarely performed), it is important to explicitly evaluate the relationship between these indicators and the condition of the mitigated wetland. Simply meeting acreage requirements did not ensure overall permit compliance (Figure 59; $p=0.612$, $r^2=0.002$); not only was there no overall trend, there was a wide range of compliance values for projects meeting 100% of their acreage requirement. Similarly, there was no relationship between percent acreage met and CRAM score for wetland condition (Figure 60; $p=0.169$, $r^2=0.015$). The range of CRAM conditions for projects with 100% acreage met was even broader than for compliance. Clearly, including sufficient acreage in a project, which is relatively easy to accomplish, had little influence on whether the project would be accomplished as required or if it would produce a high-quality wetland.

Although compliance with the acreage requirement was not correlated with CRAM score, general compliance with permit conditions was. Mean 401 compliance score (Figure 61; $p=0.000$, $r^2=0.126$), mean percent of 401 conditions met (Figure 62; $p<0.001$; $r^2=0.207$), and mitigation plan compliance (Figure 63; $p=0.001$, $r^2=0.150$) were all significantly correlated with wetland condition. However, the low r^2 values indicate the relationships between the variables were not very strong, with the compliance data explaining only 13-21% of the variance in the overall CRAM scores. Clearly, other factors influence the condition of mitigation wetlands, but compliance with permit conditions appears to have some influence.

Since some permit conditions are more administrative in nature while others are directly focused on mitigation site performance, it is possible that certain categories of permit conditions might have a stronger relationship to wetland condition than others. Separate regression analyses were performed to compare the four condition categories deemed the most relevant to the CRAM outcome (Figure 64). No significant relationships were found between the overall Total-CRAM scores and the mean scores for the site implementation ($p=0.219$, $r^2=0.027$), site maintenance ($p=0.297$, $r^2=0.068$), site protection ($p=0.743$, $r^2=0.005$), or success & performance standards ($p=0.052$, $r^2=0.091$) condition categories. Most of the “conditions” included in these categories came from mitigation plans, rather than the regulatory permits themselves. When additional regressions were performed just for the set of conditions found in the mitigation plans, the relationship with the Total-CRAM score became significant for success & performance standards ($p=0.024$, $r^2=0.086$). However, as with the other significant compliance relationships, the r^2 value was very low. This suggests that while compliance with performance standards is somewhat correlated with a positive CRAM outcome, the relationship is not very strong. Given the recent emphasis on success and performance standards in permitting and mitigation requirements, this latter result might seem surprising. However, the lack of a relationship highlights the fact that CRAM condition success means achieving the appropriate hydrological, physical, and ecological conditions at the site, while most performance standards are focused primarily on vegetation success. As a final test, we investigated the relationship between performance standard compliance and the CRAM biotic structure attribute scores: this is the portion of CRAM most closely focused on vegetation success. No significant results were found ($p=0.196$, $r^2= 0.042$, for average 401 compliance; $p=0.639$, $r^2= 0.006$, for average 401 percent-met). Thus, it seems safe to conclude that while compliance was weakly correlated with CRAM, adequately meeting the permit conditions, even those performance-based standards, does not guarantee the mitigation site will be a well functioning wetland. This implies the need for on-going development of more appropriate standards which will ensure a stronger connection between permit conditions and overall functional development of mitigation wetlands.

An analysis of these 143 files by permittee type (developer, industry, Caltrans, municipal, private, and state/federal) revealed notable differences in both mitigation requirements and outcomes (Table 20). As was mentioned earlier, Caltrans was distinguished from other state and federal permittees because of the large number of permits they receive and the uniformity in the types of projects involved (mostly bridge crossings). State/federal permittees had the highest mean impact acreage, were assigned among the lowest mitigation ratios, had the lowest obtained mitigation ratios, and had the lowest 401 compliance scores, though they had slightly better scores for mitigation plan compliance. Despite having lower permit requirements and compliance, state/federal permittees achieved the highest Total-CRAM scores. On the other hand, developers and industry-related permittees had lower mean impact acreages but were assigned the highest mitigation ratios, scored in the middle for permit compliance, and had the lowest Total-CRAM scores. Municipal and private entities had lower mean impacts (private had the lowest of all permittee types), while their mitigation requirements and mitigation outcomes were near the middle of the range. Caltrans projects had impact acreages near the middle of the range, but like other state/federal agencies had low required mitigation ratios, lower obtained ratios, and higher CRAM scores.

It is not clear if the regulatory agencies assign mitigation requirements differently depending on the type of applicant, or if these mitigation ratios reflect the different types of impact or mitigation projects. For Caltrans, most permitted impacts involved bridge installation and repair projects. Due to the prevalence of temporary impacts for such projects, the mitigation required was often a 1:1 ratio and involved mere vegetation plantings in the associated channel. The CRAM scores for such mitigation projects are often high because of the pre-existing conditions in the channel. Other state or federal permittees might blend their mitigation responsibilities into larger restoration objectives and their actions are not as constrained by the typical concerns of “for profit” entities.

Industry permittees stand out in Table 20 as having exceptionally high mitigation ratio requirements, up to an order of magnitude higher than some other permittee types. This was due primarily to two files. The first involved the complete relocation of a stream channel from one side of a landfill site to the other. Only the loss of the channel itself was considered impacts (2.9 acre narrow strip of "waters" with no accounting of floodplain impacts), while the mitigation requirement included the new channel plus a wide non-"waters" floodplain and the banks of the stream, for a total of 44.0 required acres (required ratio of 15.2:1). The other involved 0.035acres of impacts and 4.3 acres of mitigation, a required mitigation ratio of 122.9:1. Without these two outliers, the required mitigation ratio for industry permittees was 2.0:1 and the obtained ratio was 2.9:1. Overall, industry, municipal, and private permittees exceeded their mitigation acreage responsibilities, while developer, Caltrans, and state/federal permittees fell short.

We include in Table 20 a summary statistic calculated by multiplying each file's obtained acreage value by its respective Total-CRAM score ("Average CRAM-Adjusted Acreage" in the last row of the table). The purpose of this calculation was to qualify the mitigation acreage according to the condition of the site. For example, if a one-acre mitigation site had a 100% CRAM score, it would get "credit" for one acre. On the other hand, if the CRAM score was 50%, the site would get "credit" for only one-half acre, since its condition was not optimal. This is a simple, but relatively crude, method for adjusting raw acreages to account for the condition of the habitats produced.

Because CRAM scores were less than 100%, the Average CRAM-Adjusted Acreage was substantially lower than the simple acreage gain estimate. We reported earlier that these 143 permit files impacted a total of 217 acres of impacts and obtained 417 of mitigation acreage for an overall mitigation ratio of 1.92:1. We used the same approach of adjusting acreages by CRAM scores for these summary ratios, and the resulting mitigation ratio dropped to 1.04:1 (Figure 65). Although the mitigation ratio is substantially lower, it still indicates more adjusted acreage required as compensatory mitigation than acres lost, with the aforementioned caveat that any existing wetlands at mitigation sites are not incorporated into this ratio. Unfortunately, were not able to break these numbers down further by permanent gain and loss to jurisdictional acreage or wetlands, since this would be most relevant to the question of no net loss.

5. Conclusions

Impacts to wetlands in California are regulated by a variety of different agencies and regulations. Although the principle objective of this study was to investigate statewide mitigation success under the CWA Section 401 Water Quality Certification program, it is not possible to evaluate the success of the State's 401 Program in isolation from the actions of other agencies, particularly the U.S. Army Corps of Engineers and the California Department of Fish and Game. This is particularly true because most 401 permits "invoke" the mitigation plan for the project, which encompasses the requirements for the suite of agencies regulating the project. To a large degree, then, the findings of this project relate to the general compensatory wetland mitigation process in California.

We have organized this discussion into a series of major issues. We start with the two major components of the 401 Program we evaluated, permit compliance and wetland condition. Included in the section on wetland condition is a discussion of how permit conditions could influence the success of wetland mitigation. Next, we discuss how mitigation replaced different habitat types and differences among the different Regional Boards. We then discuss issues related to mitigation banks. The final section considers the question of whether "no net loss" is being achieved in California.

5.1. Permit Compliance

Overall, compliance with 401 permit conditions relating to compensatory mitigation was reasonably high, though by no means perfect. Using a strict interpretation of compliance as having to meet each condition to 100% satisfaction, only 46% of the files with 401 conditions met 100% of those conditions, with another 50% at least partially in compliance. On average, 73% of a project's 401 permit conditions were fully complied with. Although this percentage is fairly high, it is worth noting that the legal standard would be 100% compliance for all conditions, so fewer than half of all mitigation projects were in full compliance.

The comparable figures for mitigation plan compliance were lower, with only 16% of the files with mitigation plan conditions meeting all their permit conditions, and a mean by-file score of 68% of conditions met. Ambrose and Lee (2004) found that about 2/3 of files for the LARWQCB met 100% of their permit conditions. This value is not directly comparable to the current study, however, because the compliance evaluations of the two studies differed substantially[8]. In the current study, fully meeting all conditions is a fairly high standard, particularly considering the fact that some of the conditions were extracted from the mitigation plan. In reviewing the mitigation plan, we had to judge what was a "condition" rather than having the conditions described explicitly. In addition, in many cases there were more than 20 or 30 conditions ranging from straightforward implementation conditions to complex performance standards. Even a relatively minor shortcoming in one standard would prevent a project from achieving perfect compliance.

A more flexible way to judge permit compliance is to evaluate how well a condition was met, allowing for a fraction of perfect compliance (e.g., 75% met). The average 401 scores, according to this definition of compliance, were slightly higher than the corresponding "percent-met" scores, with a mean score of 84% across all files. For mitigation plan compliance, which includes the requirements of all regulatory agencies, the overall mean score was 81%. Regardless of which aspect of compliance was used (average scores or percent-met scores, 401 permit or mitigation plan) most projects largely met their permit requirements.

When separated by compliance category, most of the average 401 compliance scores ranged from about 76% to 85%. Conditions relating to third-party mitigation requirements (mostly acreage or credit requirements) had a high average score (around

[8] In the Ambrose and Lee study, conditions from the 401 permits that were not related to mitigation were included in the assessment and the evaluation did not include any "invoked" conditions from other permits. We altered our methods for assessing compliance in the current study to provide more focus on compensatory mitigation, at the same time examining the entire set of mitigation requirements.

99%) while monitoring and submission requirements yielded a lower average score (about 59%). Acreage requirements were usually assessable, but for the other condition categories, a significant number of the conditions (regularly between 25% and 50%) could not be determined. Many of the permit conditions did not directly relate to mitigation actions that promote proper site functioning. When those condition categories were removed from the analysis (i.e. only those conditions relating to site implementation, site maintenance, site protection, and performance/success standards included), both 401 and mitigation plan compliance scores averaged about 80%.

With compliance scores averaging about 80%, it appears that permit compliance has not been a substantial impediment to the success of compensatory wetland mitigation required by 401 certifications. While we encountered a few files with significant compliance shortcomings (13 such files were excluded from our study because the mitigation projects were never undertaken, despite project impacts), most mitigation projects met most of their permit conditions, or at least met the permit conditions we could assess.

5.2. Wetland condition

Understanding how wetland mitigation sites function is a key component of assessing whether the goal of no net loss of wetland acreage and functions has been met. In this project, we used the California Rapid Assessment Method (CRAM) to assess the condition of mitigation wetlands (as well as reference wetlands). Although CRAM is specifically designed to assess wetland condition rather than function, since it is based on a one-time “snapshot” of the assessment wetland, we view it as a reasonable indicator of wetland function.

Only about 19% of the permit files we assessed were considered successful with respect to overall wetland condition. This was based on overall CRAM score as compared to the scores of relatively undisturbed reference wetlands, with “success” identified as an overall score greater than 70% (i.e., “optimal” category). These results indicate that the vast majority of wetland mitigation projects are not resulting in wetlands in optimal condition. Although 19% is a low success rate, it is actually somewhat higher than that found in previous studies but likely due to differences in how success criteria are identified. Sudol (1996), using a different assessment method (the Hydrogeomorphic [HGM] Assessment Method), reported 0% success in wetland mitigation projects in Orange County, California. Ambrose and Lee (2004), using a previous version of CRAM, reported a very low success rate (2%) for the Los Angeles/Ventura region. Although it is possible that the statewide success rate is somewhat higher than reported by Ambrose and Lee, more likely the difference is due to Ambrose and Lee’s previous use of 80% rather than 70% as the cut-off for optimal condition, suggesting that their results for LA/Ventura are likely comparable to the current results for the entire state. CRAM is still under development and future refinements will undoubtedly occur, so it may be difficult to compare directly the early applications of CRAM. Nonetheless, it is clear that very few mitigation wetlands have the same conditions as relatively undisturbed natural wetlands.

Mitigation sites tended to have relatively high CRAM scores for the "buffer and landscape context" metrics, but lower scores for hydrology, physical structure, and biotic structure. As discussed above, some of this variation may be due to differences in the relative effectiveness of CRAM for each of these metrics, but when compared with reference site scores, median mitigation scores were substantially different across the attributes. For example, for buffer and landscape context, the median score was 72 for mitigation projects vs. 90 for reference sites; the mitigation score was 80% of the reference. For hydrology, the median score was 63 for mitigation projects vs. 91 for reference sites; the mitigation score was 69% of the reference. For physical structure, the median score was 53 for mitigation projects vs. 79 for reference sites; the mitigation score was 67% of the reference. For biotic structure, the median score was 52 for mitigation projects vs. 68 for reference sites; the mitigation score was 76% of the reference. Mitigation sites appear to do worst in this comparison for hydrology and physical structure. As CRAM is calibrated and refined, more detailed comparisons among attributes will be possible.

There was no relationship between year of certification and total-CRAM score. At least two factors might be expected to influence this relationship, and they probably work in opposite directions. On the one hand, since regulatory practice has evolved since 401 certifications (or waivers) were first issued, one might expect CRAM scores to improve over time. That is, as regulators have changed the way they reviewed projects or the conditions they added to permits in order to improve the success of the mitigation projects, these improvements should lead to higher CRAM scores if they were effective. On the other hand, one might expect older mitigation projects to score higher because they have had more time to mature and develop optimal wetland conditions. Certification date is not the same as construction date since there is a variable lag between certification and when a mitigation project is actually completed, but certification date should be a reasonable proxy for age of a mitigation project. Other studies (e.g., Craft et al. 2003) have demonstrated that wetland structure and functions increase over time since restoration. In addition, some workers have argued that monitoring should be required for at least ten years to give the mitigation wetland time to develop so that any deficiencies would be more apparent. There is a slight suggestion that the youngest mitigation sites (certification date of 2002) did not achieve as high a CRAM score as older sites; however, no other pattern is apparent. Because there was no trend in CRAM score over time, it is not clear if either – or both – of these factors were acting. However, it is clear that any improvements in wetland condition that might have been caused by improved regulatory practice were swamped by other factors.

The average compliance scores were not correlated with the CRAM scores, even when compliance with performance standards was compared to CRAM biotic structure. In other words, permit compliance did not guarantee optimal, or even high, wetland condition.

5.2.1. Permit conditions

Permit conditions guide mitigation projects to produce the types of wetlands needed to compensate for losses due to impacts. The conditions set the parameters of the mitigation project and, in theory, as long as these conditions are complied with, the mitigation project should provide appropriate compensation. In practice, compliance with permit conditions was not correlated with CRAM score, even when we considered only the conditions most directly related to mitigation performance.

Does this mean that permit conditions do not influence the success of wetland mitigation? Probably not. However, it does appear that the conditions typically included in 401 permits and mitigation plans do not ensure that the mitigation wetlands have optimal condition, even when there is compliance with the permit requirements. Although more detailed examination of the relationship between compliance and wetland condition might provide some additional insight into this relationship, the general conclusion is likely to remain: a permittee can do everything required by a 401 permit and mitigation plan yet still produce a mitigation wetland lacking important characteristics. There are three areas of permit conditions that we suggest could be improved.

First, permit conditions need to focus on a more important set of wetland characteristics. Currently, permits and mitigation plans focus largely on the vegetation component of wetlands, in particular the percent cover and survivorship of native species. Extensive planning goes into the species to plant, planting configurations, survival and growth, and prevention of non-native plant species. All of these are important. However, wetland ecosystems incorporate many aspects beyond simply plant cover, and the production of a well-functioning, sustainable wetland requires broader consideration (Ambrose 1995). Permit conditions should focus on the full suite of wetland functions and services (see Section 6.1.1).

In general, the metrics incorporated into CRAM could serve as an initial guide to the types of wetland characteristics addressed by 401 permits. These metrics were selected by an experienced group of wetland experts to reflect wetland condition hence and they reflect the suite of characteristics a wetland should posses in order to have optimal condition. CRAM metrics do not include all aspects of a wetland that should be considered in permit conditions, however. Regulatory staffs should explicitly consider the functions and services lost at the impact site and ensure that the mitigation actions to be taken adequately compensate for those losses, so that the "no net loss" goal can be achieved (Ambrose and Lee 2004).

Second, permit conditions should support closer tracking of jurisdictional losses and gains. In previous work in Region 4 (Ambrose and Lee 2004), we found that jurisdictional habitats (those within jurisdictional "waters of the United States), were being replaced with non-jurisdictional habitat, with the net effect of a loss of jurisdictional habitats. The current study confirmed that result for Region 4, but did not find an overall net loss of jurisdictional habitat statewide. Nonetheless, 401 certifications are rarely clear and precise about the types of habitats being impacted and replaced through mitigation. If a simple habitat classification scheme (e.g.,

Table 2) was used consistently in 401certifications, file documents, and the database, the accounting between habitat types impacted and created, restored, enhanced, or preserved through mitigation would be much clearer. This would help ensure that permit conditions will require compensation appropriate to the permitted impacts.

Finally, wetland mitigation might be improved if 401 permits included more conditions concerning the implementation and protection of mitigation projects and specifying success criteria/performance standards. Remarkably few permits included these types of permit conditions, and even when they were included in a permit, there were not many separate conditions specified.

5.3. Changes in habitat types and acreage

In previous assessments of the success of wetland mitigation projects, there has been little consideration of the fact that the habitats under consideration vary in their regulatory status. To remedy this problem, in Ambrose and Lee (2004) we distinguished between different types of habitats, and especially between jurisdictional and non-jurisdictional habitats, which allowed us to investigate “no net loss” with respect to acreage and individual types of wetland habitat. In the present study, we again evaluated impacts and mitigation according to the different types of habitats they affected.

Our jurisdictional habitat evaluations demonstrate that, while essentially 100% of the regulated acreage losses were to jurisdictional waters of the United States (including wetlands, jurisdictional riparian habitats and other non-wetland waters), almost 30% of the mitigation “gains” involved riparian and upland habitats that were not jurisdictional “waters.” After isolating the jurisdictional waters portion of the mitigation acreage, the resulting overall gain (permanent losses versus creation gains) still gave an overall mitigation ratio of 1.4:1, but when the individual files were considered, only 36% had net acreage gains, 17% replaced their acreage exactly, and 47% of the files resulted in net acreage losses. This issue appears to be particularly important for riparian habitats, where there are wide-ranging definitions of wetland/upland boundaries used across agencies, and in a regulatory versus ecological context.

For wetlands specifically, more acres were created than impacted. Forty percent of individual files resulted in net acreage gains (permanent losses/creation mitigation) and 28% resulted in net losses of wetland acreage. Our estimates of wetland habitat at mitigation sites represent the best-case scenario because we assumed no existing wetland acreage at the mitigation sites and we did not apply a strict three-parameter test. More acres on non-wetland waters were also created than impacted. Seventeen percent of individual files resulted in net acreage gains and 46% resulted in net losses. Thus, for both jurisdictional wetlands and non-wetland waters, our results indicate that there has been a net gain in acreage overall. However, a quarter to a half of all individual files still failed to replace fully the acres lost.

This study confirms the findings of Ambrose and Lee (2004) that overall, the cumulative acreage of compensatory mitigation projects exceed the cumulative impacts. However, within the Los Angeles/Ventura Region, our previous study found that over half the mitigation acreage consisted of drier riparian and upland habitats that were outside jurisdictional waters of the U.S. In this study, we found that, while there was substantial non-waters mitigation acreage, this was over and above the net gains of jurisdictional acreage that were obtained.

Although acreage is an important component of the goal to have "no net loss" of wetlands, the goal also encompasses wetland functions. The achievement of "no net loss" of wetlands is discussed further in Section 5.6.

5.4. Differences among regions

We found no significant differences in permit compliance among SWRCB Regions. There was a hint in the data that Regions 8 and 9 might have slightly higher average 401 compliance scores, and Regions 2 and 3 slightly lower, but these differences were not significant.

We discovered that some Regional Boards (e.g., Regions 4 and 9) considered shading for bridge/crossing projects to be a permanent impact, while others (e.g., Region 5) considered only the actual bridge footings as permanent impacts with no mitigation required for shading except for bridges that were very low relative to the stream/floodplain elevation.

With respect to mitigation wetland condition, some regional differences were apparent. There was little difference in Total CRAM scores among the regions with large sample sizes, except that Region 2 had a slightly lower mean score than some of the other regions. Differences in proportions of mitigation files in optimal, suboptimal, or marginal/poor condition were more distinct. The underlying cause(s) of the regional differences in mitigation wetland conditions are not clear. There was a slight (non-significant) indication that Regions 2 and 3 had lower compliance scores, but this seems unlikely to explain the differences since Region 3 was typical in its distribution of wetland conditions and overall there was no relationship between compliance and wetland condition. Differences in the geographic distribution of different wetland types might explain at least part of the difference. Region 2 had more depressional and estuarine wetlands, which had the lowest mean CRAM scores, than other regions. In addition, Region 2 includes a major urban area, which seems likely to constrain many of its mitigation projects. Region 4 also includes a major urban area; although its proportion of optimal sites was higher than Region 2's and its proportion of marginal/poor sites was not as high, Region 4 did have more marginal/poor sites than some of the other regions. In contrast to the slightly lower scores we found, previous work by Breaux et al. (2005) for 20 mitigation sites in Region 2 found relatively high condition scores using the WEA method. Differences in the two studies could be due to differences in the sites sampled (5 of the 20 sites studied by Breaux et al. were selected nonrandomly, whereas all of our sites were selected randomly) or methodology (e.g., WEA appears to result in consistently higher scores than CRAM).

There were regional patterns in mitigation acreage requirements. While most regions experienced net gains in acreage, sub-Regions 5F and 6T had net losses, though both of these had relatively few permit file evaluations. The acreage for just two regions (Regions 2 and 8) exceeded the cumulative mitigation requirements, while the remaining regions fell short of their respective requirements. Compared to other regions, Regions 7 and 8 stood out as having relatively high cumulative impact acreages given the number of permits involved. Region 7 had one file involving particularly large impacts. This result for Region 8 is especially noteworthy since that Regional Board had required the lowest cumulative mitigation ratio (1.15:1). Regions 2, 5S, and 7 had required the greatest cumulative mitigation ratios.

Interestingly, the results for Region 4 were consistent with the Ambrose and Lee (2004) study, in that over half that region's mitigation acreage (53%) consisted of non-jurisdictional riparian and upland habitats. While Region 4 had a small net gain in acreage overall, there was a net loss in jurisdictional acreage (14.6 acres lost, or 40% of the acreage not replaced). Region 8 and Sub-Regions 5F, 6T and 6V also experienced net losses of jurisdictional acreage. Region 4, 8, and 9 were the only regions requiring fewer jurisdictional acres of mitigation than impacted. Sub-Region 5S was similar to Region 4 in that approximately 50% of the gains were non-jurisdictional, though in this case, it was over and above a net gain in jurisdictional acreage. For Region 3 and sub-Region 6V, the proportion of non-jurisdictional habitat was around 31% and 38%, respectively, of the total obtained mitigation acreage, and for all other Regions and sub-Regions the non-jurisdictional acreage was 30% or less.

5.5. Mitigation banks

Our results indicate that compensation at mitigation banks yielded slightly higher, though non-significant average CRAM scores than project-specific mitigation (see Appendix 9). The lack of statistical significance could be due to differences in sample size between mitigation types (formal banks, informal banks and project-specific mitigation) and the wide range of habitat types which increased variation within each mitigation type, as well as any natural variation in these responses. For CRAM, the largest differences between banks and project-specific mitigation projects were in the hydrology and buffer/landscape context attributes. There were no differences in physical and biotic structure attributes between banks and project-specific mitigation. Given the importance of hydrology for mitigation wetlands, as noted above, our results indicate that banks should continue to be evaluated as a potential improvement to the mitigation process. There are a number of likely benefits associated with the consolidation of habitats in mitigation banks, and while our results do not show a strong difference in CRAM scores, the trends are informative.

Ideally, a more focused evaluation of banks should be designed to compare a similar number of bank and file-specific projects of similar habitat classes within a particular region. This would reduce outside variation in CRAM scores, or other functional measures, and provide a more definitive comparison of the relative effectiveness of mitigation banks. However, given the actual distribution of mitigation bank projects within the state this could be difficult. We found that most banks were clustered in the Central Valley, with a small number of banks being developed in the Santa Rosa area, and others found sporadically around the state. A focused study within the Central Valley is most likely to yield high sample sizes. Similarly, banks vary in terms of habitat types, with most focusing on depressional, vernal pool, and riparian wetlands. There has not been clear distinction in some banks to differentiate vernal pool mitigation from other depressional wetlands. More consistent classification in this regard would be useful for future assessments of banks and other mitigation projects.

Although CRAM scores include aspects of biogeochemical functions, suggesting that mitigation banks are performing these functions adequately, they do not consider the geographic distribution of those functions. Mitigation policy has traditionally prioritized on-site mitigation over off-site mitigation, but the putative benefits of mitigation banks have many agencies reconsidering this prioritization. However, some wetland functions may not be replaced on a regional basis as effectively as others. In particular, water quality improvement, such as nutrient recycling or pollutant removal, provide an important service to a local watershed, and creating a similar function in a distant watershed does not seem the same. This may be especially relevant for mitigation banks in relatively undeveloped areas. In those cases, there will be relatively little gain in water quality improvement because water quality will already be good. In contrast, the loss of water quality improvement services at the impact site could be substantial from some developments (such as a residential development). When focusing on this one service, other mitigation strategies in the same watershed as the impact, such as removal of concrete lining from a channelized stream, might provide a better balance to the loss of water quality improvement services while maintaining geographic proximity to the impact (see Recommendations 6.1.2 and 6.1.5).

5.6. Evaluating "no net loss"

Our results indicate that, statewide, the overall acreage of compensatory mitigation projects has exceeded the wetland and other jurisdictional acreages impacted (see Section 5.3). Although the overall mitigation acreage exceeded the overall impacted acreage, a substantial portion of the files resulted in net acreage losses. In addition, the wetter jurisdictional areas lost were frequently replaced by drier riparian and upland habitats.

A separate question is whether wetland functions are being replaced. Despite the obvious importance of assessing compensatory mitigation in terms of wetland functions, there have been remarkably few functional assessments in a regulatory context. In part, this may be due to the lack of a standard method for such assessments. There is a long history of wetland evaluation methods being developed for regulatory purposes, but most methods have had severe limitations. The Hydrogeomorphic (HGM) Assessment Method was developed specifically to address many of these limitations, and it is well suited for functional assessments in a regulatory context. In fact, Sudol (1996) used an early version of the HGM Assessment Method to evaluate Section 404 mitigation sites in Orange County. However, HGM requires regional models for each wetland type, and many compensatory mitigation projects in California would not have had an appropriate model available to assessment them. The California Rapid Assessment Method (CRAM) is being developed to fill the need for a simple method to assess wetland condition (as a proxy for function) at a wide range of wetland types in California. In this study, we used CRAM as an indication of the functioning of wetland mitigation sites.

A more fundamental problem with assessing no net loss of wetland function is the study designs available for use. Functional assessments conducted at a mitigation site years after the mitigation was completed, such as we had to do, cannot indicate whether the policy of "no net loss" has been achieved. Determining the change in function requires measuring function at the impact site before and after impact to assess loss of functions, and at the mitigation site before and after mitigation to assess gain. Such an approach is not possible in an after-the-fact assessment such as the present study; in fact, we know of no large-scale survey that has been able to adopt this approach.

Although our assessments of the current condition of the mitigation sites indicate whether the ultimate outcome of mitigation actions resulted in a high quality/functioning wetland, our data cannot address how much of the quality/function was *caused by* the mitigation action. It is likely that all current "function" was not attributable to the mitigation activities; in many cases, this was certainly the case. For example, many mitigation actions consisted of simple vegetative enhancements to pre-existing stream habitats and other "creation" projects involved slight enlargements of existing wetlands. Had comparative CRAM evaluations been done at these mitigation sites *prior* to the mitigation actions, many of the resulting scores might have been no different than our post-mitigation assessments. This would be especially true for hydrological and biogeochemical function, since most mitigation efforts focused on improving vegetation. In addition, in our decision about how to score sites that were adjacent to existing streams but did not include any actual stream habitat, we decided to give the mitigation site credit for the existing channel; although these sites were physically and hydrologically connected to the channel, in no way did they "create" those functions the CRAM scores credited them with. Despite the many cases where it was clear the mitigation actions did not create all of the wetland functions at the site, we could not assess how much gain in function might have occurred due to the mitigation actions because we had no comparable data on the pre-existing functions at each mitigation site. Similarly, we had no information on the loss in function caused by the impact site. With neither an assessment of gain nor an assessment of loss, a rigorous evaluation of no net loss is not possible.

In our study of mitigation success for the Los Angeles/Ventura region, we tried to evaluate "no net loss" directly by assessing the beneficial wetland services lost due to project impacts and gained through the mitigation actions (Ambrose and Lee 2004). Through site visits and careful review of files, we gained insights as to the nature of the functional losses and gains. Through our resulting structured qualitative assessment, we determined that over half of the mitigation projects (66%) failed to compensate adequately for the full suite of beneficial services lost through the project impacts. Unfortunately, time constraints prevented us from performing a similar assessment in the present study. However, our anecdotal observations suggest that the results would have been similar if we had performed the same qualitative assessment.

Although a rigorous assessment of no net loss is not possible in this study, the relatively low CRAM scores do suggest that the mitigation sites are not functioning as well as they could be. Since our reference sites were representative of the types of habitats that would have been impacted by the Section 401 projects, and the condition of the mitigation sites was considerably lower than the condition of the mitigation sites, it seems likely that the mitigation actions were not fully compensating for the functions lost at the impact sites. Our understanding of the 401 projects we evaluated is consistent with this conclusion. However, this conclusion remains unconfirmed pending a study using the proper study design.

6. Recommended Administrative and Regulatory Changes

The recommendations are separated into five main categories (Table 21). First, we present recommendations aimed at improving mitigation requirements. These recommendations concern mainly permit conditions, but also issues of the location of mitigation projects and how gains and losses associated with a project are tracked by habitat. Second, we present recommendations under the general heading of Information Management. These recommendations concern improvements to the database (either the existing database, or a modified database), improvements to permit archiving, and improvements to tracking the progress of mitigation projects. Third, we present recommendations to improve the clarity of permits. Fourth, we recommend that the goal of "no net loss" be assessed in a more effective manner. Finally, we present recommendations concerning coordination with other agencies.

To the extent possible, we have tried to ensure that the recommendations included in this section stem directly from the work done under contract to the SWRCB[9]. However, our previous study for the Los Angeles Regional Water Quality Control Board (Ambrose and Lee 2004) had a similar goal, and we produced an extensive series of recommendations in a Guidance Document to the LA Board (Ambrose and Lee 2004b); there are inevitably many similarities between those recommendations and the recommendations presented here. In addition, we acknowledge the influence of many other studies of mitigation effectiveness (e.g., Allen and Feddema 1996, Breaux and Martindale 2003, Breaux and Serefiddin 1999, Breaux et al. 2005, DeWeese and Gould 1994, Kentula et al. 1992, Race 1985, Sudol 1996, Zedler 1996), as well as comments by State and Regional Board staff.

Although the recommendations presented below are based on work done during this project, early results and recommendations were discussed with State Board staff. In addition, there are other ongoing efforts to improve processes associated with the 401 Program. Thus, a number of these recommendations are already being implemented or are planned for implementation in the near future. For example, two database efforts, the California Integrated Water Quality System Project (CIWQS) and Wetland Tracker, would incorporate some of the information requested in some of these recommendations.

6.1. Improving Mitigation Requirements

The success of compensatory mitigation depends fundamentally on the mitigation requirements specified by the regulatory agencies. Our study found relatively high levels of compliance with mitigation permit conditions. In addition, there was no relationship between compliance with permit conditions and the condition of wetland mitigation sites. It appears that compliance with permit conditions is no guarantee that a mitigation wetland will have high condition or function. Perhaps the most effective way to improve the success of compensatory mitigation would be to include permit conditions that lead to better mitigation projects.

[9] Thus, this is not an exhaustive list of how we think mitigation practice could be improved, but rather represents recommendations addressing issues we encountered during the present study.

6.1.1. Permit conditions should ensure complete compensation for the full suite *of wetland functions and services lost.*

Wetland functions include a broad range of physical and biological processes. Many of these functions, such as flood water attenuation, groundwater recharge, water quality improvement (i.e., pollutant removal), and support of wildlife, provide valuable services for humans. To ensure that compensatory mitigation provides full compensation for lost wetland functions and services (also called values), discussion of project impacts and mitigation should be framed in terms of functions and services.

Note: in this section, “wetland” is used in the broad, non-regulatory sense as a shortcut to the regulatory terms “waters of the United States and adjacent wetlands.”

6.1.1.1. Permit conditions should place more emphasis on performance standards

401 permits include conditions addressing various aspects of compensatory mitigation projects, one of which concerns the performance of the mitigation project. We found that the number of success and performance standard conditions included in most 401 permits was relatively limited; only 15% of all permit conditions related to mitigation addressed success or performance standards. Thus, the basis for determining whether the mitigation project is successful is mostly not specified in the 401 permit; instead, performance standards are contained in other permits (e.g., 404 or 1600 permits) or the mitigation plan.

In many cases, other permits or, especially, the mitigation plan may be an appropriate location for performance standards. For example, the details about a particular mitigation project are often not known until the mitigation plan is produced. However, the absence of particular success criteria or performance standards in the 401 permit leaves the Regional Boards with less explicit input into the nature of the mitigation project. If the Regional Boards want to emphasize particular elements of the mitigation project (for example, see Recommendation 6.1.2), the 401 permit is the most effective place to require these.

6.1.1.2. Performance standards should include hydrological and biogeochemical conditions as well as vegetation

When performance standards are included in 401 permits, they often focus on aspects of vegetation or invasive plants. We do not recommend that fewer performance standards be required concerning native vegetation or invasive plants. In fact, the current attention on vegetation and invasive plants is well-founded on scientific studies of mitigation success.

Despite the importance of vegetation and invasive plants, there are other important wetland functions that should be included as performance standards (see Section 2.2). General summaries of wetland functions, as well as functional assessments such as the Hydrogeomorphological (HGM) assessment method, include hydrology, biogeochemistry[10], and ecological functions. Permit conditions, however, rarely focus on hydrology or biogeochemistry. In addition, performance standards should include conditions that cover different ecological scales, such as population, community, and ecosystem conditions (Ambrose 1995). For example, at the population level performance standards could require successful reproduction for key species (especially habitat-forming species such as trees) to ensure sustainable populations.

Although we found that, in general, hydrological and biogeochemical functions of wetlands were not addressed as completely as they should be in permit conditions, the necessary focus depends on the specific circumstances. In some cases, vegetation standards may need greater emphasis. Some trends were apparent for different wetland types. For example, "riparian" mitigation tended to be focused too heavily on vegetative plantings without appropriate hydrological improvements, while "seasonal/depressional" mitigation tended to involve excavation and seeding without enough plantings.

6.1.2. Ensure that mitigation projects compensate for losses in water quality (pollution) improvement services

Wetlands can remove pollutants, including excess nutrients, metals and bacteria, from water flowing through the wetland. This service is frequently cited as a key benefit of wetlands. Given the focus of Section 401 of the Clean Water Act on water quality, the pollutant removal capabilities of wetlands should be considered explicitly in 401 permits. This may best be achieved by having a separate analysis for impacts to water quality and how each of those impacts would be mitigated. (We use "water quality" here in the general sense relating to pollutants in water, rather than in the broader regulatory sense.)

Water quality services provided by natural wetlands may be replaced incidentally by the compensatory mitigation projects that are typically required by 404 and 401 permits. However, without a specific consideration of these services, it is impossible to know if these services are replaced fully. Systematic consideration of the effects of different mitigation alternatives on water quality may lead to a shift in priorities for mitigation for the Regional Boards. For example, treatment wetlands are often discouraged as a form of mitigation because ostensibly pristine wetlands could be replaced by urbanized wetlands with high pollutant loads. This may be a valid point from the perspective of ecological function, and a high-quality wetland may be required to mitigate impacts to ecological functions. But from the perspective of pollutant removal, treatment wetlands may be ideal for compensating for impacts to water quality.

We discuss three examples where water quality services are especially likely to be overlooked.

First, the compensatory mitigation projects we studied focused largely on the provision of habitat, and the upper, drier riparian habitat that is commonly a part of compensatory mitigation projects (see Section 4.4.1, Figure 54) provide relatively little

[10] Wetland biogeochemical functions include processes that transport or transform different materials (see Section 2.2.2 for more detail). The breakdown of organic material and nitrogen cycling are two common biogeochemical functions. These functions support important services such as removal of nutrients or contaminants from water.

water quality benefit. While such habitats may replace many of the lost functions in the broader regulatory sense of “water quality,” they may not replace the functions that remove pollutants. To ensure the replacement of lost water quality improvement services, it may be necessary to add elements to mitigation projects in addition to the normal conditions focusing on habitat replacement. For example, a portion of the mitigation wetland near the water inflow point(s) might incorporate design features used in such as treatment wetlands, or treatment wetlands might be required outside the boundaries of the wetland used for general mitigation. It may be appropriate for the Water Board to require treatment wetlands for all large development projects to ensure that the permitted projects do not result in water quality impairment (i.e., pollution).

Second, a specific analysis of water quality aspects might alter the mitigation required for some projects concerning “low quality habitat.” The term “low quality habitat” may be appropriate when considering the value of a habitat for plants or animals. However, from the perspective of water quality, such habitats may have significant water quality improvement function. For example, channels surrounded by development can have high potential for water quality remediation. Mitigation for impacts to “low quality habitat” tends to be limited because of the focus on habitat, but such mitigation may not adequately replace the water quality improvement functions performed by the original habitat. The Water Board should be careful to ensure that all functions performed by “low quality habitats,” especially water quality improvement functions, are fully replaced.

Third, mitigation banks may be effective tools for replacing lost habitat functions, but, as currently designed, they may not provide adequate compensation for water quality impacts, particularly for services such as floodwater attenuation and pollutant removal. For many wetland functions, maintaining the function in the same region may be appropriate. The loss of water quality improvement functions or floodwater attenuation in a local reach may have far-reaching local consequences, however, which would not be compensated by a mitigation bank in a different location (see Section 6.1.5).

6.1.2.1. Projects involving channelization, the installation of concrete linings, and cut and fill operations resulting in large scale drainage modification/culvert installation should be discouraged.

When a stream segment is channelized, lined, or culverted, the hydrological, biogeochemical, and ecological functions and services lost are very difficult to mitigate. While this has been widely recognized and stream "improvements" are now discouraged, such projects are still occuring, often because the surrounding area is already urbanized and the stream is considered degraded and consisting of "low value habitat." This may be an accurate assessment with respect to ecological functions and services, however, such streams can be extremely beneficial with respect to water quality improvement (notably water pollution remediation). Large scale development projects with drainage modification can have particularly high net water quality impacts because the loss of water quality function is coupled with increased runoff and pollution input.

6.1.2.2. Promote channel daylighting and complete channel restoration projects (concrete removal) as compensation for biogeochemical impacts.

One reason that losses of stream function are difficult to mitigate is that one cannot easily create stream systems in previously upland habitats. Most projects that called for riparian creation were, in fact, riparian vegetation projects within upland areas with little or no alteration of site hydrology. Some mitigation projects have attempted to create stream function by widening existing streams, or by creating side channels in upland areas that are fed by water diversions. Such projects can result in limited functional gains.

In our previous study (Ambrose and Lee 2004), and again in the present study, we found that complete channel relocation and/or restoration projects, especially those involving the removal of concrete linings, can result in significant gains in hydrological, biogeochemical, and ecological functions and services. In urban setting (where concrete-lined channels often occur), habitat values can be limited due to buffer landscape context issues. Nonetheless, channel relocation/restoration projects can still provide substantial ecological functions and services, as well as providing mitigation opportunities in a setting where such opportunities can be limited.

Although channel daylighting or complete channel restoration could open up new opportunities for replacing lost stream functions, such projects could be quite expensive and thus might not be feasible for all permittees. Large developers might be able to undertake projects such as these on an individual basis. In addition, mitigation banks could be developed to enable the benefits of channel daylighting or complete channel restoration to be realized even for relatively small individual projects. Mitigation banks have many advantages over permit-specific mitigation, but most existing bank projects have been focused on ecological functions and services, namely habitat for threatened and endangered species. Because the benefits they can impart to water quality improvement, and "no net loss" in general, the SWRCB should promote the development of mitigation banks involving full channel restoration (including dayighting and the removal of concrete linings). Channel daylighting and complete channel restoration might have relatively limited benefit if conducted in only small areas; mitigation banks would provide a mechanism for pooling efforts to achieve a more meaningful project.

6.1.3. There should be a better accounting of the habitat types lost and gained.

Permit documents should use a standardized habitat classification. Currently, the Section 401 Draft Guidance document indicates that five different waterbody types should be used in the Project Information Sheet: wetland, riparian, streambed, lake, and ocean. (For each waterbody type, the Guidance document indicates that acres of permanent and temporary impacts should be recorded.) Although these are all generally recognized waterbody types, our review of impact and mitigation projects suggests that a somewhat different classification could make it easier to track mitigation of impacts to jurisdictional habitats, which is an important step towards determining whether the goal of no net loss of wetland area and function has been achieved.

"Riparian" is a particularly problematic term. Impacts and mitigation concerning riparian habitats need to be more clearly defined to ensure that non-jurisdictional areas are not used to mitigate for jurisdictional impacts. The 401 Draft Guidance document defines riparian as "stream or lakeside jurisdictional water (below line of normal high water), vegetated, but not jurisdictional wetland (may be either wet or dry most of the time)." This definition seems to clearly restrict the use of "riparian" to jurisdictional waters, as is appropriate for regulatory use with respect to 401 and 404 permits. Impacts are generally delineated according to this definition, although occasionally we found that the entire jurisdictional area, including the stream itself, was termed "riparian." However, mitigation planners have regularly applied a more ecological definition of "riparian" that includes both jurisdictional and non-jurisdictional habitat. Permits and mitigation plans seldom distinguish between these two habitat types. Thus, a non-regulatory definition of "riparian" is often being used in a regulatory situation. As a result, impacts to jurisdictional riparian habitat have often been compensated for by mitigation within non-jurisdictional riparian or even upland areas, resulting in a net loss of jurisdictional riparian acreage and values.

A more useful terminology would clearly distinguish between areas classified as waters of the United States versus areas that are not waters of the United States (for example, see Table 22). These main categories are distinguished based on regulatory considerations. Within each of these main categories, appropriate general habitat classifications are identified. These categories are based on those currently presented in the 401 guidance (and, in fact, those exact categories could be used if desired). The categories presented in Table 22 reflect the types of habitats frequently named in wetland permit documentation, as well as general types of wetlands recognized by wetland scientists.

Besides standardizing the way habitats are described in wetland permits, Table 22 provides a structure for tracking the areas of losses due to permitted impacts and gains from mitigation. The losses and gains (in acres and/or linear feet) should be recorded for wetland/riparian creation, restoration, enhancement, preservation for each of the habitat types, including transitional habitat and upland buffer areas.

6.1.4. Mitigation projects should have appropriate landscape context

One of the clearest differences between the CRAM evaluations of compensatory mitigation wetlands sampled in this study and their reference wetlands was their landscape context. In CRAM, landscape context contains four metrics, one for connectivity and three related to the amount and quality of the buffer around the wetland. The CRAM manual defines these concepts as:

> The **connectivity** of a wetland refers to its potential to interact with other areas of aquatic resources, such as other wetlands, lakes, streams, lagoons, etc., and their surrounding environs at the watershed or embayment scale, and to the likely relative importance of the wetland in the landscape context. Wetlands within a watershed or in the same embayment are often functionally connected by the flow of water, such that they have an

> additive influence on the timing and extent of flooding, filtration of pesticides and other contaminants, and the movement of wildlife.
>
> For the purpose of CRAM, a **buffer** is a zone of transition between the immediate margin of a wetland and its larger environment that is likely to help protect the wetland from anthropogenic stress. Areas adjoining wetlands that probably do not provide protection are not considered buffers. Buffers can protect wetlands by filtering pollutants, providing refuge for wetland wildlife during times of high water levels, acting as barriers to the disruptive incursions by people and pets into wetlands, and moderating predation by ground-dwelling terrestrial predators. Buffers can also reduce the risk of invasion by non-native plants and animals, by either obstructing terrestrial corridors of invasion or by helping to maintain the integrity and therefore the resistance of wetland communities to invasions.

Mitigation wetlands frequently had poorer buffers and/or connectivity to adjacent wetlands (especially for riparian habitats). Because buffers and connectivity relate to conditions outside mitigation project boundaries, they may not typically be considered carefully in mitigation planning. However, poor buffers or low connectivity will adversely affect the functioning of a mitigation wetland. Mitigation projects should be planned with adequate buffers and functions.

While adequate buffers and adjacent open space are extremely important for wildlife and other ecological functions and services, they may be less important when the purpose of the mitigation site is focused on flood control and water pollution remediation.

6.1.5. Offsite mitigation should be within the same catchment, or at least the same watershed.

While some functions can be replaced in another watershed, other functions (such as water quality improvement, floodwater retention, habitat connectivity) cannot. When mitigation occurs outside the catchment in which the impact occurs, some functionality in that system is lost. In some cases, mitigating those losses in a nearby catchment in the same watershed would provide adequate compensation for downstream impacts. For example, if impacts to a wetland reduces its ability to attenuate floods, then mitigation in the same catchment would provide the most appropriate compensation, but mitigation somewhere else in the same watershed would at least provide similar protection against downstream flooding.

The problem of mitigation occurring outside of the catchment or watershed in which the impact occurred is especially prevalent with third-party mitigation. As discussed earlier (Section 5.5), mitigation outside the watershed, as occurs with many mitigation banks, may be especially problematic because the mitigation may occur in relatively undisturbed watersheds where these services may be less important.

6.2. Information Management Recommendations

In this section, we discuss recommendations to improve the management of information associated with 401 permits. The performance of this study revealed the difficulty of retrieving specific permit files. Of the 429 files we sought, we could locate only 257. The difficulty in locating files had a variety of causes, ranging from limitations in the database to the physical management of hardcopy permit files. This section also includes recommendations designed to improve the ability to track the progress of mitigation projects.

6.2.1. Improvements to Database

Our review of mitigation projects depended on information from the SWRCB database for project identification. We used the database to select projects indicating compensatory mitigation requirements, and using the project information contained therein, attempted to identify and locate the physical permit files at either the Regional Boards, or Corps district offices. During the course of our extensive work with the database, we identified a number of areas that could be improved.

Note: Recommendations 6.2.1.1to 6.2.1.4 can be implemented with the existing database. Although the existing database contains fields for the most important information concerning 401 permits, we have identified some areas that could be improved. These improvements would require that the database be modified, as reflected in Recommendations 6.2.1.5 to 6.2.1.11.

Also note that, as an early action response to the preliminary findings of this study, the SWRCB began documenting ACOE file numbers in the database (Recommendation 6.2.1.2) in May 2005. To enhance data quality, file numbers are being entered duplicatively, discrepant field values are rechecked (Recommendation 6.2.1.3), and full project titles are being entered (Recommendation 6.2.1.1). In addition, we recommend a number of additional fields be added to the database. Many of the fields recommended are included in the California Integrated Water Quality System (CIWQS), an agency-wide data management system now being deployed that will store all water board data, and in "Wetland Tracker," which Region 2 hopes to begin requiring soon as a permit condition in a pilot program.

6.2.1.1. Full project titles should be entered into the database

The location of permit files was much more arduous than expected because the information in the State Board database was not sufficient to identify a unique project in the Regional Board's or Corps of Engineers' respective databases. Generally, the project title was abbreviated, and therefore, lacked many relevant key words that would have facilitated cross referencing with other databases.

6.2.1.2. Additional critical information should be included within the "notes" field

Much additional information is available in the 401 permit that would have been useful in the cross-referencing and identification of files using the Regional Board's or Corps's respective databases. Information such as the Regional Board's permit ID number, the Corps' 404 number, other agency permit numbers, and the county should be entered in the "notes" field of the database.

Note: if the database is modified as recommended, it would include this information as database fields; see Recommendation 6.2.1.6. However, there is no reason to wait until the database is modified to begin entering this information. The 401 guidance document indicates this information can optionally be included in the "notes" field.

6.2.1.3. Each permit should be assigned a unique numeric or alpha-numeric identifier to be used by both the Regional Board and the State Board.

While most Regional Boards assign each project a project identification number, their numbering formats are not compatible with centralized use by the State Board. Hence, these identification numbers have not been included in the State Board's database. A consistent statewide format should be implemented and the State Board's database should include a field for these primary identification numbers.

Note: if a centralized database is developed as recommended (see Recommendation 6.2.1.5), a single permit identifier would naturally be assigned because both the Regional and State Boards would use the same database. However, there is no reason to wait until a centralized database is developed to assign a unique identifier.

6.2.1.4. Database records should be entered using a quality assurance protocol.

As would be expected in any extensive data entry project, there were a number of mistakes in the State Board database entries. A quality assurance protocol should be established to double-check entries. This would included, at a minimum: (1) checking whether the permit represented a modified or re-issued certification to avoid redundant data entry, (2) ensuring that all permanent and temporary impact to wetlands and non-wetland waters are included and that these are inputted into the correct fields per the established protocol (see Recommendation 6.2.1.8), and (3) checking entries for typographical errors. In many quality assurance programs, a certain percent of the entries (e.g., 10%) are checked independently for accuracy. This protocol would have to be integrated into any future changes to data entry methods.

Although pure entry errors occurred, some database entry errors were due to misinterpretations of the permit information caused by ambiguous wording or the difficulty of having to extract important information that was embedded in the text of the permit (see Recommendation 6.2.2).

6.2.1.5. A central database should be developed for use by both RWQCB and SWRCB to avoid redundant data entry.

Currently, the State Board maintains a database for information from all 401 certifications, and some Regional Boards maintain their own independent databases. There is a lack of correspondence between the fields in the Regional Boards and State Board databases. In addition, since much of the information required by the State Board is the same as required by the Regional Boards, there is unnecessary duplication of effort to maintain a series of independent databases.

6.2.1.6. Database records should include fields for all critical information from a permit, and those fields should be adequately populated for every permit

Within the State Board database, project descriptors were often abridged versions of the full titles found in the certification letters, and the county and other agency permit numbers were usually absent. With such limited information, it was difficult to identify and locate the physical permit files at either the Regional Board or Corps offices using their respective databases. The Section 401 Draft Guidance document specifies "to facilitate cross-referencing, include the U.S. Army Corps of Engineers' (Corps) file number if it is available (Optional)." In practice, we found few files with the corresponding Corps number included. The database should included fields for the 404 permit number and the numbers of other agency permits including the Department of Fish and Game's 1600 permit and the Fish and Wildlife Service's Biological Opinion. In addition, a field should be included for the county and the permittee's consultant (if relevant). In the draft 401 guidance document, information such as this is identified as optional additional information that may be added at the Region's option; we feel that critical administrative details, such as county and other agency permits, should be required fields in the database.

Additional fields could also be useful in the database. For example, information fields for file attachments for permits, pre- and post- mitigation photos, and so forth would provide a broader view of the project. This information would be useful for later compliance evaluations, and might be entered by the permittee if electronic form submission is adopted (Recommendation 6.2.1.10).

Having full project titles, county of project, and other agency permit numbers would greatly simplify any future efforts to evaluate the 401 program. Perhaps more importantly, though, it would ensure that each project is unambiguously identifiable. Clear identification of projects would be important for any action that needed to check project characteristics, including enforcement actions and (when the database has such capabilities) tracking mitigation monitoring or other compliance activities (such as paying in-lieu fees).

6.2.1.7. Include GPS locations for the impact and mitigation sites in the SWRCB database

The 401 draft guidance indicates that latitude and longitude information would be useful for GIS analysis of impact (discharge) locations; this information is listed as optional. With the ready availability of inexpensive GPS instruments, latitude and longitude should be required for all permits, for both the impact and the mitigation sites. As a minimum requirement, a single point location could be recorded for impact and mitigation site (or each of the mitigation sites, if more than one).

Ideally, a survey-grade GPS would be used to determine the boundaries of impact and mitigation sites. Recent technological advances have made survey grade GPS units relatively affordable, and it would be reasonable to expect all future projects to provide an electronic GIS shape file with the specific boundaries of the mitigation project. This information could be submitted for GIS mapping and analysis by Regional or State Board staff. It would simplify the assessment of compliance with acreage permit conditions.

6.2.1.8. Eliminate ambiguities between permanent and temporary impacts by including fields for "total impacts," "permanent impacts," and "temporary impacts."

Currently, the fields for total impacts and the subset of the total impacts that are temporary are not consistently being applied appropriately. As an example, the fields for wetland impacts include "wetlands" and "wtemp." According to the database entry instructions, the total wetland impacts are to be recorded in the "wetlands" field and the subset of the impacts that were temporary are to be recorded in the "wtemp" field. In practice, permanent impacts were often entered into the "wetland" field and the temporary impacts were entered into the "wtemp" field. Data entry staff should be adequately trained to ensure that these fields are used appropriately. Alternatively, the confusion could be eliminated by having one field for total impacts, one for permanent impact, and one for temporary impacts.

6.2.1.9. Permit conditions should be entered into the database

Tracking the compliance of a compensatory mitigation project would be simpler if the permit conditions upon which compliance will be judged was recorded in the database. Having permit conditions in the database would simplify independent studies of compliance. When the database has capabilities for tracking project compliance, having the permit conditions specified in the database would reduce the amount of time needed to understand the crucial permit requirements and determine if they had been met.

Currently, it would be difficult to extract the appropriate permit conditions from the permit file. However, Recommendation 6.3.2 recommends that permit conditions should be clearly delineated in the permit.

6.2.1.10. Have permittees submit permit information in electronic form

Clearly, one of the difficulties of maintaining a database is the time required to enter the appropriate data. If the information needed for the database could be submitted by the permittee in electronic form, staff time needed to enter information would be minimized. Having an electronic form for permittees to fill out would also minimize database entries. Instead of having to enter all information (multiple times when separate databases are maintained by the State Board and each regional board), the basic information would need only to be checked, although additional information (such as permit conditions; see Recommendation 6.2.1.9) might have to be entered by Water Board staff. The form and database could be designed so the information from the form would flow simply into the database.

6.2.1.11. The database should contain information to improve management after a permit is issued

Information management for 401 permits currently seems focused almost exclusively on activities leading up to the issuance of a permit. However, post-permit activities are also critical for a successful 401 program. Better information about the project after the permit is issued would allow Regional Board staff to track the progress of projects and assist compliance and evaluation efforts.

Post-issuance information that could be useful includes:

- The database should track document submissions
- The database should incorporate flags for overdue documents.
- In concert with the fields for specific permit conditions, there should be fields for recording satisfactory compliance with conditions.
- The database should track any enforcement actions undertaken on the permit.

This type of information is included in CIWQS and is being proposed for the Wetland Tracker.

6.2.2. Improve permit archiving

During our previous study of permits at the Los Angeles Regional Board (Ambrose and Lee 2004), we discovered a number of issues associated with the archival of office hardcopy file management. Informal surveys of other Regions suggested that file organization and archiving at the Regional Boards did not support efficient file retrieval, making it necessary to perform our file reviews at the Corps district offices. Issues with hardcopy file management were also apparent in this project when we tried to locate specific files and either had difficulty locating them through the issuing Regional Board or the Regional Board was never able to provide us with a copy of the files.

File archival is obviously important for a retrospective program evaluation such as this study, but it is also essential for tracking permit compliance, including compliance with submissions of monitoring reports. Obviously, it is difficult to establish compliance with a permit if the file cannot be located. Therefore, we recommend that permit archiving systems for each Regional Board be evaluated and improved if necessary.

One particular addition to the database that could help with office hardcopy file management would be a chain of custody field for recording the location of physical permit file folder. This could avoid the problem of not knowing where the file is supposed to be, since sometimes staff keep files they are currently or have been working on at their desks.

6.2.3. Improve tracking the progress of mitigation projects

Various changes to the database could improve its ability to track the progress of mitigation projects after a permit has been issued (e.g., Recommendation 6.2.1.11). However, there are additional activities the Water Boards could undertake to improve project tracking.

6.2.3.1. Track the submission of monitoring reports

Monitoring reports provide a potentially simple and efficient method for assessing the progress, and potentially the compliance, of a mitigation project (see Recommendation 7.3.1). However, our review suggests that this tool is not being used effectively. Monitoring and submission requirements had among the lowest compliance rates of all categories we evaluated. Through a tracking field in the database or other means, monitoring reports (and other submission requirements) should routinely reviewed.

6.2.3.2. Keep better track of credit purchases

Currently, files for projects requiring mitigation bank or in-lieu fees often lack information about the payment of the required fees. In our assessments we found several examples where the evidence of fee purchases was submitted to one agency but not other agencies (see Recommendation 6.4).

6.2.3.3. Track in-lieu fee payments

We found some examples of in-lieu fee projects in which the money was paid, but not used (yet) for actual mitigation activities. For instance, several payments to the Center for Natural Lands Management were not applied to a mitigation site because no approved site was available at the time of fee payment. Several years had gone by in the interim and those projects appeared to have been forgotten about; at the very least, there was an extended period of temporal resource loss. It would be useful if a record could be made, either in the revised database (see Section 6.2.1.8) or elsewhere, when the payment was made and when the money was applied to mitigation.

6.3. Improve permit clarity

Permit conditions should be written as clearly assessable criteria, with individual conditions for each specific criterion to be evaluated. Permit conditions should be written with a clear and direct method of assessment in mind. Our results suggest that more clearly written conditions would improve the chance of compliance. Presently, some conditions are too vague or may be presented in a way that it is not possible to assess them.

6.3.1. Important permit information, including impact and mitigation acreage and permit conditions, should be clearly delineated in tables and not buried within the permit text.

After comparing the information in the 401 permits and database to the other regulatory permits, we found many cases where the database errors were the result of ambiguous language in the 401 permit. For example, the language of a permit may not have been clear whether two or more distinct impacts were additive or inclusive. Although these were considered database errors, it was clear that the cause was the difficulty in understanding the intent of the permit. The likelihood of such errors is higher when information for the database must be extracted from the text of the permit. Misinterpretations would be less likely if the key mitigation requirements were listed in tables.

6.3.2. Permit conditions should be written so that efforts made in a small portion of the site cannot satisfy the verbatim text of the condition when the intention of the condition was that the efforts would be made throughout the site.

In our compliance assessments, we frequently encountered situations where ambiguous phraseology in the permit requirements required that we assign a high compliance score to a mitigation project even though only partial mitigation efforts had been made. As an example, in assessing compliance with a condition that read "must remove invasive plants prior to planting," we had to assign a high score even if we found evidence that invasive plants were removed from only a small portion of the site. When the intention of a particular condition is that the action or success standard would apply to the entire site, the condition should include such specifications ("…throughout the entire site").

6.3.3. Mitigation plans (and perhaps all permits) should include a table listing the requirements upon which compliance will be judged.

Prior to permit issuance, all parties should understand and approve the conditions upon which permit compliance will be judged. These conditions have generally been scattered diffusely throughout the text of regulatory permits and mitigation plans. Summarizing these clearly and succinctly would ensure that all parties understand the permits and simplify future compliance evaluations.

The mitigation plan is the most obvious place for a summary of permit conditions. The mitigation plan must incorporate the requirements from all permits for the project. In the plan, the permit requirements should be clearly delineated in table form. The development of this table should be a collaborative effort with all involved agencies (see Section 6.4) and not left solely to the permittee or consultant. In monitoring reports, assessment of compliance should be centered on this table (see Recommendation 7.3.1).

The table of mitigation requirements should distinguish conditions required by different agencies. In addition, the conditions should be organized within the following categories: (1) Permittee-responsible acreage requirements, (2) third party acreage credit purchases, (3) mitigation site implementation, (4) mitigation site maintenance, (5) site protective measures, (6) success and performance standards, (7) monitoring and submission requirements, (8) invocation conditions (e.g., “follow the 404 permit”), and (9) other/miscellaneous.

Although many of the specific mitigation conditions are not known until the mitigation plan is developed, and hence often cannot be included in the permit, understanding of exactly what was being required by the permit would be enhanced if each permit also included a summary table with an explicit statement for each condition included in the permit.

6.3.4. Permits should be clear about the meaning of enhancement, restoration and creation.

Enhancement, restoration and creation can all increase the amount of wetlands functions in ways that can be appropriate for compensatory mitigation, but the amount and nature of the increase varies, and the likelihood of success also varies. Thus, the terms should be useful carefully and consistently. The term “restoration” is often used in a general sense to encompass all three of these terms, but in permit analyses and language they should be used strictly.

Enhancement refers to changes made to an existing habitat (e.g., wetland) to improve its functions or services. Enhancement does not increase the area of a habitat, which is an important consideration when assessing the goal of no net loss of wetland acreage. Because many physical processes may already be occurring before enhancement, enhancement projects may be the easiest to achieve successfully. Because some functions are typically occurring in the degraded habitat before enhancement, enhancement generally doesn’t produce as many functions or services (per unit area) as restoration or creation.

Restoration refers to changes made to an area that was once, at some point in the past, the desired habitat (e.g., wetland), but has been converted to a different habitat type. Restoration returns the area to the desired habitat, with the general goal of achieving the level of ecological functioning found in the original habitat. Restoration increases the area of a habitat as well as the amount of functions and services provided by that habitat.

Creation refers to the creation of a habitat in an area that had never supported that habitat. Because none of the physical processes or biological functions characteristic of the habitat, and required to sustain it, occur at the site before the creation, creation can be the most difficult type of “restoration.” Whenever wetland creation is required, wetland delineations, or at least proof of inundation or saturation appropriate for wetland development, should be included as permit requirements to ensure a wetland was actually created (see Recommendation 6.3.6).

In its 2004 Final Mitigation Guidelines and Monitoring Requirements, the Los Angeles District of the Corps uses similar definitions, and has a similar assessment of benefits and risks of the different types of “restoration”:

> Generally, the physical characteristics of the sites considered determine whether establishment (i.e., creation), restoration, enhancement, or, more rarely, preservation are viable compensatory mitigation options. The categories of compensatory mitigation, as defined by Lewis (1990) are:
>
> Restoration: return to a pre-existing condition.
>
> Creation: conversion of a persistent non-wetland habitat into wetland (or other aquatic) habitat. Two subdivisions are recognized: Artificial (i.e., irrigation required) or self-sustaining.
>
> Enhancement: increase in one or more functions due to intentional activities (e.g., plantings, removal of non-native vegetation).
>
> Passive Re-vegetation: allow a disturbed area to naturally re-vegetate without plantings.
>
> Regulatory Guidance Letter 01-1 used the term establishment instead of creation. The former term will be used in this document for consistency with this Corps Headquarters’ guidance. Establishment projects have the greatest potential because, in theory, the full suite of functions performed by that habitat type are established; but they also have the highest risks. Establishing aquatic habitat in an area where it did not previously exist is a difficult proposition. Restoration projects have had a higher degree of success in the Los Angeles District. Despite the uncertainties associated with establishment projects, the Corps usually recognizes establishment and restoration equally when it comes to determining compensatory mitigation credit. Enhancement projects generally receive less compensatory mitigation credit, because enhancement targets particular functions instead of the full suite of functions performed by that habitat type. When enhancement is accepted, the Corps will require that the enhancement improve as many of the functions as possible.

In common mitigation practice, restoration and creation focus on the addition of plants (normally facultative riparian or wetland species) to areas where they do not currently occur. These are not true restoration or creation projects. True creation and restoration projects add hydrological, biogeochemical and ecological functions to a site, typically through topographical modifications and/or the establishment or re-establishment of appropriate hydrology. Section 6.1.1 discusses the need to include the full suite of physical and biological processes in mitigation projects.

Note that one other related term, preservation, is sometimes used in a mitigation context. Preservation occurs when an existing habitat (wetland or other) is protected but not manipulated. Although preservation may be an appropriate component of a mitigation requirement (see LAD ACOE guidelines for an example), preservation does not increase the amount of wetland acreage to compensate for acreage losses, nor does it increase the amount of wetland function or services to compensate for losses of those wetland attributes.

6.3.5. *When invasive species removal is required, performance standards should be clear about the goal of invasive species control*

In our evaluations, we found examples where invasive species eradication was an important goal of the mitigation and specifically required as a permit condition, and others where invasive removal and maintenance were required so that newly planted native species would have less competition for resources at establishment. However, in many instances, the goal of an invasive removal was not clearly defined, and while eradication may have been the intent, the permit language simply required removal. In such cases, we were forced to assign high compliance scores for the condition (some removal had occurred) even though substantial recurrence may have been observed. For some projects (e.g., site-specific invasive removal projects, or in-lieu fee payments for *Arundo donax* eradication), enhancement involving invasive species control was the entire mitigation project. Permits should be specific for the mitigation goal and the permit language should accurately reflect that goal.

6.3.6. *If a wetland is planned as part of a mitigation project, proof of inundation or saturation appropriate for wetland development should be required.*

We found several examples where one of the regulatory agencies had required verification of wetland hydrology or three parameter wetlands as a specific performance standard. Unfortunately, most wetland mitigation projects did not include such a condition. This condition should be included as a performance standard in all permits involving wetland mitigation.

6.4. Improve the assessment of “no net loss”

6.4.1. *Pre- and post-construction functional assessments of impact and mitigation sites should be required to ensure no net loss of wetland functions*

Much of the interest about the success of compensatory wetland mitigation revolves around the question of whether “no net loss” of wetland area and functions has been achieved. It is very difficult to answer this question definitively with respect to functions without suitable data before any impacts have taken place. In our previous study (Ambrose and Lee 2004), we incorporated a method for assessing the net gain or loss of services, but quantitative, objective conclusions are difficult without appropriate “before” data. Conceptually, the correct way to answer this question is to assess wetland functions at the *impact* site before and after the impact occurs to estimate the loss of functions, and to assess functions at the *mitigation* site before and after mitigation occurs to estimate the gain of functions. These paired before-and-after functional assessments would provide the information necessary to assess a net change in wetland functions.

We recommend that functional assessments be conducted before the construction of any development project or mitigation project to establish the baseline conditions at those sites. Then, as part of the monitoring requirements, post-construction assessments should be conducted.

There are a variety of methods that could be used for a functional assessment. Ideally, the State Board would adopt one particular method so the functional assessments were consistent across the state and could be easily compared and aggregated for a state-wide assessment. Some wetland evaluation methods, such as the Hydrogeomorphic Assessment Method (Hauer and Smith 1998), have been explicitly designed to incorporate no-net-loss analyses of mitigation projects. Others, such as the newly developed California Rapid Assessment Method (CRAM), which we used in our study, are readily used for this use. The method should be useable in a wide range of wetland habitats, quick to apply, and provide scientifically rigorous, objective data.

Although paired before-after functional assessments are necessary for a careful assessment of net change in wetland function, they are rarely if ever undertaken. Besides the general difficulty of funding such studies, this particular study design carries the additional logistical difficulty that the "after" samples must be taken some years after the "before" sample. Despite these difficulties, we feel the paired before-and-after study design is needed to address the key policy question of whether compensatory mitigation under the Clean Water Act is accomplishing the goal of no net loss of wetland functions.

There are additional benefits of before and/or after functional assessments, of course. A pre-construction functional assessment of the mitigation site would inform the design of the mitigation project, to help the analyst determine whether the proposed design is likely to result in the desired post-construction functions. A post-construction functional assessment of the mitigation site, such as we performed for this study, would show whether the mitigation project actually produced the desired functions. Even for these purposes, adoption of a standard functional assessment method such as CRAM would increase the value of the functional assessments by allowing the compilation of results across the state.

6.5. Coordination with other agencies

Although the Water Board has responsibility for 401 permits, the entire process of regulating impacts to wetlands and waters of the United States is closely coordinated with other agencies, especially the U.S. Army Corps of Engineers and the California Department of Fish and Game. Improved information management might improve this coordination.

6.5.1. Improve incorporation of final permit information into Water Board files

Although the 401 process is integral to wetland permitting, we found a significant number of files where changes to a project (impacts and/or mitigation) that occurred later in the project planning and permitting were not incorporated into Water Board files or 401 permits (see Section 4.1.1). Our review of permit files suggests that the Regional

Board staff have not always been included in the planning decisions that occurred after the 401 permit was issued. The Regional Boards should be active through all phases of the project planning or should at least insist on being copied on all subsequent changes that are approved by the other regulatory agencies. Once finalized, the 401 permit should be updated to reflect the actual impacts and mitigation actions/acreage that occurred, and then the database should be updated.

Although our review focused on 401 permits and the information included in them, it is worth noting that 401 conditions should always be explicitly included in the 404 permit.

6.5.2. Consider developing an integrated permit

Coordination with other agencies would be maximized if there was a single integrated permit required for projects impacting wetlands or waters of the U.S. Since there must already be significant coordination among the agencies, an integrated permit might not mean additional work, but it would simplify the permitting process for permittees, it would ensure that all relevant information was available and included in Water Board files, and it would eliminate redundant permit conditions.

7. Recommended Compliance Monitoring Program

The SWRCB contract for this work states that this final report shall "provide recommendations on the necessity, frequency, location, and type of ongoing compliance monitoring." Section 7.1 discusses the need for compliance monitoring based on the results of the present study. The next section discusses whether compliance monitoring might be focused at particular locations, how often it might be needed, and what type of monitoring might be required. In addition, we have some specific recommendations (Section 7.3) concerning monitoring.

Our recommendations about compliance monitoring reflect our own experiences, the scientific literature, and other guidelines. A particularly relevant guideline was produced in 2004 by the Los Angeles District of the Army Corps (LAD USACE 2004). Although directed more at monitoring the progress of mitigation projects, aspects of these guidelines are relevant to compliance monitoring.

7.1. The need for compliance monitoring

The results of this study clearly indicate the need to evaluate the compliance of mitigation projects with their permits. Thirteen of the 257 permits we located had to be excluded because of potential compliance issues. This indicates that up to 5% of the files we reviewed may have significant compliance problems (such as the impact occurring but no mitigation being undertaken).

Our analysis of discrepancies between the 401 permit and information in the permit file identified additional compliance issues. For example, 8% of the 143 files we evaluated had information indicating that the actual impacts were greater than authorized in the 401 permit; overall, there appeared to be compliance issues with **42%** of the files we evaluated.

We found relatively high compliance with third-party mitigation requirements, but substantial lack of compliance with nearly every other category of permit conditions we assessed (see Table 7). Only about 65% of acreage requirements were met. Only about 50% of success criteria/performance standards were met. About 53% of monitoring and submission requirements were met. Moreover, many of the categories we assessed had a high fraction of permits for which the conditions could not be assessed; for example, we could not assess monitoring and submission conditions for more than half of the permits.

These results indicate a definite need for compliance monitoring. Without a significant compliance effort, permittees are failing to comply with a wide range of permit conditions without the Water Board staff knowing about it.

7.2. How should compliance monitoring efforts be focused?

Our observations here are based on inferences gained from reviewing the permit files as well as data on compliance with permit conditions. Data from our analysis of compliance might be used to guide decisions about the most effective places to focus compliance monitoring. However, in considering this information, it is important to remember that ours was a retrospective analysis, sometimes assessing compliance many years after the mitigation project was completed, and as a consequence there were many permit conditions we could not assess. It is possible that there were compliance problems with the permit conditions that were not assessable for us, but we cannot determine that. A more complete assessment of compliance (enforcement) problems should focus on contemporary permits so that all conditions could be assessed.

Our data allow us to identify some areas that seem most likely to have low compliance. For example, we found some differences in compliance for different types of permittee. The lowest 401 compliance scores were State/Federal and Municipal agencies. For mitigation plan compliance, Caltrans and private permittees (individual land owners or commercial entities with small “one-time” projects) joined these two as having the lowest compliance. Industry (corporation-owned factories, landfills, etc.) had the highest compliance scores for the mitigation plan compliance.

We also found some regional differences in compliance. Among the different Water Board regions, Region 2 had relatively low 401 compliance and Region 8 had lower mitigation plan compliance. The low 401 compliance in Region 2 appears to be the result of higher expectations and more specific permit conditions in Region 2 compared to other regions rather than the permittees in Region 2 being less diligent. For this reason, compliance numbers alone do not reflect the quality of the mitigation undertaken, since better compliance could be achieved by having fewer permit conditions and less demanding conditions. Among the Water Board regions, Regions 8 and 5F had among the fewest specific conditions in the 401 and among the highest proportion of redundant conditions.

The mean 401 compliance differed somewhat among the different wetland types (Figure 66). High gradient riverine habitats had the highest compliance rate. Low gradient riverine, depressional, and lagoon (the latter with only a single example) had intermediate compliance rates. Vernal pools (N=10) and estuarine wetlands (N=1) had the lowest compliance rates.

Although the preceding results provide some guidance in terms of possible areas for focusing compliance assessments, in our view it does not provide a very sharp focus. Compliance issues are spread quite broadly across all aspects of the 401 program, so compliance monitoring will also need to be spread quite broadly. The areas identified as having lower compliance might warrant a particular emphasis during compliance monitoring, but compliance was not so high for most other areas (with the possible exception of third-party mitigation conditions) that it would be safe to assume high compliance with them.

Although we have conducted a detailed assessment of compliance with 401 permits, we have little direct knowledge of the State or Regional Boards' current activities for checking compliance. Our review of information in the permit files suggest that there are substantial compliance issues for which there was no evidence of Regional Board response, but we did not follow up on these instances to determine if the Regional Boards were aware of those issues or had taken actions not evident in the file. Hence, we cannot comment on how current compliance efforts might be re-directed. However, we can identify mitigation monitoring reports as a cost-effective vehicle for evaluating a mitigation project.

Although monitoring requirements were regularly included as 401 permit conditions, and evaluated for compliance when appropriate, the relative scarcity of monitoring reports in the permit files we reviewed suggest that compliance with the monitoring requirement is checked infrequently. Our compliance assessment indicated that conditions requiring mitigation monitoring were met only about 53% of the time; it was unclear whether any enforcement actions were undertaken in response to the absence of monitoring reports. While we were conducting our study for the Los Angeles Regional Board, that region was compiling lists of permit files without monitoring reports and contacting permittees to obtain the reports. This seems like a relatively cost-effective area on which to focus compliance monitoring efforts.

In addition to reviewing submissions, it would be ideal if Water Board staff could undertake periodic site visits to confirm the reported monitoring results. However, we recognize that Water Board staff time is extremely limited, and it may not be feasible for existing staff to conduct site visits. Recommendation 7.3.2 suggests an organization that could undertake these site visits.

7.2.1. Frequency of compliance monitoring

There are different phases of a mitigation project, and different types of compliance monitoring would be required for each phase.

In the early construction phase of a mitigation project, many decisions are being made and many activities are being undertaken. Compliance monitoring during this phase would ensure that the mitigation project took shape as envisioned by the 401 staff and described in the mitigation plan. In addition, many compliance problems identified during this early phase are more likely to be resolved easily than if they were to be identified much later.

The best type of compliance monitoring for the early phase would be on-site inspections. However, as noted above, it is unlikely that existing Regional Board staff would have the time to conduct on-site inspections, although perhaps this would be possible for the largest or most complicated projects. (If an independent monitoring cooperative was established, as recommended in Section 7.3.2, they could conduct some site inspections.) In the absence of on-site inspections, appropriate monitoring reports, required frequently during and immediately after construction, could document the progress of construction. If the permit conditions relating to construction were clearly established in the permit and/or monitoring plan, then these initial monitoring reports could focus their information on documenting that the permit conditions had been met. Extensive photographs would assist in documenting the progress of construction and compliance with the permit conditions.

After the initial post-construction period, we would expect the mitigation site to change fairly rapidly as physical processes establish themselves and equilibrate to the system and plantings begin to grow. Fairly frequent documentation of these changes would allow Regional Board staff to confirm the appropriate development of the project. In the first year, quarterly or semi-annual reports would be useful.

After the initial development of the mitigation site, we would expect changes to occur at a slower rate (e.g., Zedler and Callaway 2000). Annual monitoring would be appropriate. However, the second year of a mitigation project is a particularly critical time, so a particular focus on that period would be important. After two years, there has been time for the site to become established, so any deficiencies should begin to become apparent. It is important to identify potential problems early; it deficiencies are not identified until the end of the monitoring period, there will be limited opportunities for remediation.

In general, on-site inspections would be the best way to confirm that all permit conditions had been met, but Regional Board staff should be able to assess compliance by careful review of monitoring reports. The most efficient use of staff resources would be to rely on annual monitoring reports through the end of the monitoring period, then confirm the report findings by an on-site inspection. As noted above, the second year is a particularly critical period, so an on-site inspection after the second year would also be useful. However, on-site visits are often not possible due to staffing constraints. Office review of the monitoring reports would be sufficient in most cases, as long as the monitoring reports were focused and informative. Because we feel that good monitoring reports are essential for an efficient evaluation of permit compliance, we have included a specific recommendation on this topic (Recommendation 7.3.1).

7.3. Specific monitoring recommendations

7.3.1. Mitigation monitoring reports should be streamlined and focused around demonstrating compliance with an established list of permit conditions.

Mitigation monitoring reports tend to be large tedious documents that restate much of the background project-related information and only diffusely and often ambiguously address compliance related issues. These documents often include highly detailed descriptions of the monitoring methods and detailed results of vegetation monitoring data. Such information can be useful and should be documented, perhaps in quarterly reports, but annual monitoring reports should focus on the success-related issues and should clearly document compliance with an established list of permit conditions (see Recommendation 6.3.3). Because agency permit files are often incomplete and lack key documents (such as the mitigation plan), we do not feel that all background information (such as the restating of project impacts and expected mitigation strategies) should be eliminated from monitoring reports. However, such information should be well organized and succinct. The extraneous nature of existing monitoring report has been an impediment to the regulatory review of these documents.

7.3.2. Form a multi-agency cooperative for compliance monitoring and project tracking.

In California there are typically three to five regulatory agencies involved in the wetland regulatory process: the Corps, the Regional Board, the DFG if the project involves stream or lakebed impacts or State-listed endangered species, the FWS if there are federally-listed endangered species issues, and the Coastal Commission if the project occurs within the Coastal Zone. Each agency is responsible for independently monitoring compliance with its own permits, including compliance with compensatory mitigation requirements. Compliance monitoring is complicated by the fact that not all agencies receive all required documents (e.g., final mitigation plans, monitoring reports, deeds, proof of payment/credit purchases, and documents describing planning changes) from the permittee. Permittees frequently submit documents to a single agency that they view as the "lead" agency for their project.

Following up on permit compliance includes the time consuming reorientation to the various projects, keeping track of document submissions and other communications, the careful review of mitigation monitoring reports, and site visits, plus maintaining the files and updating the database. Yet each agency suffers from perennial understaffing and limited resources. The result is that little monitoring of compliance is done by any agency.

To help address this problem, we recommend that regulatory agencies establish a multi-agency cooperative to monitor compliance and track wetland losses and mitigation success across the State. This cooperative could report the results of its evaluation to each of the regulatory agencies and serve as a central repository for permit-related information. This could improve compliance monitoring and free-up staff resources.

Costs would be distributed and redundancy would be eliminated, thus maximizing the efficient use of limited resources.

In our study, we reviewed 200-300 permit files and thoroughly assessed almost 150 files within one year with a limited staff. With limited funding from each agency, a small staff could receive and manage copies of documents from across the state, visit a significant percentage of sites as agents of all agencies, and report their findings to each agency. After issuing their permits, project managers would be freer to concentrate on new projects instead of simultaneously tracking multiple existing projects. Such a cooperative would ensure that compliance monitoring would actually get accomplished, while avoiding substantial redundancy of effort and promoting the centralization of permit file information and tracking.

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9. Tables

Table 1. Reference Site information

SiteID	Name	Region	Latitude	Longitude	Research Group*	Wetland Type
WCAP99-R026	Coldwater Creek	1	41.84611	124.02750	CCG	Riverine Low
WCAP99-R029	Clark's Creek	1	41.80861	124.11667	CCG	Riverine High
WCAP99-RO92	Prairie Creek State Park	1	41.40000	124.05806	CCG	Riverine High
BC-Y	Blue Creek	1	41.20000	123.54000	CCG	Riverine High
WCAP99-R037	Horse Linto	1	41.00893	123.60197	CCG	Riverine High
11921	Grove's Prarie	1	40.95667	123.48528	CCG	Riverine Low
WCAP99-R077	Canoe creek	1	40.29490	123.90290	CCG	Riverine Low
FREE 11130	Freeman Meadow	5R	39.67333	120.62075	SFEI	Riverine Low
WCAP99-R003	Trout Creek	1	39.53852	122.86077	SFEI	Riverine High
WCAP99-R008	Rattlesnake Creek	1	39.49388	122.86368	SFEI	Riverine High
WCAP99-0614	Austin Creek East	1	38.53603	123.07221	SFEI	Riverine Low
Ref. 16	Ashbury Creek Lo	1	38.35028	122.53793	UCLA	Riverine Low
Ref. 17	Ashbury Creek Tributary	1	38.34976	122.53352	UCLA	Riverine High
CA02-0604	Upper Petaluma	2	38.20767	122.56683	SFEI	Estuarine
CA02-0608	Point Edith	2	38.04353	122.07233	SFEI	Estuarine
CA02-0612	China Camp	2	38.01475	122.49280	SFEI	Estuarine
Ref. 22	Briones Regional Park	2	37.92129	122.16454	USF	Riverine High
Ref. 5	Walker	6V	37.90109	119.12983	UCLA	Riverine Low
Ref. 4	McGill Trail Head	6V	37.54992	118.80384	UCLA	Riverine High
Ref. 3	Fish Slough	6V	37.48043	118.40321	UCLA	Seep & Spring
Ref. 9	TNC Vernal Pool Reserve	5F	37.39987	120.45229	UCLA	Vernal Pool
Ref. 10	Chowchilla	5F	37.17623	120.07051	UCLA	Riverine Low
101	Upper Scott's Creek	3	37.07404	122.23793	CCG	Riverine Low
106(a)	East of Seal Bend	3	36.82000	121.77000	CCG	Estuarine
12339	Carmel Valley River	3	36.52243	121.81748	CCG	Riverine Low
12330	San Antonio River	3	35.89417	121.07361	CCG	Riverine Low
310-ADC	Arroyo de la Cruz Creek	3	35.70833	121.30035	CCG	Riverine Low
310-SSU	Upper San Simeon creek	3	35.60921	121.07393	CCG	Riverine Low
310-SSC	Lower San Simeon creek	3	35.59448	120.12112	CCG	Riverine Low
CA02-0031	Chorro Creek, marina	3	35.34553	120.83629	CCG	Estuarine
CA02-0021	Chorro Creek, flats	3	35.34430	120.83168	CCG	Estuarine
CA02-0002	Los Osos creek	3	35.33418	120.83638	CCG	Estuarine
Ref. 12	Coon Creek	3	35.25498	120.88692	UCLA	Riverine Low
310-COO	Coon creek	3	35.25476	120.88549	CCG	Riverine Low
Ref. 1	Pismo Beach Ecological Reserve	3	35.13359	120.62396	UCLA	Lacustrine
Ref. 15	Sedwick Reserve	3	34.73013	120.02692	UCLA	Depressional
Ref. 13	Sedwick Reserve	3	34.72113	120.03613	UCLA	Riverine Low
Ref. 14	Sedwick Reserve	3	34.68298	120.04469	UCLA	Vernal Pool
Ref. 2	Los Padres National Forest	4	34.51467	119.26867	UCLA	Riverine Low
Ref. 20	Arroyo Hondo Canyon	3	34.48702	120.14222	UCLA	Riverine Low
Ref. 21	El Capitan Canyon	3	34.48049	120.01888	UCLA	Riverine High
Ref. 18	Santa Paula Creek	4	34.44172	119.07551	UCLA	Riverine Low
Ref. 11	Upper Santa Clara River	4	34.44020	118.31349	UCLA	Riverine Low
Ref. 7	City Creek Rte 330	8	34.17385	117.18515	UCLA	Riverine High
Ref. 19	Solstice Cyn	4	34.03935	118.75321	UCLA	Riverine Low
Ref. 8	Upper Santa Margarita River	9	33.40826	117.23828	UCLA	Riverine Low
Ref. 6	Cibola Lake (NWR)	7	33.22461	114.67300	UCLA	Lacustrine

* CCG = Central Coast Group

Table 2. Jurisdictional habitat hierarchy.

Every mitigation site was apportioned into its component habitat types according to this hierarchy. First, the evaluator determined which proportion of the sites consisted of "waters" and which proportion was outside of waters (e.g. 60:40). Next, the wetland and non-wetland waters percentages would be determined (e.g. 50:10), as would any non-waters riparian and upland habitats (e.g. 20:20), and so forth. The sum of the equivalent habitat percentages would equal the above percentage in the hierarchy. These percentages were multiplied by the overall site acreage to determine the individual jurisdictional habitat acreages.

Waters of the United States			
	Wetland		
	Non-Wetland Waters		
		Non-Streambed Open Water	
		Streambed	
			Open Water Stream
			Unvegetated Streambed
			Vegetated Streambed
		Riparian Waters	
Non-Specified Riparian			
Non-waters of the United States			
	Non-waters Riparian		
	Upland		

Table 3. Overall summary of the permit file selection results by region.

This table includes the 429 permit files that were randomly selected from the SWRCB database, and pursued at either the Corps or Regional Board offices, or both. Two files were initially pursued, but later excluded because they had 401 permits that were issued directly by the State Board (SB).

Region	Pursued for review	Not located	Removed during review	Removed after field visit	Not visited or assessed	Assessed for compliance only	Assessed fully
1	32	15	5	0	1	2	9
2	75	29	20	0	0	1	25
3	43	16	4	7	1	2	13
4	44	6	10	9	0	4	15
5F	18	10	0	2	0	2	4
5R	27	17	2	0	2	0	6
5S	54	13	10	2	4	1	24
6T	23	14	4	1	2	0	2
6V	10	4	2	2	0	0	2
7	11	7	1	0	0	1	2
8	25	7	3	2	0	0	13
9	65	33	12	5	0	1	14
SB	2	1	1	0	0	0	0
Total	**429**	**172**	**74**	**30**	**10**	**14**	**129**

Table 4. Number of onsite and offsite mitigation sites for file specific mitigation actions, formal mitigation banks, informal mitigation banks, and in lieu fees.

	N	File-Specific	Formal Mitigation Bank	Informal Mitigation Bank	In-Lieu Fee
On Site Mitigation	127	125	1	1	0
Off Site Mitigation	77	29	31	14	3
Total	**204**	**154**	**32**	**15**	**3**

Table 5. Summary of the discrepancies between the impact and required mitigation acreage values obtained through our detailed permit reviews and the corresponding values in the State Board's permit tracking database. Multiple discrepancy categories may apply to a particular file.

Source of Impact and/or Mitigation Acreage Discrepancy	Number of Files	% of Total Files (N=143)
Discrepancy due to minor rounding issues in 401 permit or in SWRCB database	9	6.2
Data entry issue in SWRCB database (typographical error or misinterpretation of information in 401 permit, often due to ambiguous wording).	26	18.2
Issues with the 401 permit itself, including transcriptional and typographical errors, misinterpretations, or a lack of critical information in the 401 permit text	24	16.8
Discrepancy due to accounting difference (e.g., permanent vs. temporary impacts, or wetlands vs. non-wetland waters) between reported values and 401 permit	27	18.9
Other agency required more mitigation than RB, but 401 permit not outdated	19	13.4
Mitigation planning modified after 401 permit issuance, permit outdated	12	8.4
Impacts reduced after 401 issuance, mitigation same, 401 permit outdated	3	2.1
Impacts reduced after 401 issuance, mitigation different, 401 permit outdated	13	9.1
401 outdated, impacts greater than 401 approved, mitigation same or different	12	8.4
Revised 401 permit entered separately into SWRCB database resulting in multiple entries and redundant acreage values	7	5.0
Summaries		
Discrepancies between reported values and the SWRCB database	101	70.6
Discrepancies between our reported values and the 401 permits themselves	86	60.1
Regulatory/compliance issues with files from an acreage perspective	60	42.0

Table 6. Summary of compliance scores based on 401 and mitigation plan evaluations including average scores and scores for the percentage of conditions met to 100% satisfaction.

Successful included files with compliance scores greater than 75%, partially successful included files with scores between 25% and 75%, and failure included files with scores less than 25%.

	N	Score	Successful	Partially Successful	Failure
Average 401	124	84.3%	76%	20%	4%
Average 401 percent-met		73.3%	57%	40%	13%
Average mitigation-plan	81	80.7%	68%	32%	0%
Average mitigation plan percent-met		67.6%	48%	35%	6%

Table 7. Compliance breakdowns for 401 and Mitigation Plan compliance grouped by compliance condition category (N=143 files). See Methods for details on condition categories.

Condition Code	Condition Category	401						Mitigation Plan					
		Total # Conditions	Average # Conditions	Average # ND	Average Score	Average % Met	Average % ND	Total # Conditions	Average # Conditions	Average # ND	Average Score	Average % Met	Average % ND
1	Third Party	58	1.5	0.1	99.3	99.3	8.8	26	1.6	0.1	90.0	90.0	6.3
2	Acreage	158	1.8	0.2	81.5	64.4	6.9	132	2.0	0.2	83.0	66.8	9.5
3	Site Implementation	411	6.0	2.7	84.8	71.9	45.1	546	7.9	3.1	84.3	72.4	40.4
4	Site Maintenance	49	1.6	0.8	76.0	56.7	45.6	93	2.2	0.7	80.7	68.1	34.3
5	Site Protection	66	1.5	0.6	81.3	72.6	42.5	58	1.6	0.4	77.9	72.4	25.6
6	Success & Performance Standards	199	3.9	1.5	76.4	49.7	31.0	298	4.4	1.3	76.0	52.9	26.3
7	Monitoring & Submission	254	3.6	2.0	59.5	52.3	54.3	220	3.2	1.4	60.9	53.7	45.7
8	Invocation of Other Agency Permits	126	1.7	1.1	N/A	N/A	69.3	5	2.5	1.0	N/A	N/A	100
9	Other	35	1.3	0.6	96.1	94.4	46.8	13	1.3	0.3	93.8	93.8	20.0
3 - 6	Site Implementation, Maintenance, Protection, Success/Performance Standards	725	3.2	1.4	79.6	62.7	41.0	995	4.0	1.4	79.7	66.4	31.6

Table 8. Summary statistics of mitigation CRAM scores (N=129) and reference site CRAM scores (N=47) for Total-CRAM scores and the four attributes, along with the percentage of files within each success category.

	Reference Sites		Filewide CRAM Scores				
	Median	Mean ± SE	Median	Mean ± SE	Optimal	Sub Optimal	Marginal to Poor
Overall	82.06	79.13 ± 1.36	60.77	58.61 ± 1.10	19.38	56.59	24.03
Landscape Context	90.28	87.10 ± 1.06	72.32	65.57 ± 1.78	47.29	24.81	27.91
Hydrology	90.74	86.67 ± 1.58	62.96	62.67 ± 1.64	27.13	42.64	30.23
Physical Structure	79.17	76.06 ± 2.48	52.79	53.81 ± 1.61	49.61	27.13	23.26
Biotic Structure	68.33	66.68 ± 2.24	51.78	52.63 ± 1.28	62.02	25.58	12.40

Table 9. Summary statistics and success breakdowns of Total-CRAM scores by SWRCB region (N=129 files).

Total-CRAM Scores (Overall Filewide CRAM Scores)						
Region	N	Mean ± SE	Median	% Optimal	% Sub-Optimal	% Marginal / Poor
1	9	57.12 ± 4.76	50.93	22.22	55.56	22.22
2	25	51.08 ± 2.07	48.40	4.00	44.00	52.00
3	13	55.61 ± 3.81	58.74	15.38	61.54	23.08
4	15	57.67 ± 3.40	57.99	20.00	46.67	33.33
5F	4	61.73 ± 5.26	64.86	25.00	50.00	25.00
5R	6	61.57 ± 2.98	61.33	16.67	83.33	0.00
5S	24	64.40 ± 1.43	64.33	16.67	79.17	4.17
6T	2	74.43 ± 3.83	74.43	100.00	0.00	0.00
6V	2	42.52 ± 14.4	42.52	0.00	50.00	50.00
7	2	56.22 ± 8.17	56.22	0.00	50.00	50.00
8	13	64.25 ± 2.79	67.50	23.08	69.23	7.69
9	14	60.44 ± 4.38	65.63	42.86	35.71	21.43

Table 10. Summary statistics and success breakdowns of landscape context metrics CRAM scores by SWRCB region (N=129 files).

Landscape Context CRAM Scores						
Region	N	Mean ± SE	Median	% Optimal	% Sub-Optimal	% Marginal / Poor
1	9	55.43 ± 6.60	50.86	22.22	22.22	55.56
2	25	57.84 ± 3.80	57.33	28.00	32.00	40.00
3	13	57.52 ± 6.86	53.30	38.46	15.38	46.15
4	15	64.75 ± 3.79	64.25	33.33	40.00	26.67
5F	4	68.40 ± 14.20	81.78	75.00	0.00	25.00
5R	6	76.92 ± 2.90	74.91	66.67	33.33	0.00
5S	24	82.55 ± 1.95	86.65	83.33	16.67	0.00
6T	2	84.44 ± 3.70	84.44	100.00	0.00	0.00
6V	2	34.97 ± 9.30	34.97	0.00	0.00	100.00
7	2	81.83 ± 4.08	81.83	100.00	0.00	0.00
8	13	61.88 ± 5.64	62.69	38.46	30.77	30.77
9	14	62.29 ± 5.50	70.49	42.86	28.57	28.57

Table 11. Summary statistics and success breakdowns of hydrology metrics CRAM scores by SWRCB region (N=129 files).

Hydrology CRAM Scores						
Region	N	Mean ± SE	Median	% Optimal	% Sub-Optimal	% Marginal / Poor
1	9	65.90 ± 7.77	52.50	44.44	0.00	55.56
2	25	61.39 ± 3.84	58.71	28.00	40.00	32.00
3	13	58.20 ± 5.11	64.82	0.00	76.92	23.08
4	15	59.15 ± 4.66	54.63	20.00	40.00	40.00
5F	4	71.79 ± 9.11	74.58	50.00	25.00	25.00
5R	6	73.00 ± 4.66	72.87	50.00	50.00	0.00
5S	24	62.65 ± 4.15	65.16	29.17	37.50	33.33
6T	2	81.20 ± 1.20	81.20	100.00	0.00	0.00
6V	2	35.51 ± 16.3	35.51	0.00	0.00	100.00
7	2	63.75 ± 27.90	63.75	50.00	0.00	50.00
8	13	63.58 ± 4.37	60.83	30.77	38.46	30.77
9	14	64.04 ± 3.79	64.27	14.29	78.57	7.14

Table 12. Summary statistics and success breakdowns of physical structure metrics CRAM scores by SWRCB region (N=129 files).

Physical Structure CRAM Scores						
Region	N	Mean ± SE	Median	Optimal	% Sub-Optimal	% Marginal / Poor
1	9	52.90 ± 4.95	50.00	44.44	33.33	22.22
2	25	40.44 ± 3.52	39.83	24.00	28.00	48.00
3	13	55.55 ± 4.81	58.33	61.54	15.38	23.08
4	15	58.87 ± 5.29	66.67	60.00	26.67	13.33
5F	4	47.18 ± 7.58	45.42	25.00	50.00	25.00
5R	6	50.90 ± 5.32	47.23	33.33	50.00	16.67
5S	24	55.17 ± 2.68	59.56	58.33	25.00	16.67
6T	2	68.75 ± 18.8	68.75	50.00	50.00	0.00
6V	2	52.08 ± 2.08	52.08	50.00	50.00	0.00
7	2	50.69 ± 0.69	50.69	0.00	100.00	0.00
8	13	67.40 ± 3.73	70.83	76.92	23.08	0.00
9	14	57.99 ± 6.49	65.98	57.14	7.14	35.71

Table 13. Summary statistics and success breakdowns of biotic structure metrics CRAM scores by SWRCB region (N=129 files).

Biotic Structure CRAM Scores						
Region	N	Mean ± SE	Median	Optimal	% Sub-Optimal	% Marginal / Poor
1	9	54.24 ± 4.91	54.85	66.67	22.22	11.11
2	25	44.66 ± 2.36	45.00	40.00	36.00	24.00
3	13	51.18 ± 3.39	48.33	61.54	23.08	15.38
4	15	47.89 ± 2.82	45.23	40.00	53.33	6.67
5F	4	59.57 ± 5.32	60.07	75.00	25.00	0.00
5R	6	45.46 ± 4.29	44.55	50.00	33.33	16.67
5S	24	57.23 ± 1.89	60.07	83.33	16.67	0.00
6T	2	63.33 ± 8.33	63.33	100.00	0.00	0.00
6V	2	47.50 ± 30.00	47.50	50.00	0.00	50.00
7	2	28.61 ± 1.39	28.61	0.00	0.00	100.00
8	13	64.14 ± 3.53	65.00	84.62	15.38	0.00
9	14	57.43 ± 5.35	56.04	71.43	14.29	14.29

Table 14. Summary statistics and success breakdowns of CRAM scores by individual CRAM metric (N=204 mitigation sites).

Metric	N	Mean ± SE	Median
Buffer and Landscape Context			
Connectivity	204	68.2 ± 1.8	77.8
% of AA with Buffer	204	81.6 ± 1.4	91.7
Avg. Width of Buffer	204	61.9 ± 1.9	66.7
Buffer Condition	204	60.6 ± 1.4	66.7
Hydrology			
Water Source	204	59.5 ± 1.5	58.3
Hydroperiod	204	64.7 ± 2.0	73.3
Hydrologic Connectivity	117	64.6 ± 2.0	66.7
Physical Structure			
Physical Patch Richness	204	43.5 ± 1.8	41.7
Topographic Complexity	204	63.5 ± 1.4	66.7
Organic Matter Accumulation	204	69.3 ± 1.4	68.9
Biotic Structure			
Biotic Patch Richness	204	45.7 ± 1.4	41.7
Vertical Biotic Structure	190	39.1 ± 1.5	41.7
Interspersion / Zonation	204	58.6 ± 1.5	58.3
% Non-native Plant Species	204	60.5 ± 2.3	52.8
Native Plant Species Richness	204	49.3 ± 2.0	41.7

Table 15. Total impacted and obtained acreage for all files (overall), waters of U.S. and Non waters of U.S., wetland, and non wetland waters.

Overall acreage includes waters of the U.S. plus non-waters areas. The breakdown for wetlands/non-wetland waters does not include 5 permit files for which the jurisdictional impacts could not be distinguished.

	Total Impact	Total Obtained	Proportion Obtained	Net Acreage Gain	Gained /Loss Ratio
Overall Acreage	216.8	417.0	NA	200.2	1.9
Waters of U.S.	212.4	303.2	72.7	90.8	1.4
Non Waters of U.S.	4.4	113.8	27.3	109.4	NA
Waters of U.S.:					
Wetlands	121.2	180.5	63.2	59.3	1.5
Non Wetland Waters	74.5	105.2	36.8	30.7	1.4

Table 16. Permanent impacts and created mitigation acreage, waters of U.S. and non waters of U.S., and wetland, non wetland waters.

	Permanent Impact	Created Acreage	Proportion Obtained	Net Acreage Gain	Gained /Loss Ratio
Overall Acreage	165.8	270.9	NA	105.1	1.6
Waters of U.S.	162.7	223.1	82.4	60.4	1.4
Non Waters of U.S.	3	47.8	17.6	44.8	NA
Waters of U.S.:					
Wetlands	106.3	146.7	66.4	40.4	1.4
Non Wetland Waters	54.9	74.2	33.6	19.3	1.4

Table 17. Total impacted and obtained acreage for all files (overall), waters of U.S. and Non waters of U.S., wetland, and non wetland waters.

	% Files with Gains	% Files where Gained = Lost	% Files with Losses
Overall Acreage	64	17	20
Waters of U.S.	54	13	33
Non Waters of U.S.	45	55	0
Wetlands	58	19	22
Non Wetland Waters	24	34	42

Table 18. Permanent impacts and created mitigation acreage, waters of U.S. and non waters of U.S., and wetland, non wetland waters.

	% Files w/Gains	% Files Gained=Lost	% Files w/Loss
Overall Acreage	41	20	39
Waters of U.S.	36	17	47
Non Waters of U.S.	24	76	1
Wetlands	40	32	28
Non Wetland Waters	17	37	46

Table 19. Mitigation success by permit file for each evaluation category: acreage requirement, 401 conditions, mitigation plan conditions, and wetland condition.

Data shown for acreage and compliance are percentages out of a total number of 143 permit files. Wetland condition data are percentages of a total number of 129 files. Numbers in parentheses are the actual number of sites within each category. For the acreage requirements, success was considered 100 percent, partial success was considered 75 to 100 percent (lower and upper bounds not inclusive), and failure was 75 percent and below. For the 401 and MP compliance evaluation, success was considered 75 to 100 percent, partial success was considered 25 to 75 percent (lower and upper bounds not inclusive), and failure was 25 percent and below. For the CRAM evaluation of wetland condition, success was considered 70 to 100 percent, partial success was 50 to 70 percent (lower and upper bounds not inclusive), and failure was 50 percent and below.

Category	**Percent Success (N)**	**Percent Partial Success (N)**	**Percent Failure (N)**	**Cannot Be Determined (N)**
Acreage Requirement	72 (101)	11 (16)	17 (24)	(2)
401 Conditions	76 (94)	20 (25)	4 (5)	(19)
Mitigation Plan Conditions	68 (55)	32 (26)	0 (0)	(62)
Wetland Condition	19 (25)	55 (71)	26 (33)	Not a category

Table 20. Acreage, compliance, and CRAM summaries by permittee type. These permittee type categories were taken directly from the 401 Permit Files.

	Developer	Industry	Caltrans	Municipal	Private	State/Federal
Number of Files	66	9	13	34	13	8
Average Impact Acreage (Total Impact Acreage)	1.17 (76.96)	1.73 (15.54)	2.35 (30.55)	1.75 (59.55)	0.63 (8.19)	3.26 (26.05)
Average Required Acreage for Mitigation (Total Required Acreage)	2.30 (151.80)	7.12 (64.11)	5.22 (67.80)	2.36 (80.30)	0.97 (12.65)	8.57 (68.59)
Average Obtained Acreage (Total Obtained Acreage)	2.15 (141.75)	6.44 (57.95)	4.79 (62.25)	2.28 (77.63)	0.83 (10.84)	8.33 (66.60)
Average Acreage Gained (Total Acreage Gained)	0.98 (64.80)	4.71 (42.41)	2.44 (31.71)	0.53 (18.08)	0.20 (2.66)	5.07 (40.55)
Mitigation Ratio (Required)	3.22:1	16.91:1	1.51:1	2.32:1	1.67:1	1.63:1
Mitigation Ratio (Obtained)	3.13:1	17.36:1	1.38:1	2.40:1	1.89:1	1.33:1
Average 401 Compliance Score	85.93	84.06	87.60	79.77	87.87	76.20
Average Mitigation Plan Compliance Score	81.70	89.96	73.94	80.56	76.98	79.20
Average Total-CRAM Score	57.42	56.71	61.24	59.81	58.03	63.53
Average CRAM-Adjusted Acreage (Total CRAM-Adjusted Acreage)	1.35 (81.18)	3.55 (31.91)	3.58 (35.79)	1.24 (38.38)	0.44 (4.82)	4.09 (32.71)

Table 21. Summary of administrative and regulatory recommendations.

	Improving mitigation requirements	Information management	Improve permit clarity	Assessment of "no net loss"	Coordination with other agencies
Permit conditions should ensure complete compensation for the full suite of wetland functions and services lost	X				
Ensure that mitigation projects compensate for losses in water quality (pollution) improvement services	X				
There should be a better accounting of the habitat types lost and gained	X				
Mitigation projects should have appropriate landscape context	X				
Offsite mitigation should be within the same catchment, or at least the same watershed	X				
Improvements to Database		X			
Improve permit archiving		X			
Improve tracking the progress of mitigation projects		X			
Important permit information should be clearly delineated in tables			X		
Permit conditions should be written so that the extent of efforts must match the intent of the condition to be in compliance			X		
Every mitigation plan and permit should include a table of requirements upon which compliance will be judged			X		
Permits should be clear about the meaning of enhancement, restoration and creation			X		
Performance standards should be clear about the goal of invasive species control			X		
Proof of inundation or saturation appropriate for wetland development should be required for mitigation wetlands			X		
Pre- and post-construction functional assessments of impact and mitigation sites should be required				X	
Improve incorporation of final permit information into Water Board files					X
Consider developing an integrated permit					X

Table 22. Suggested jurisdictional and non-jurisdictional habitat hierarchy, with structure for tracking losses and gains.

Impact/Mitigation Acreage Accounting	**Impacted**			**Required**				
	Total	Permanent	Temporary	Total	Creation	Restoration	Habitat Enhancement	Preservation
Waters of the United States.								
Wetland (Total)								
Riverine								
Estuarine/Lagoon								
Seasonal/Depressional								
Vernal Pool								
Seep/Spring/Wet Meadow								
Lacustrine Fringe								
Other								
Non-Wetland Waters								
Non-Streambed Open Water								
Streambed (Total)								
Open Water								
Unvegetated Streambed								
Vegetated Streambed								
Other (Ex: Riparian Waters)								
Non-waters of the United States.								
Riparian								
Upland								

10. Figures

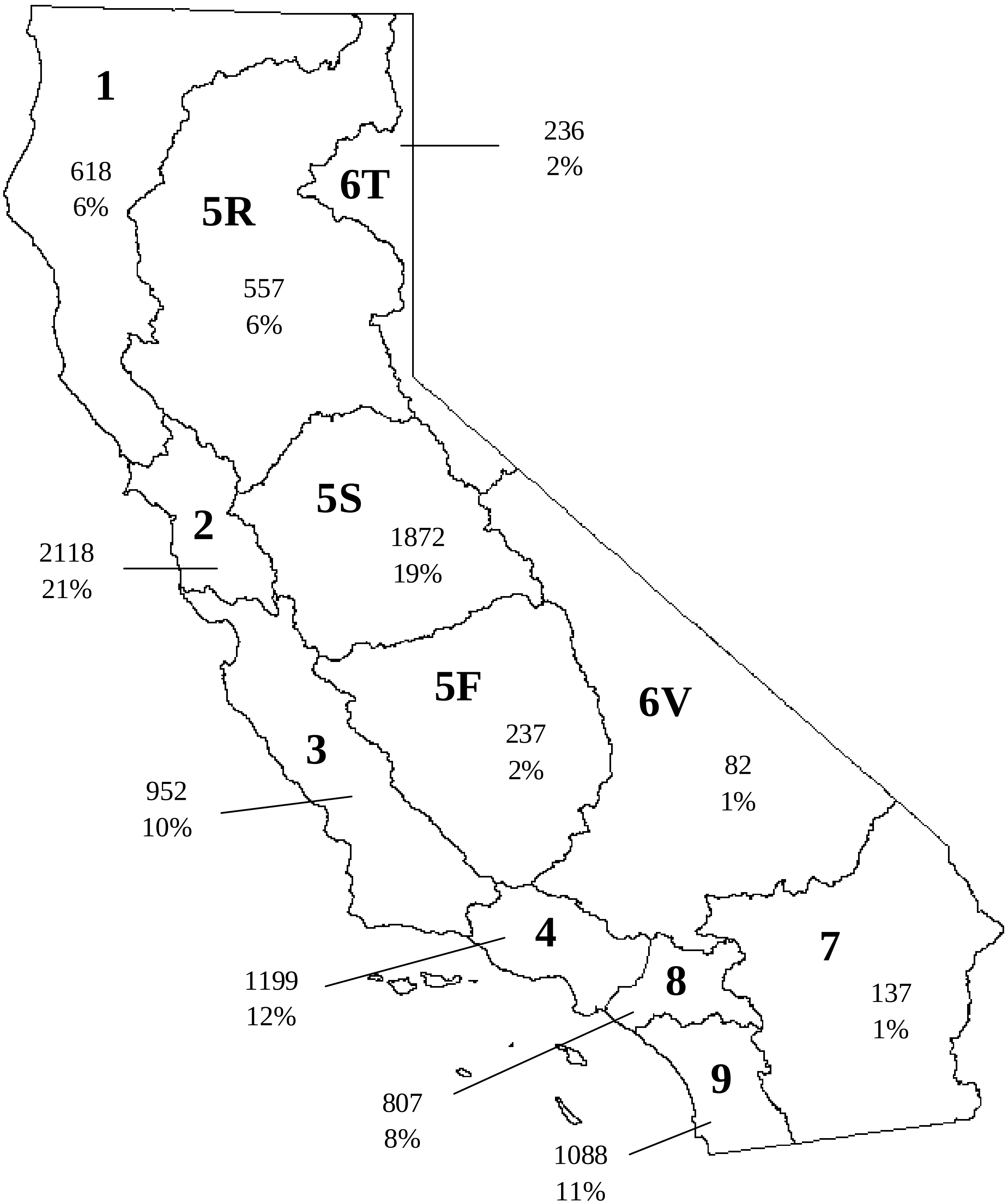

Figure 1. Map of California state board regions with breakdown of number of permit files.

The total number of files listed in the SWRCB database by region from 1991-2002 (N=9924 files) and the percentage of files by region of the total number of files in the SWRCB database from 1991-2002.

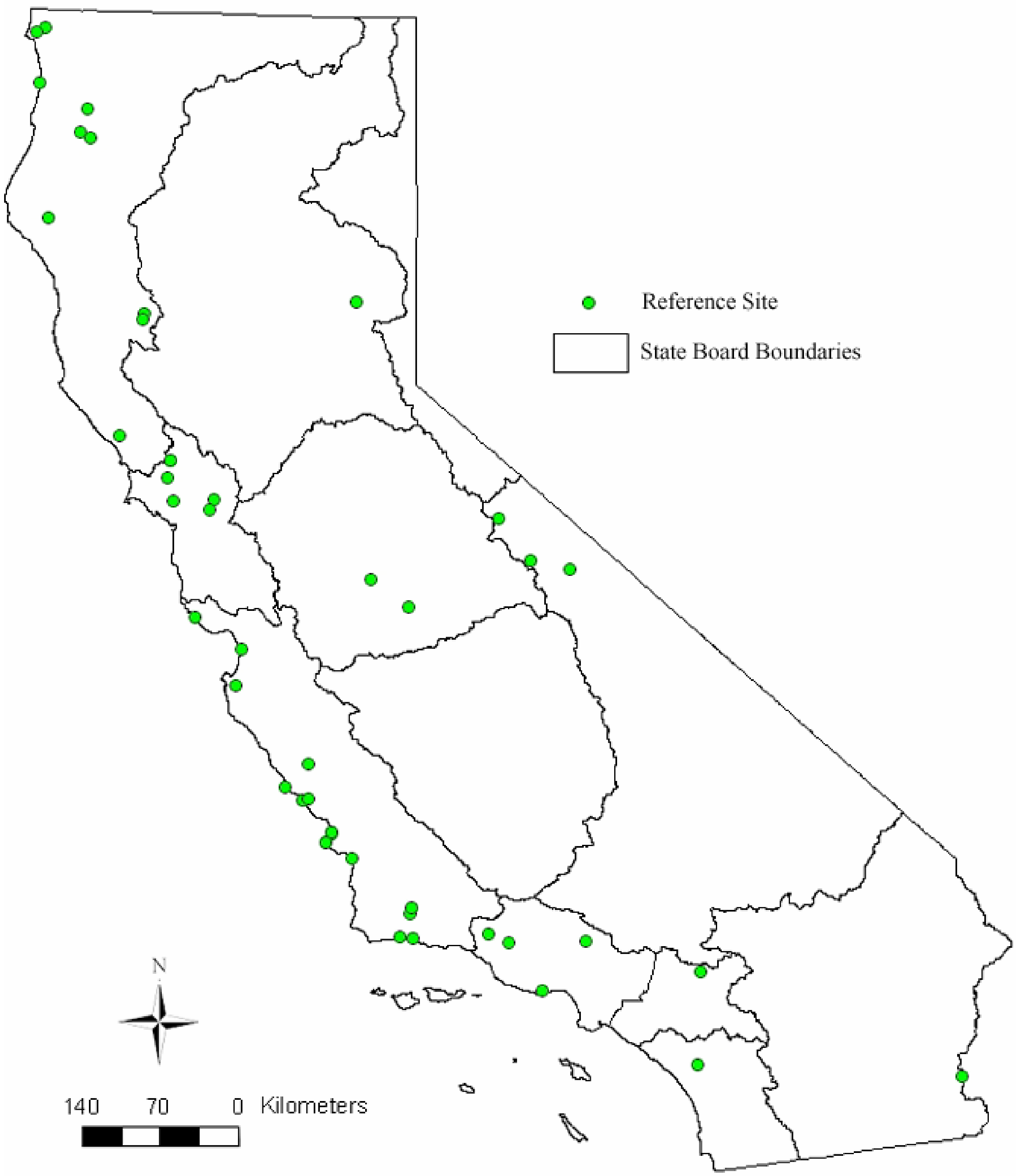

Figure 2. Statewide distribution of reference sites.

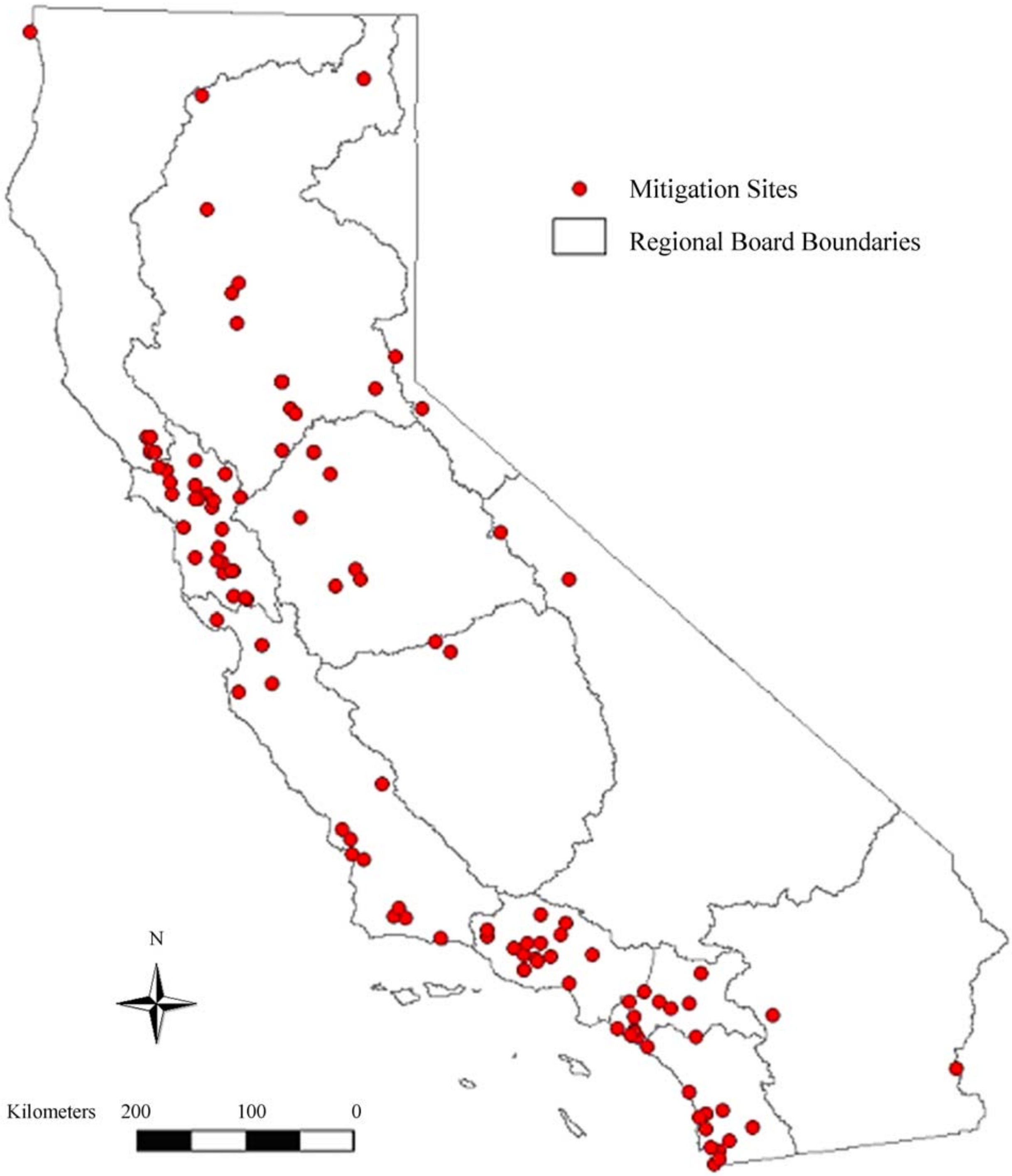

Figure 3. Statewide distribution of the assessed mitigation sites associated with the 143 permit files.

Several of these sites, especially those in the central valley (Region 5) involved a collection of shared mitigation banks which resulted in fewer than 143 mitigation sites. Points represent each assessed mitigation site rather than multiple sites per file.

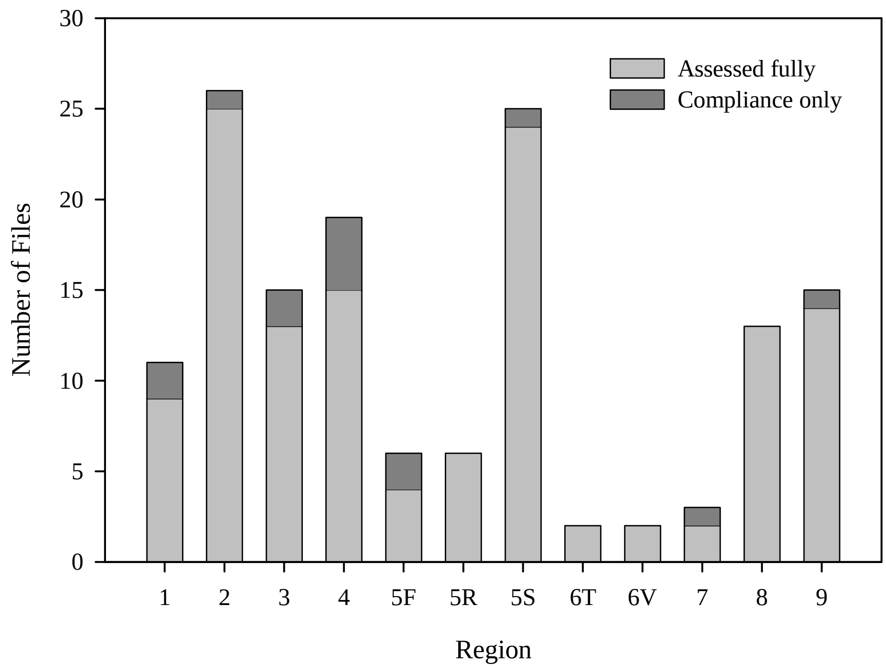

Figure 4. Files assessed fully and for compliance only by state board region.

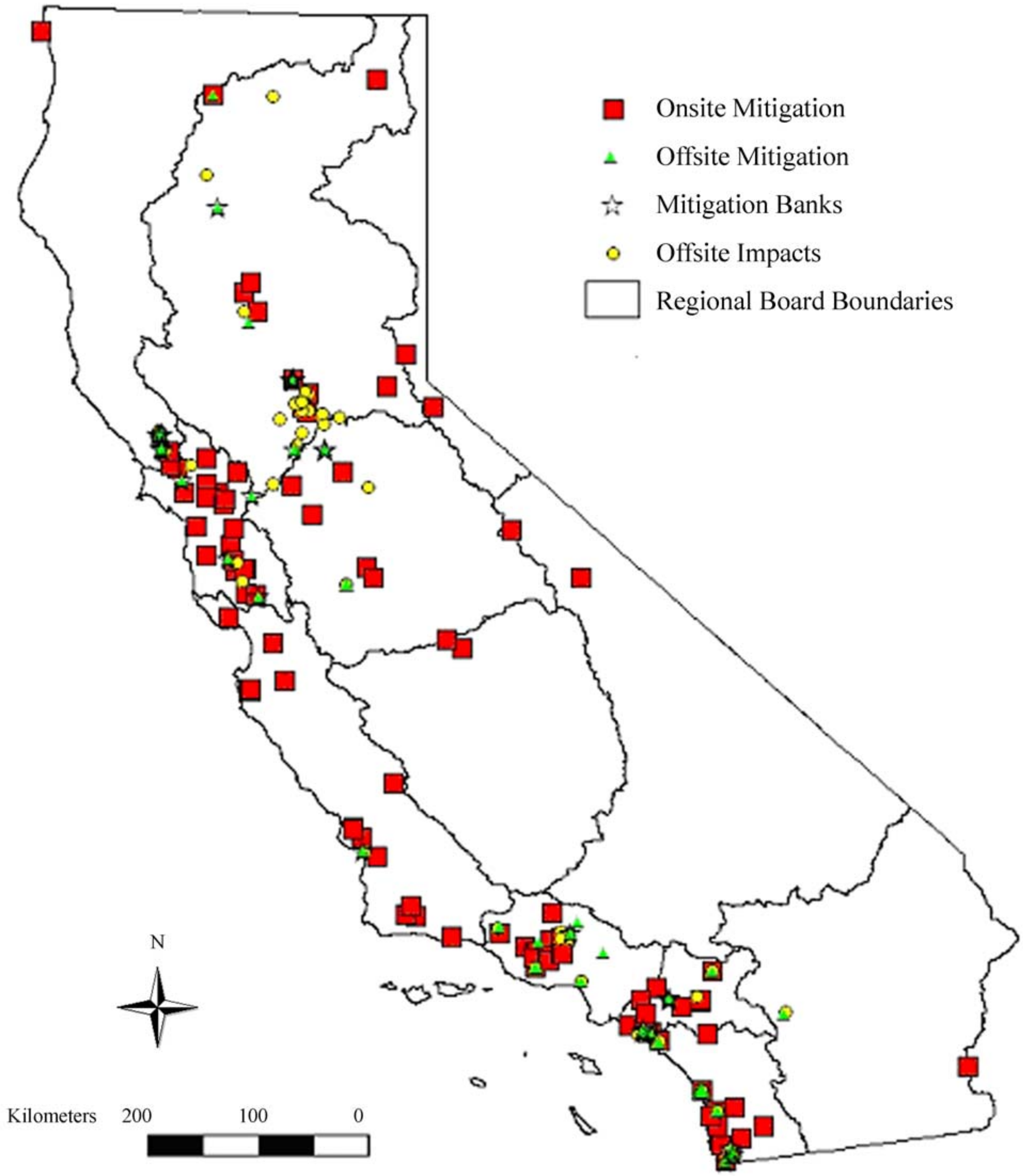

Figure 5. Statewide distribution of the impact and mitigation sites associated with the 143 permit files assessed.

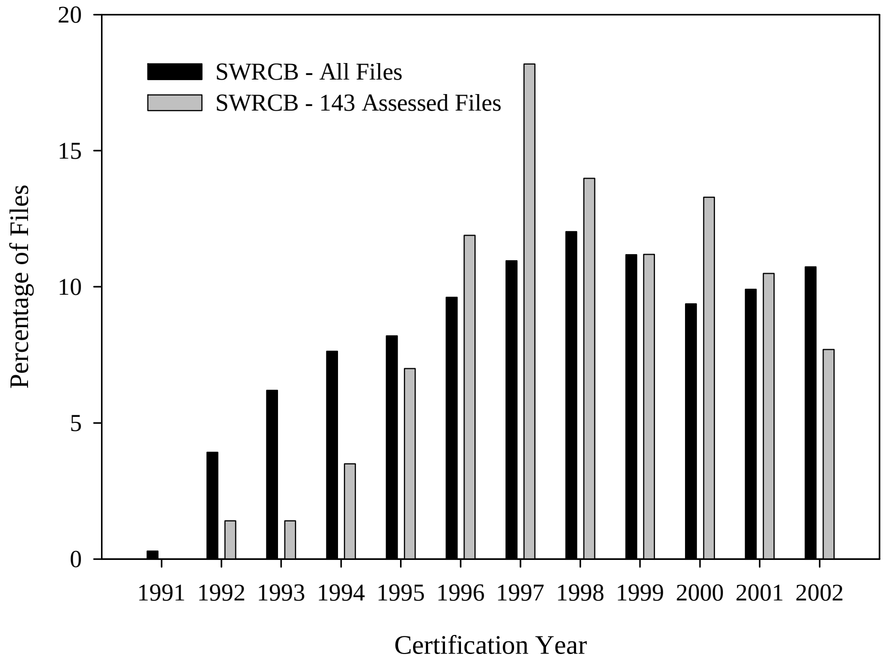

Figure 6. Percentage of applications per certification year listed in the SWRCB database from 1991 to 2002 compared with the percentage of files per year in our sample of files assessed fully and for compliance only (N for files assessed=143, N for SWRCB database=9924).

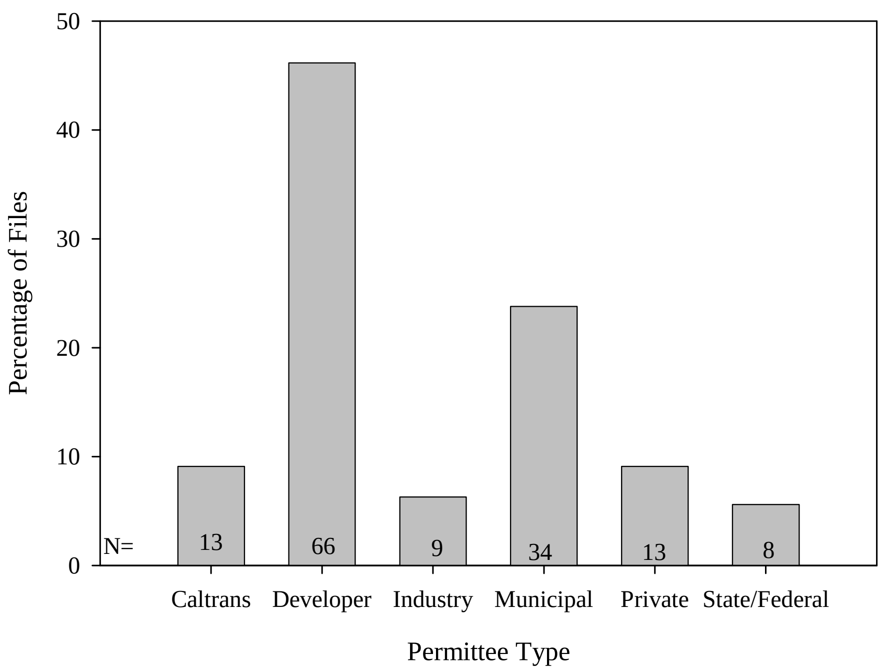

Figure 7. Percentage of files assessed by permittee type (N=143 files).

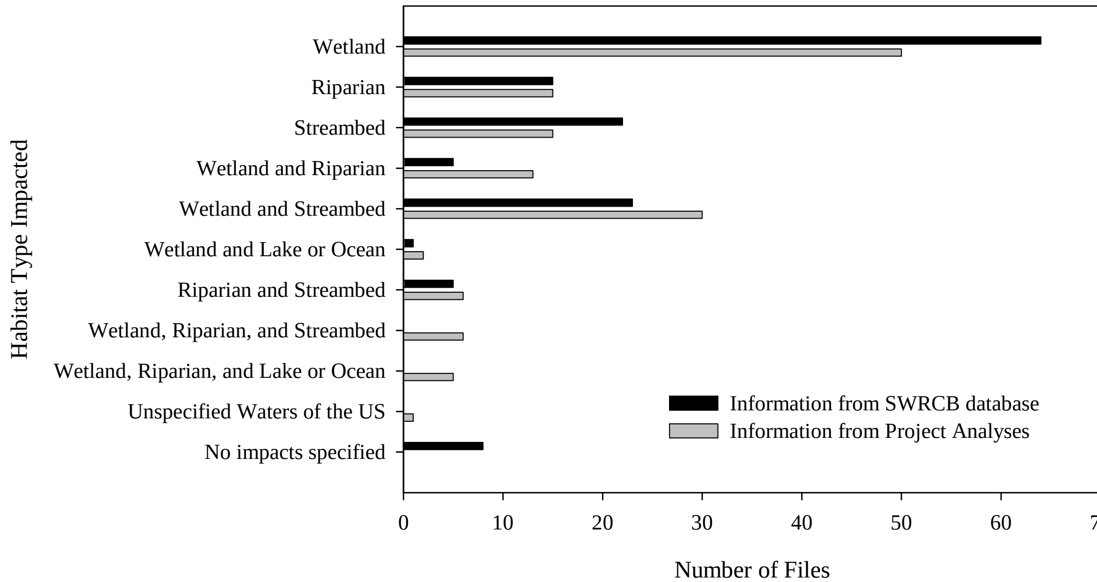

Figure 8. Breakdown of the 143 assessed files by habitat type impacted as reflected by the SWRCB database, and by our detailed permit reviews.

Some files had impacts to a single habitat type while others impacted multiple habitat types. The individual wetland types are not included here as such information is not consistently available in the SWRCB database.

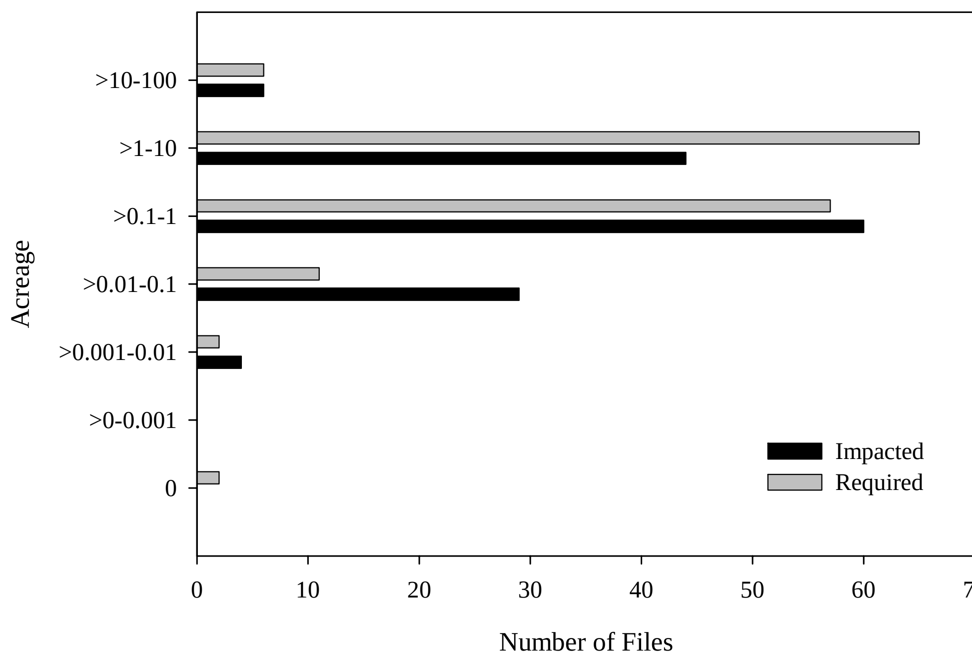

Figure 9. Acres impacted and acres of mitigation required displayed by acreage-size categories using data from project analyses for files assessed (N=143).

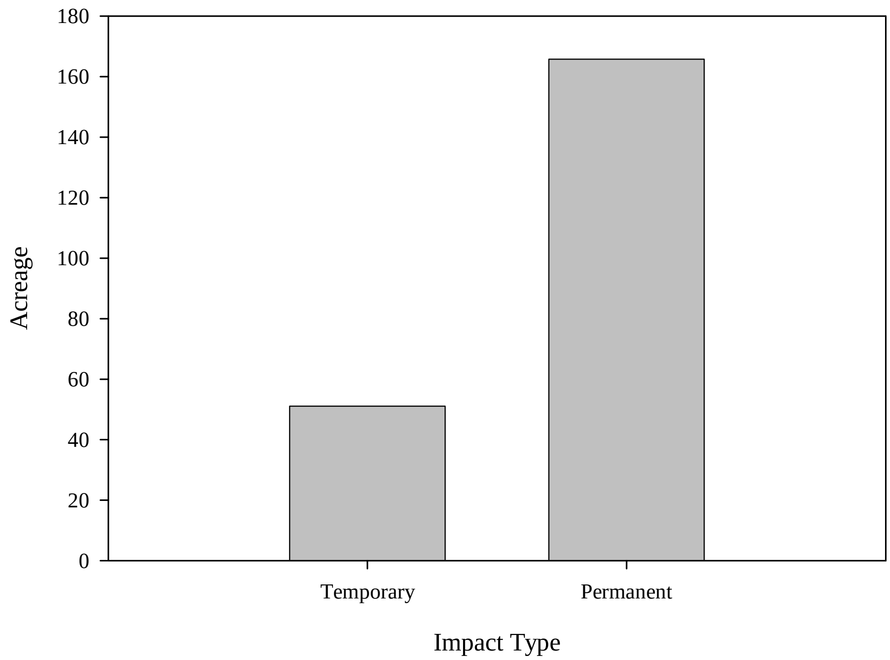

Figure 10. Breakdown of the 143 assessed permit files by permanent and temporary impacts as reflected by the SWRCB database, and by our detailed permit reviews.

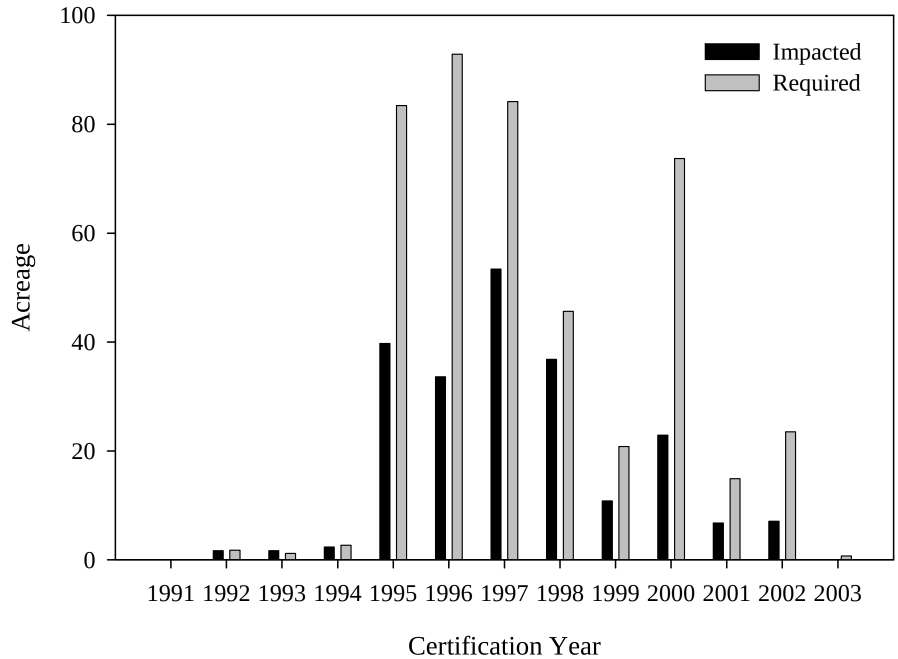

Figure 11. Acres impacted and acres of mitigation required displayed by certification year from the project analyses for files assessed (N=143).

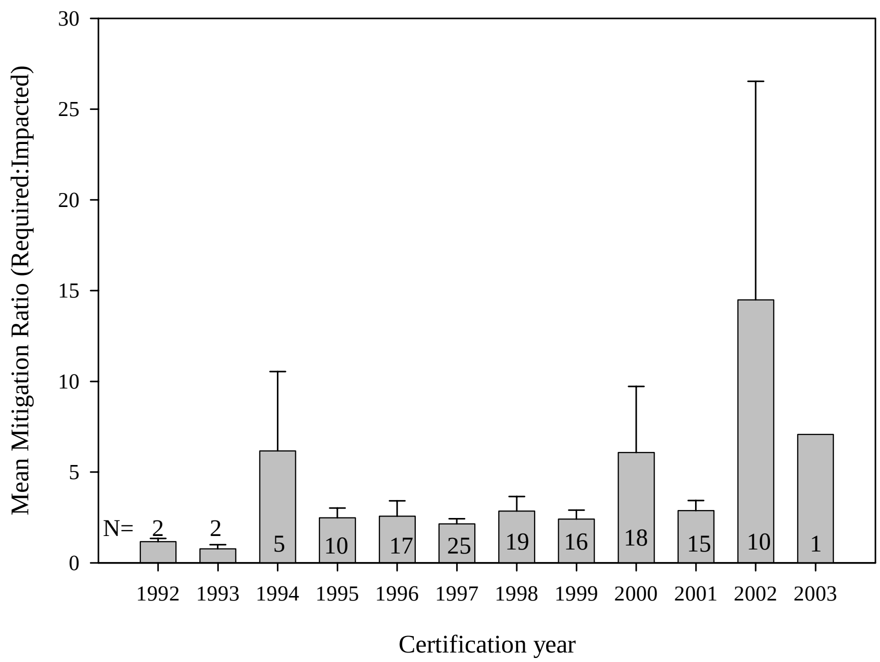

Figure 12. Average mitigation ratios required by certification year as determined from our detailed permit file review (N=143).

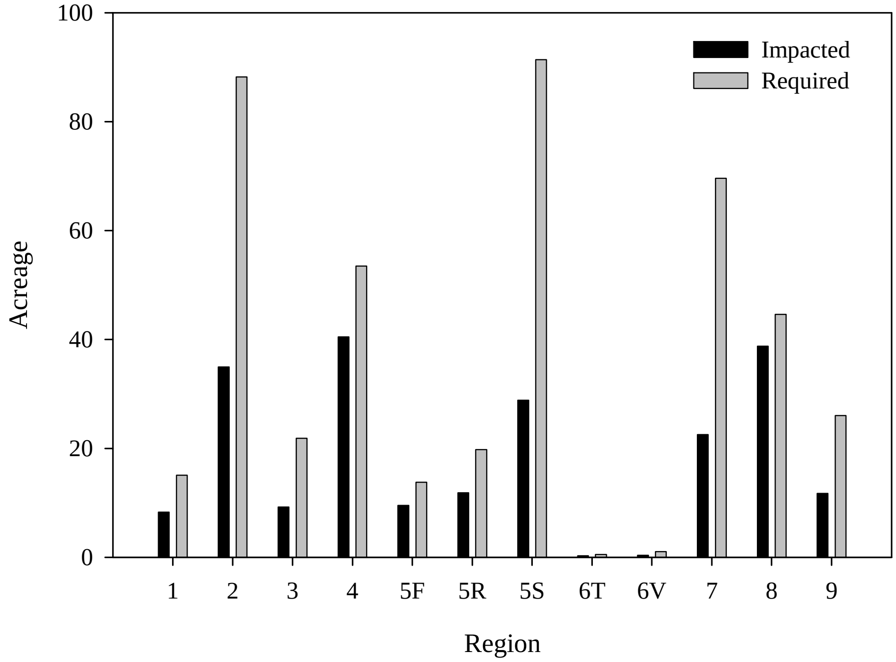

Figure 13. Acres impacted and acres of mitigation required displayed by state board region from the project analyses for files assessed (N=143).

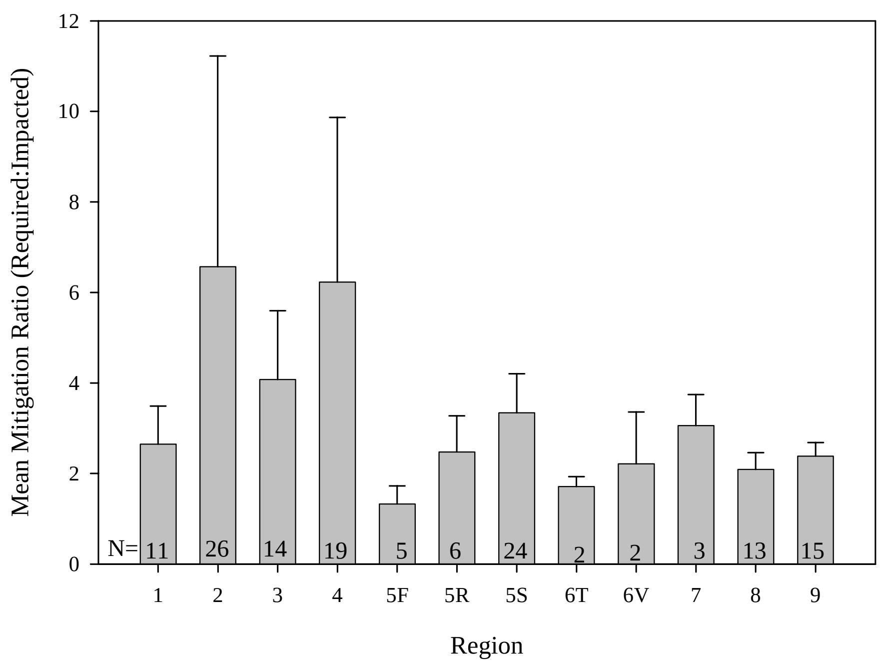

Figure 14. Mitigation ratios required by region (N=143).

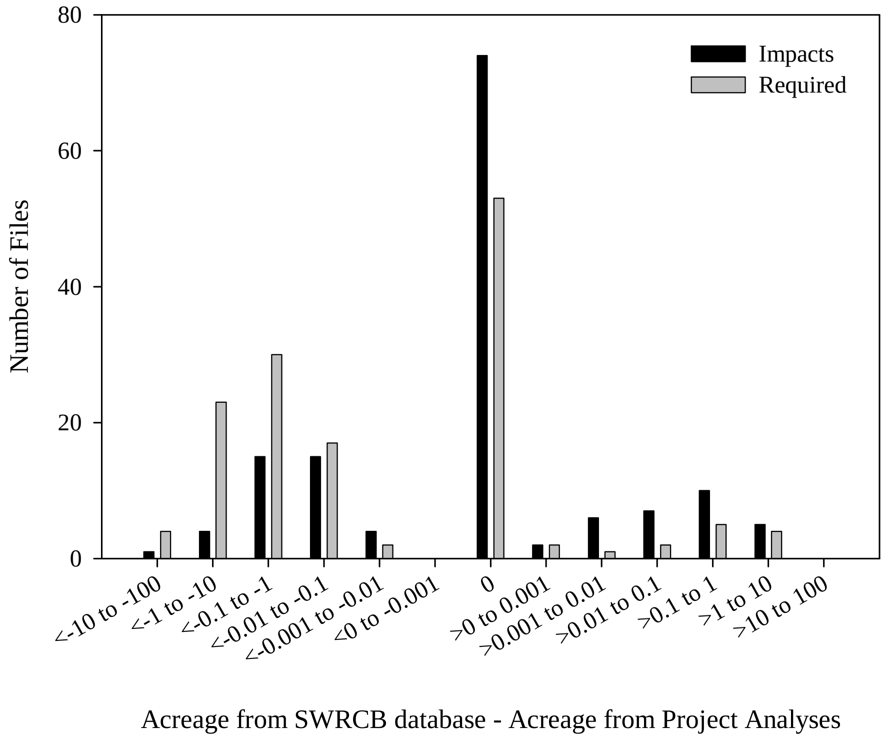

Figure 15. Plot of the differences between the impacted and required acreage values obtained through our detailed file review, and the corresponding values recorded in the SWRCB database.

A logarithmic scale was used for the data bins due to the wide range of acreage values involved. Negative values indicate that a lower value of acreage required was recorded in the SWRCB database compared to the acreage calculated during project analyses.

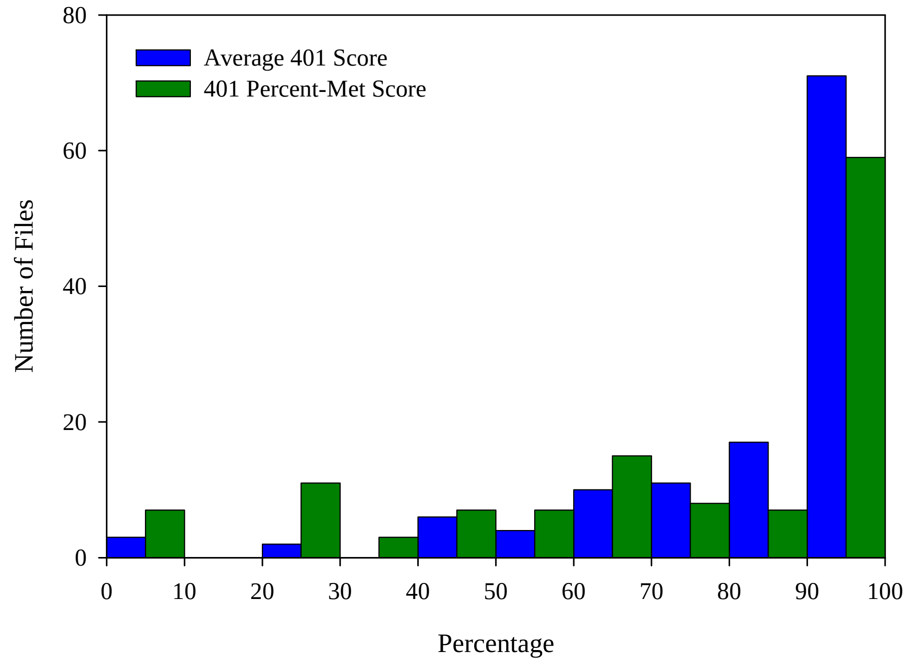

Figure 16. Distribution of files according to the average 401 permit compliance score and 401 percent-met score (N=124 files with assessable 401 permit conditions).

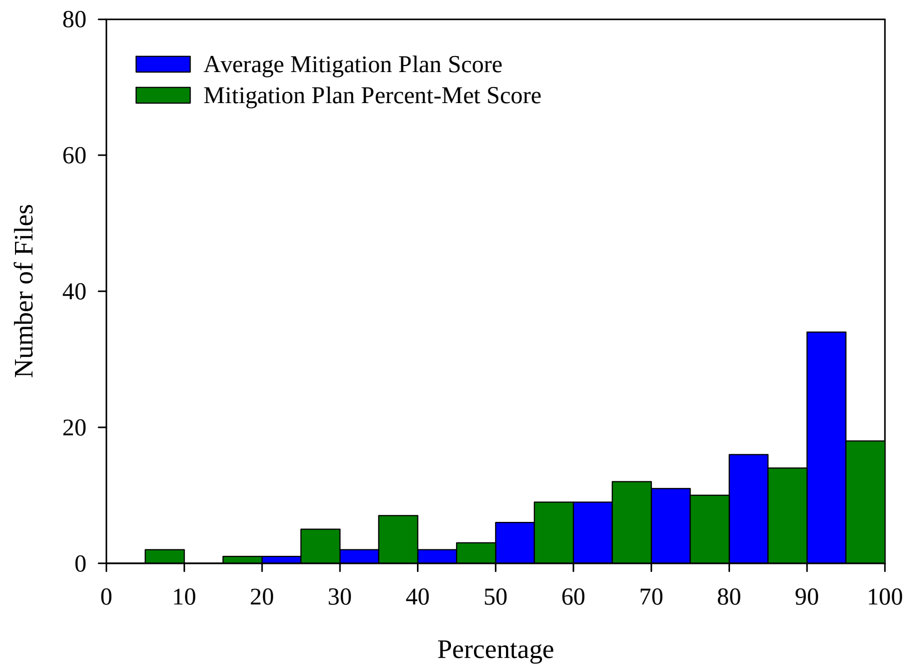

Figure 17. Distribution of files according to the average mitigation plan compliance score and mitigation plan percent-met score (N=81 files with assessable mitigation plan conditions).

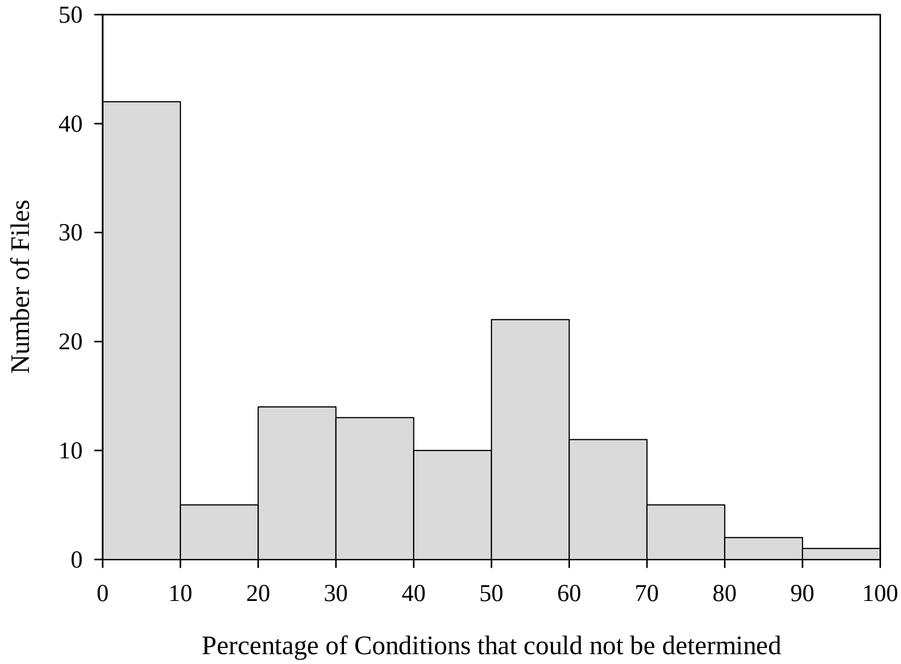

Figure 18. Distribution of files according to the percentage of 401 permit compliance conditions that could not be determined (N=124 files with assessable 401 permit conditions).

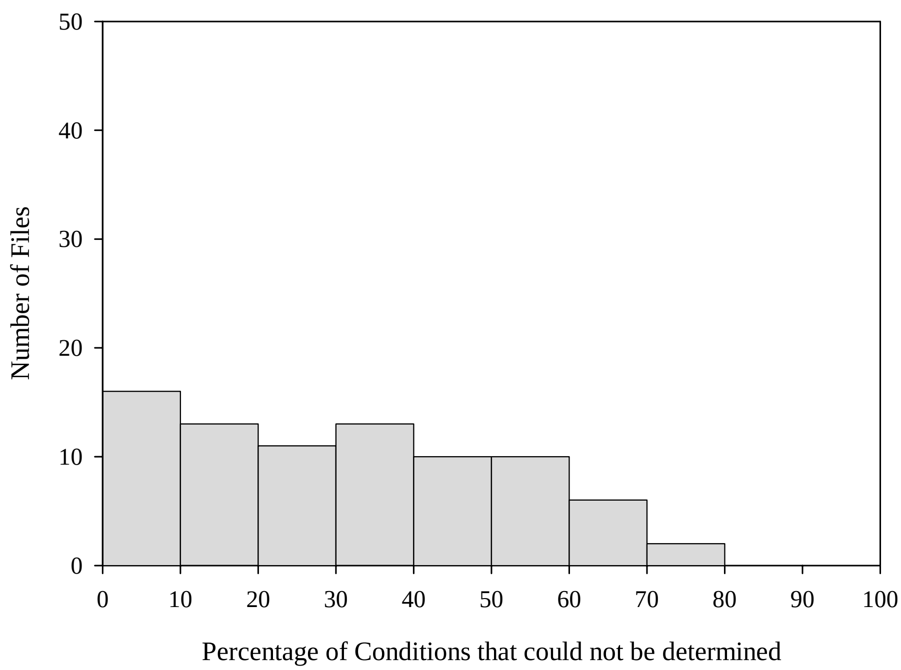

Figure 19. Distribution of files according to the percentage of mitigation plan compliance conditions that could not be determined (N=81 files with assessable mitigation plan conditions).

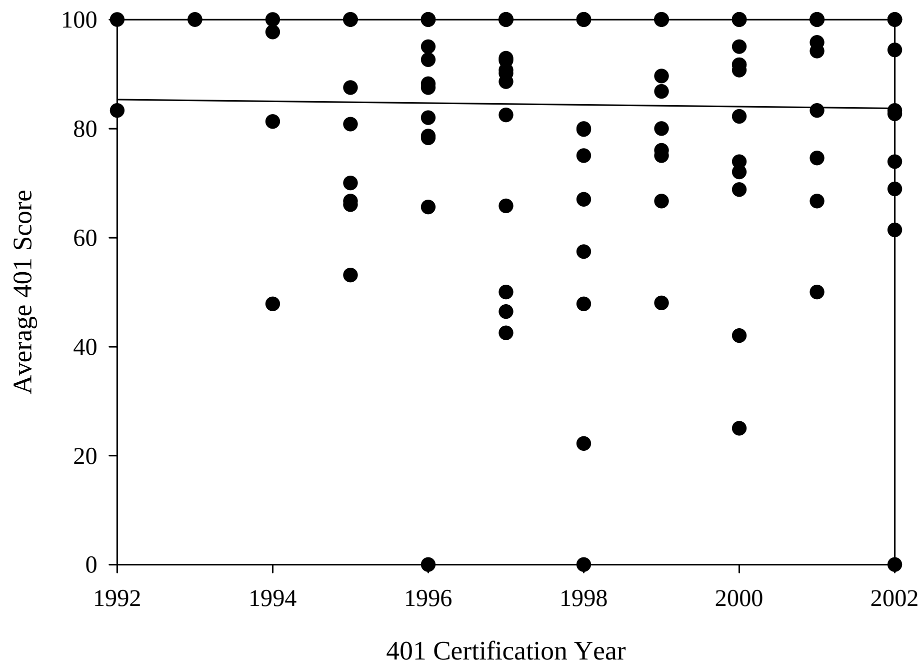

Figure 20. Relationship between 401 certification year and average 401 permit compliance score (N= 124 files with assessable 401 permit conditions; p=0.845, r^2=0.000).

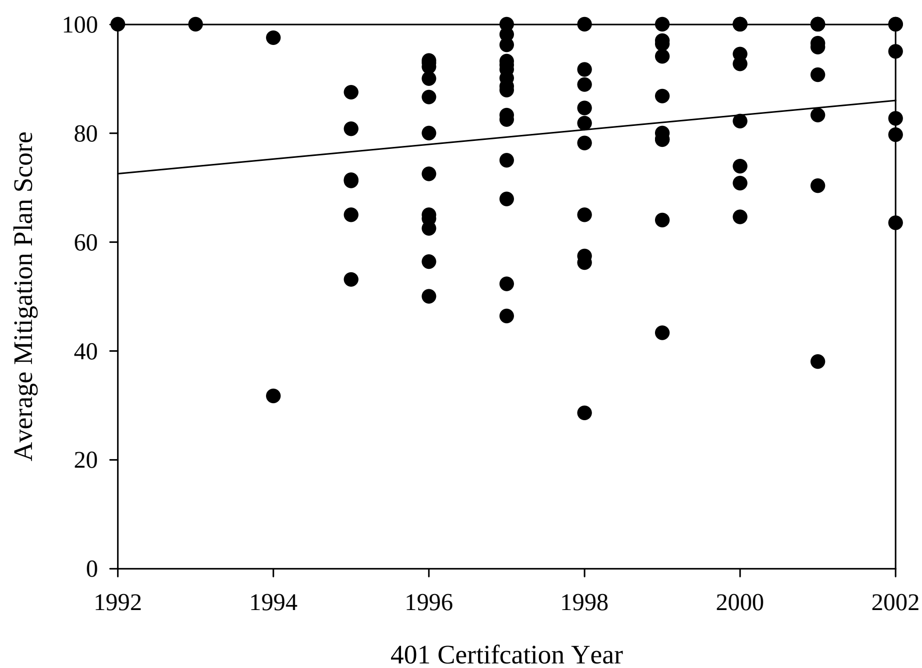

Figure 21. Relationship between 401 certification year and average mitigation plan compliance score (N= 81 files with assessable mitigation plan conditions; p=0.119, r^2=0.030).

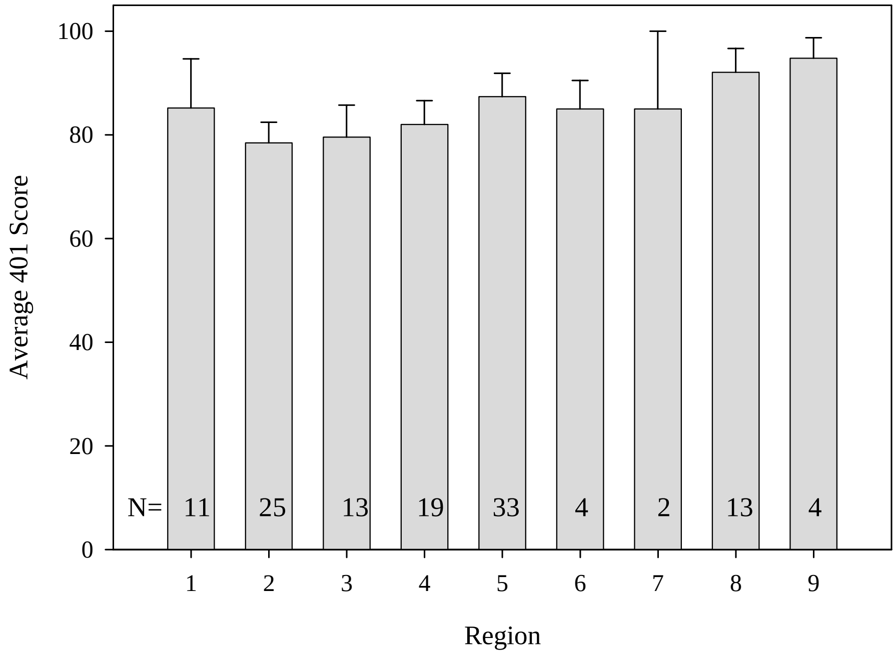

Figure 22. Average percentage score for 401 permit compliance by state board region (N=124 files with assessable 401 permit conditions).

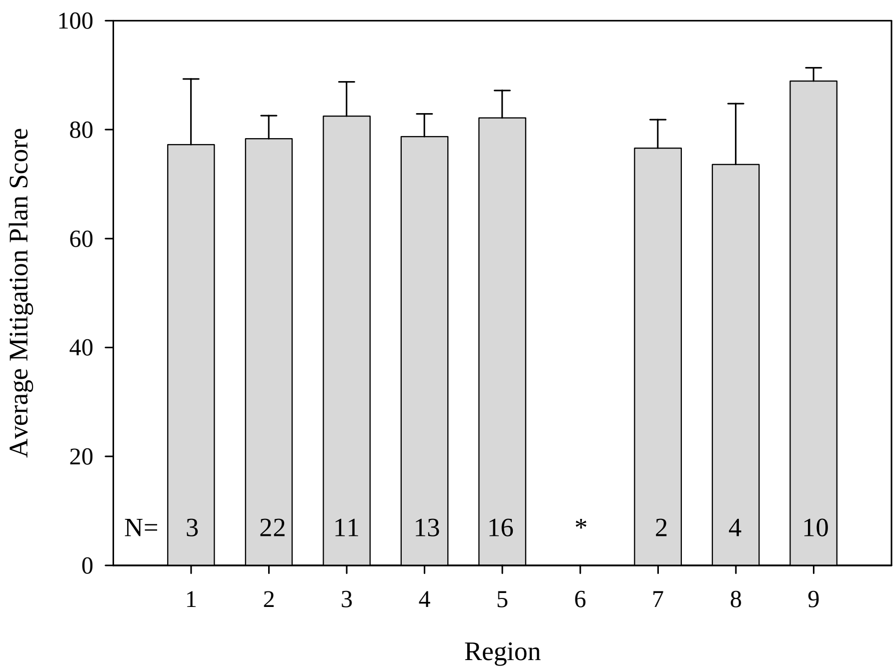

Figure 23. Average percentage score for mitigation plan compliance by state board region (N=81 files with assessable mitigation plan conditions).

*None of the four files from Region 6 included mitigation plans.

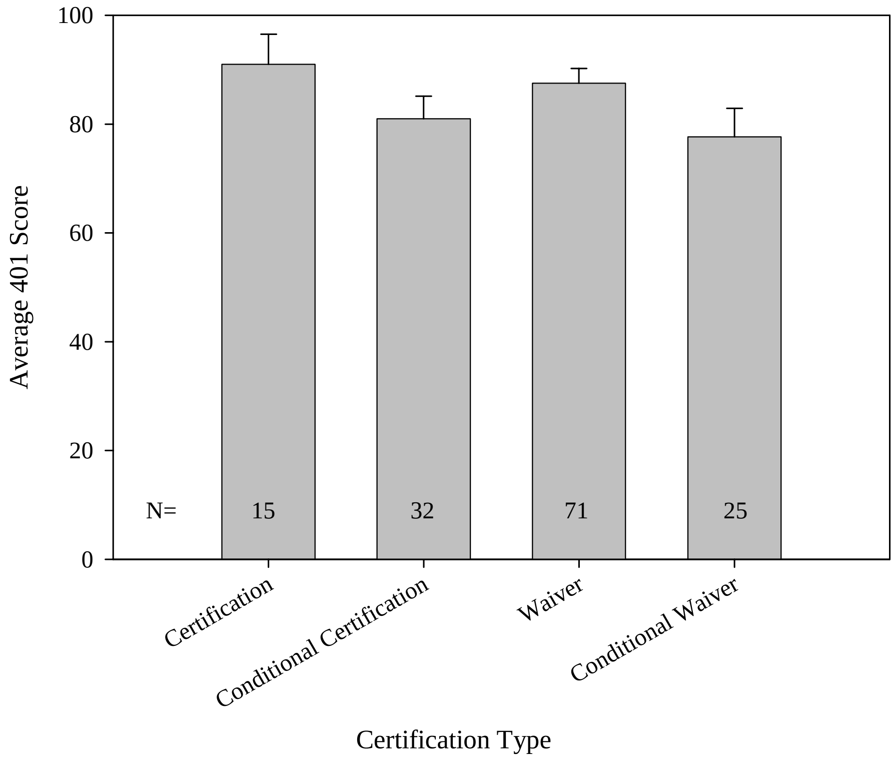

Figure 24. Average 401 score by certification type (N=143 files).

The categories used in this analysis correspond to the categories in the SWRCB database as follows: Certification=CERT, STDCERT, WDR; Conditional Certification=CONDCERT; Waiver=WAIVE, WDRWV; Conditional Waiver=CNDWV, WDRCNDWV. Several files were listed as certifications and as waivers of waste discharge requirements; these files were categorized as certifications for the purposes of this figure. File #0 was not listed in any of these categories in the SWRCB database, so we determined from the 401 permit that it was a certification and waiver of waste discharge requirements. Therefore, it is listed as a certification for this analysis.

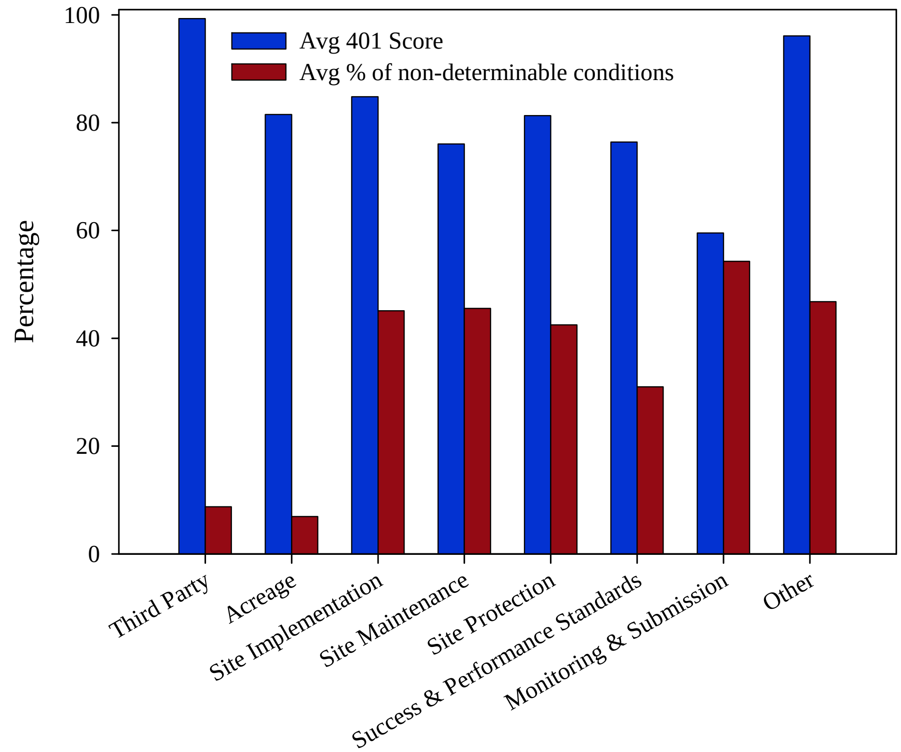

Figure 25. Average scores for 401 permit compliance and average percentage of conditions that could not be determined grouped by the type of permit condition (N=124 files with assessable 401 permit conditions).

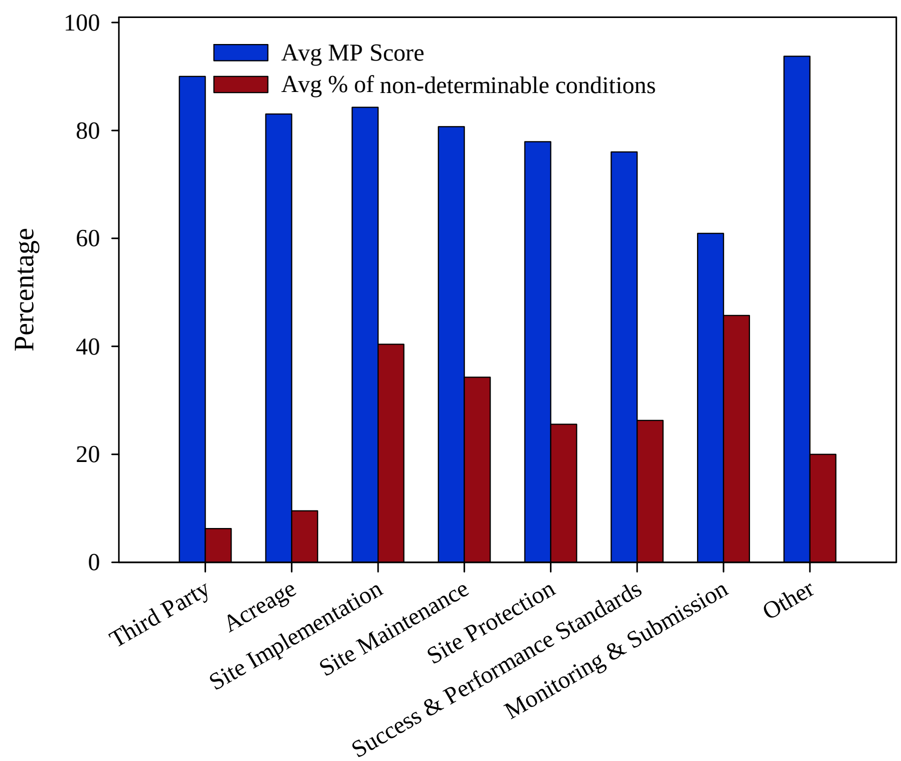

Figure 26. Average scores for mitigation plan compliance and average percentage of conditions that could not be determined grouped by the type of permit condition. (N = 81 files with assessable mitigation plan conditions).

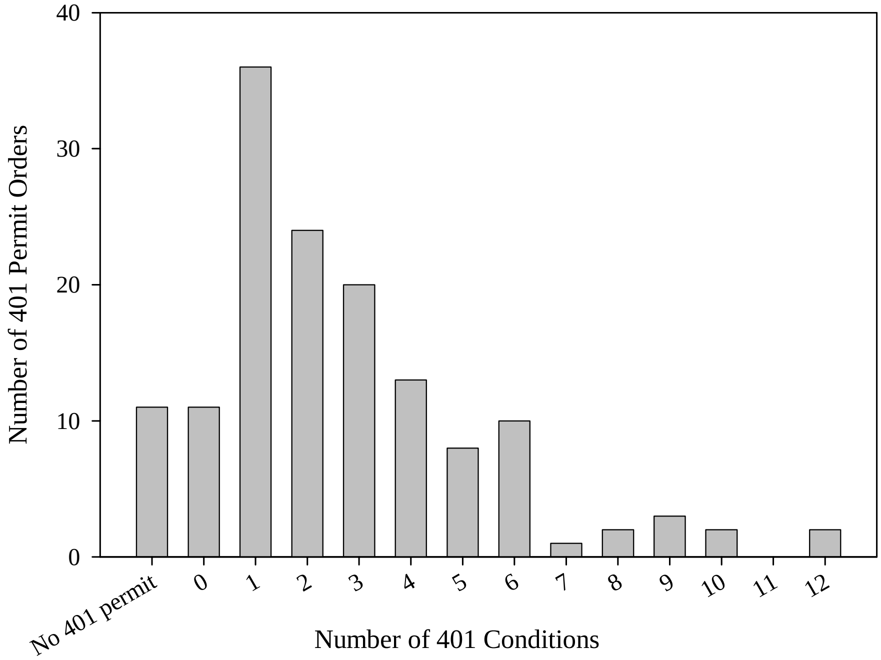

Figure 27. Breakdown of the number of mitigation-related permit requirements (conditions) in each 401 permit order (N=143).

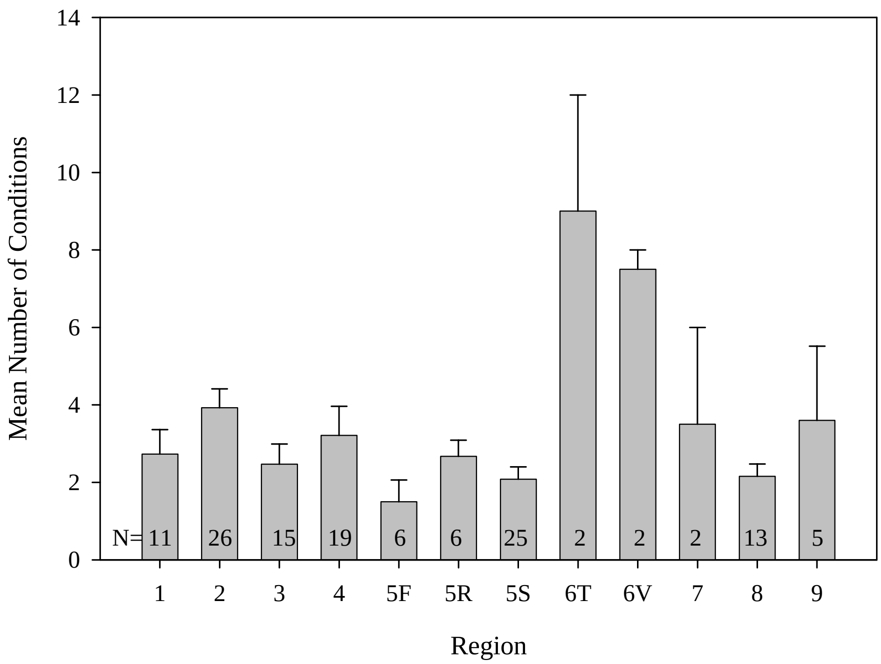

Figure 28. Mean number of mitigation-related 401 conditions per order within each SWRCB Region, including standard error bars (N=132). Eleven files for which no 401 permit was obtained were excluded.

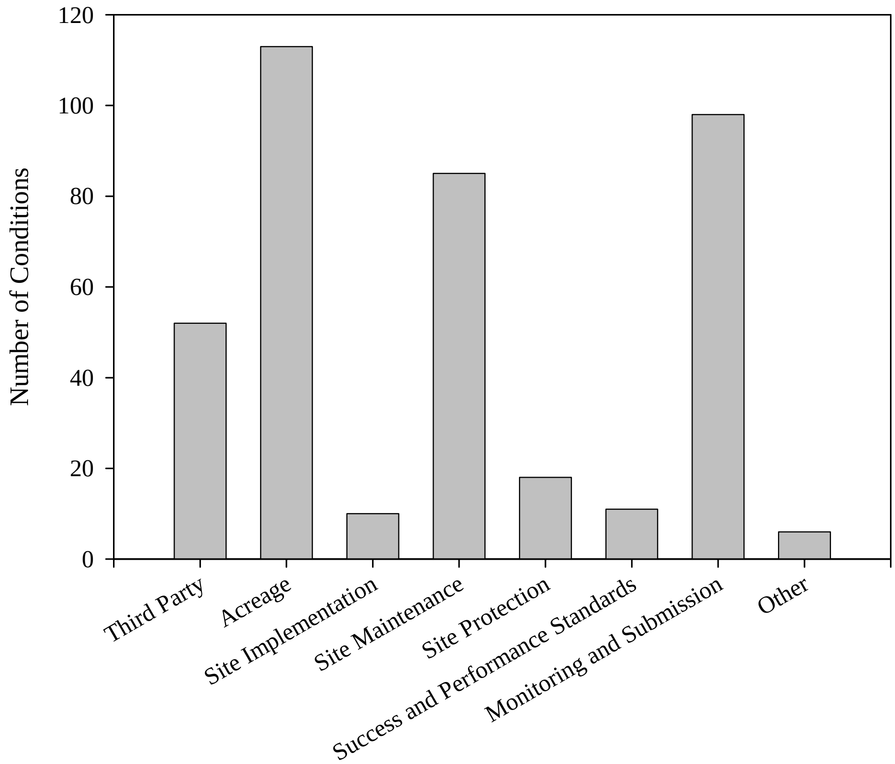

Figure 29. Breakdown of all mitigation-related 401 permit conditions by condition category (N=132).

The conditions from all permit orders were combined into a single list prior to categorization. Eleven files for which no 401 permit was obtained were excluded.

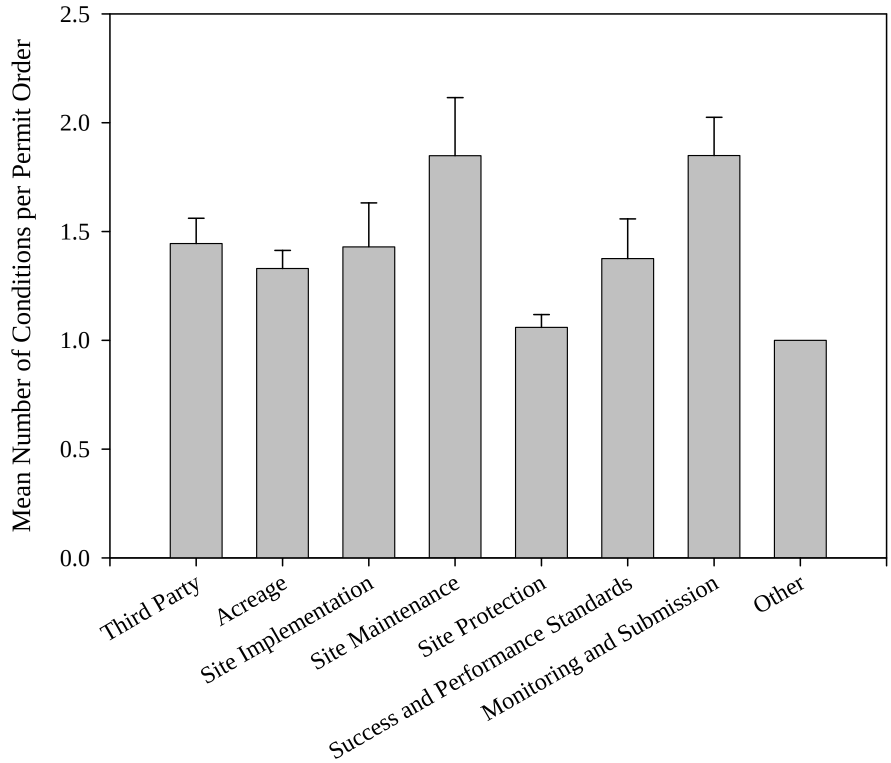

Figure 30. Mean number of mitigation-related 401 permit conditions per permit order (N=132).

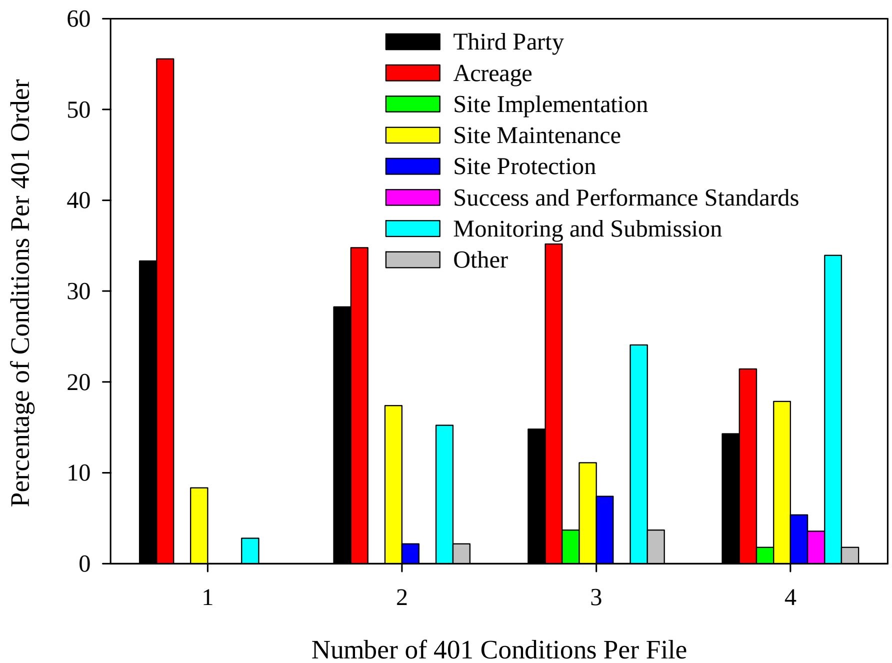

Figure 31. Frequency of occurrence for the eight permit condition categories when the 401 order includes just a single mitigation-related condition (N=36, 23, 18, 14, respectively).

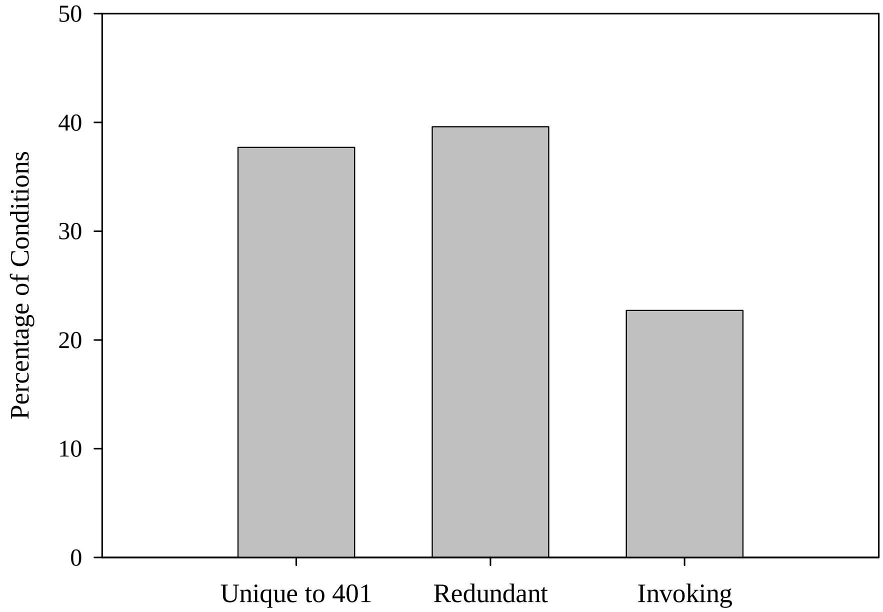

Figure 32. Percentage of mitigation-related conditions found in 401 permit orders that were unique to the 401, redundant with equivalent conditions required by other regulatory agencies, or invoking those other agency permits or the common mitigation plan (i.e., “must follow the 404”) (N=115).

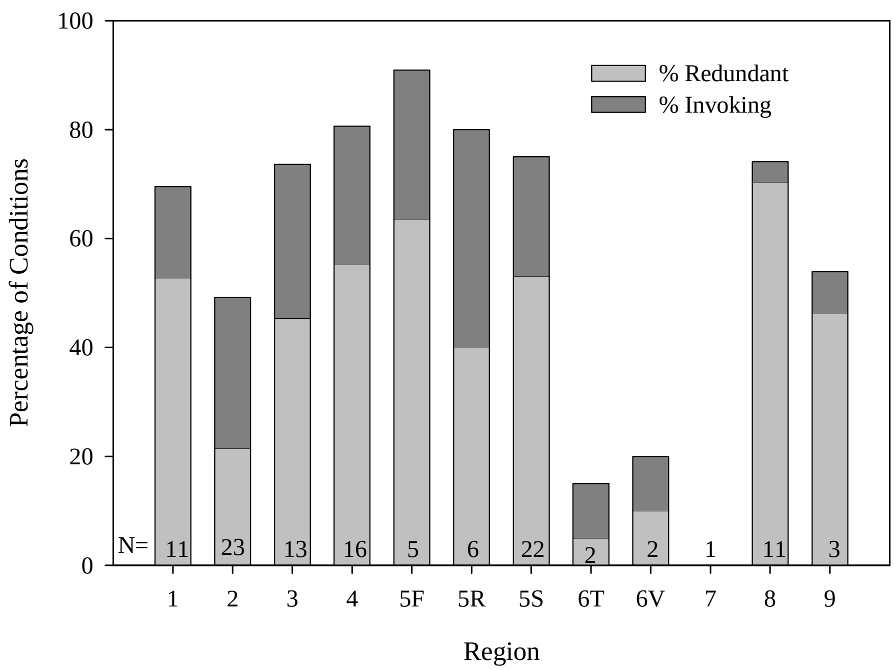

Figure 33. Percentage of redundant and invoking 401 conditions by Region (N=115).

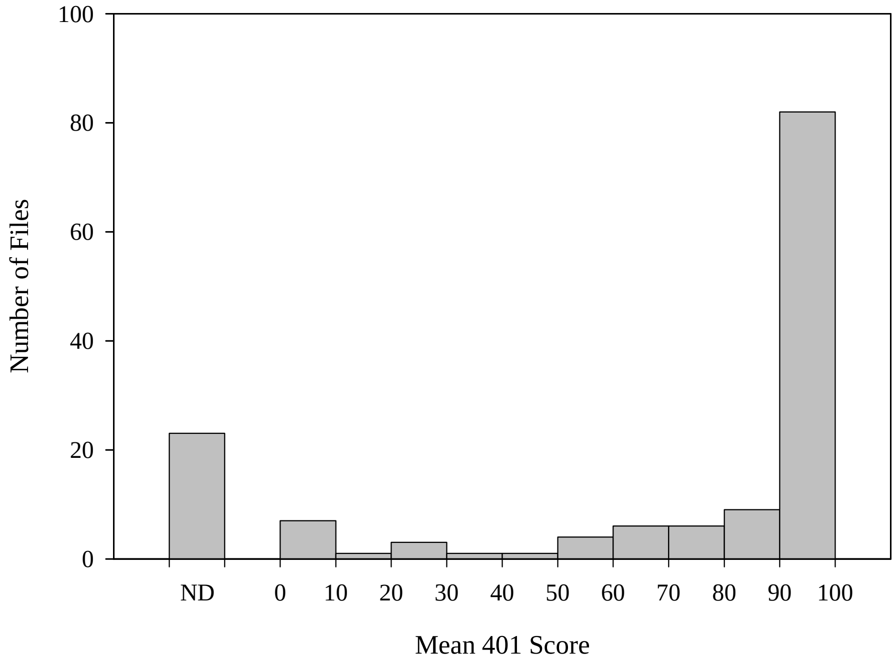

Figure 34. Distribution of files according to the average 401 permit compliance score including only those mitigation conditions explicitly specified in the 401 permit order (N=143).

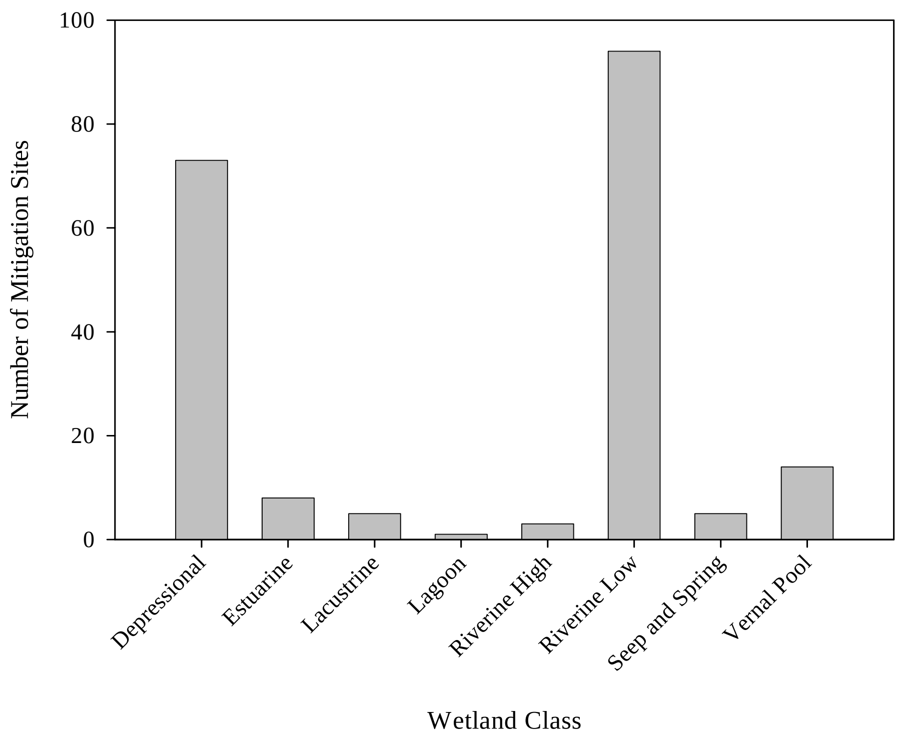

Figure 35. Breakdown of wetland hydrogeomorphic classes as defined and assessed by the CRAM evaluations for all 204 mitigation sites representing 129 files evaluated using CRAM.

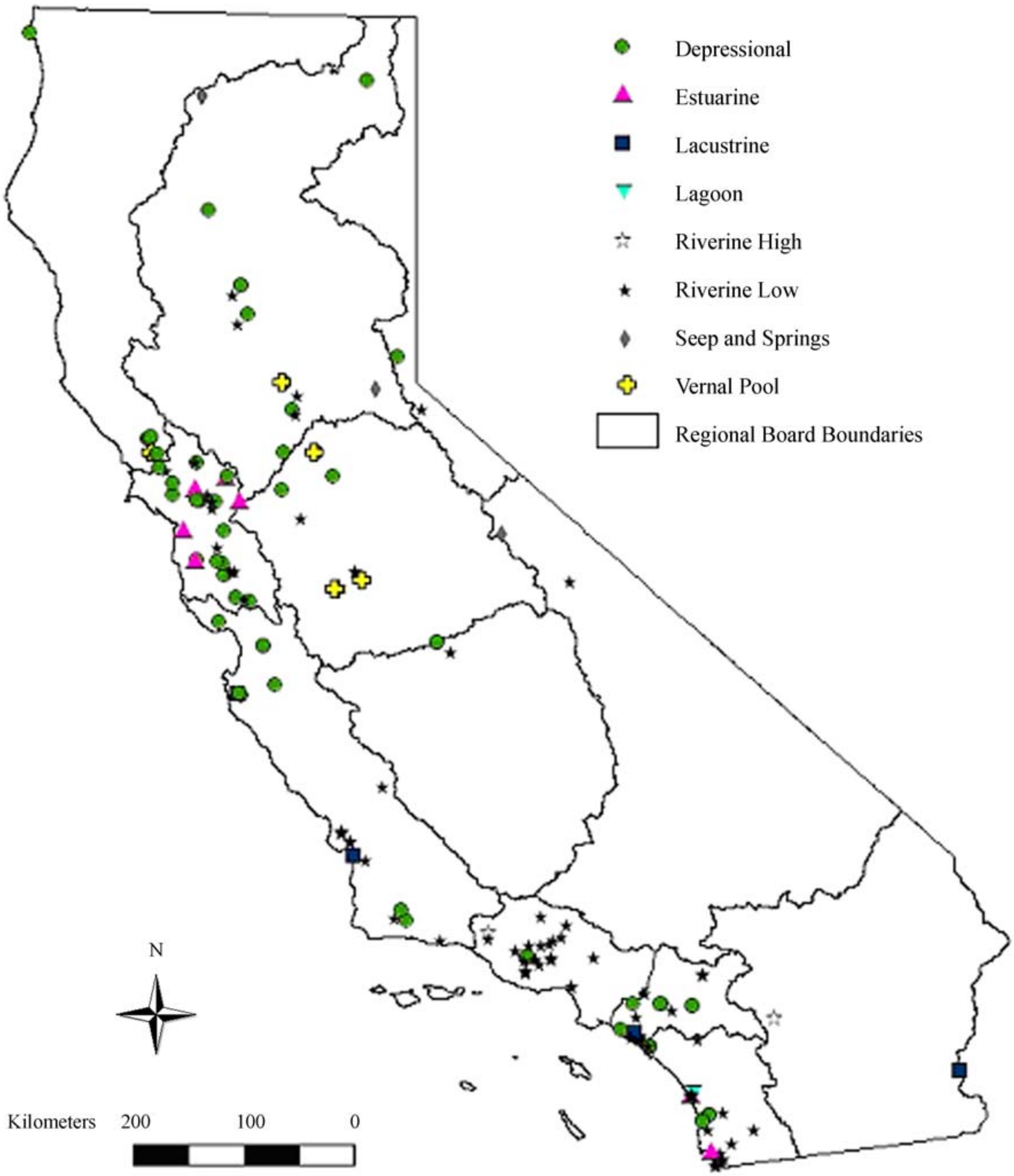

Figure 36. Distribution of assessed mitigation sites by wetland class across the state.

Symbols indicate individual mitigation actions; multiple points may be indicated for individual projects with multiple mitigation actions, and some points may represent multiple projects, e.g., mitigation banks.

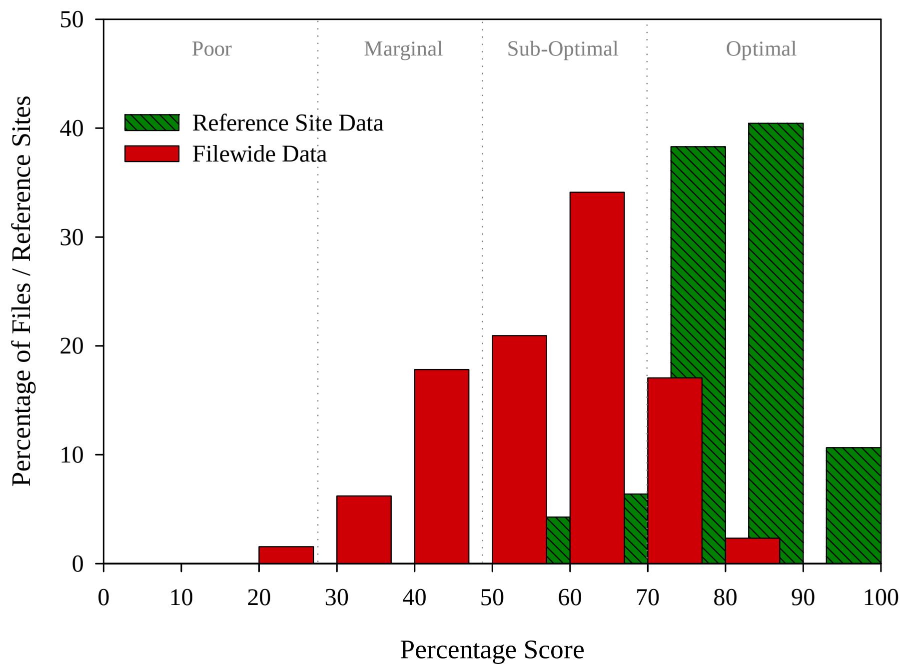

Figure 37. All CRAM data combined into a single overall wetland condition success score for each of the 129 files and 47 reference sites evaluated using CRAM.

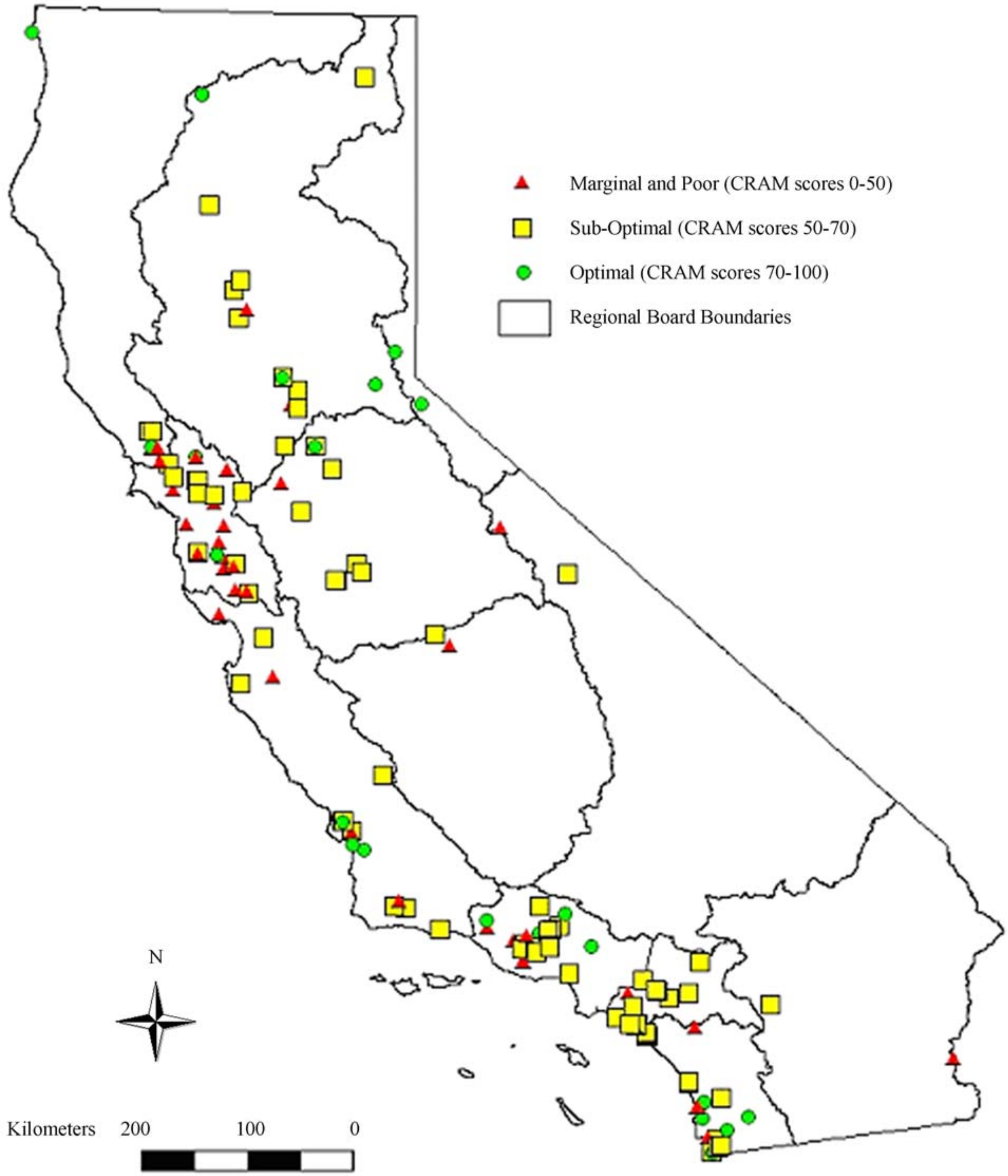

Figure 38. Map of California showing location of mitigation sites color coded by condition score.

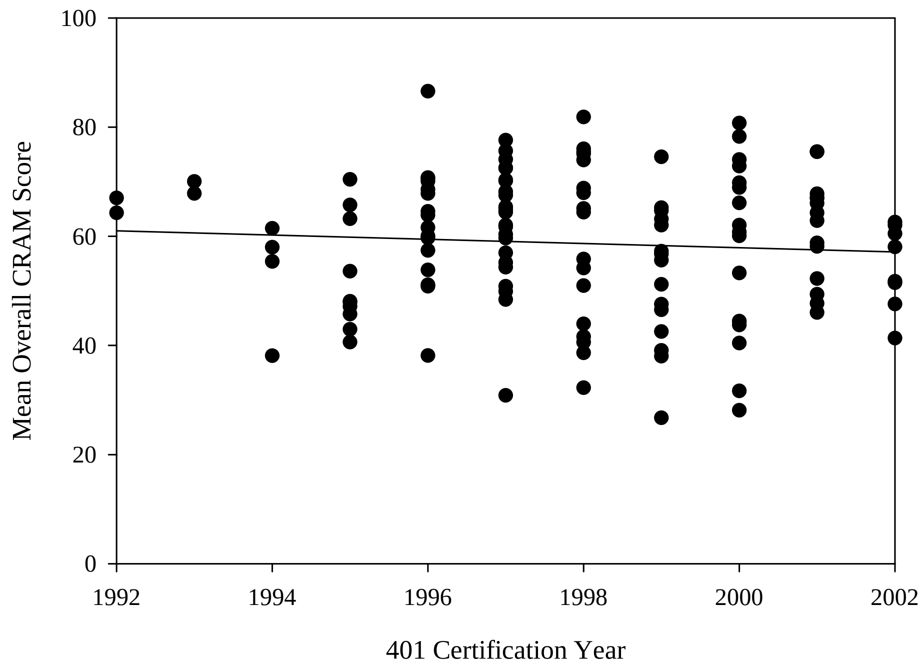

Figure 39. Relationship between 401 certification year and filewide mean overall CRAM percentage scores grouped by certification year (N=129 files, r^2=0.005, p=0.415).

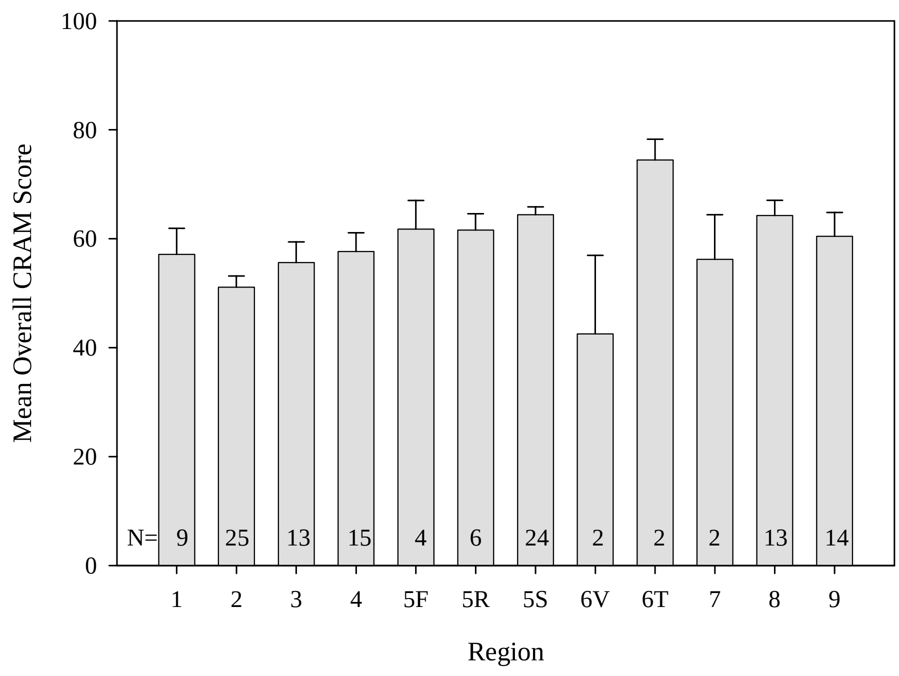

Figure 40. Filewide mean Total-CRAM percentage scores by SB region (N=129 files).

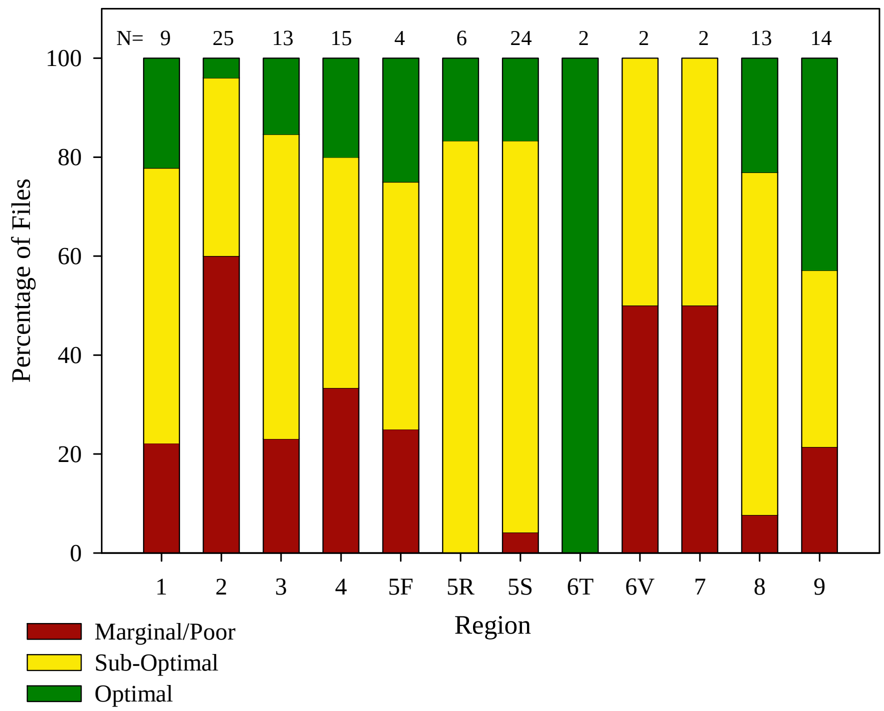

Figure 41. Percentage of files in CRAM success categories by state board region (N=129 files).

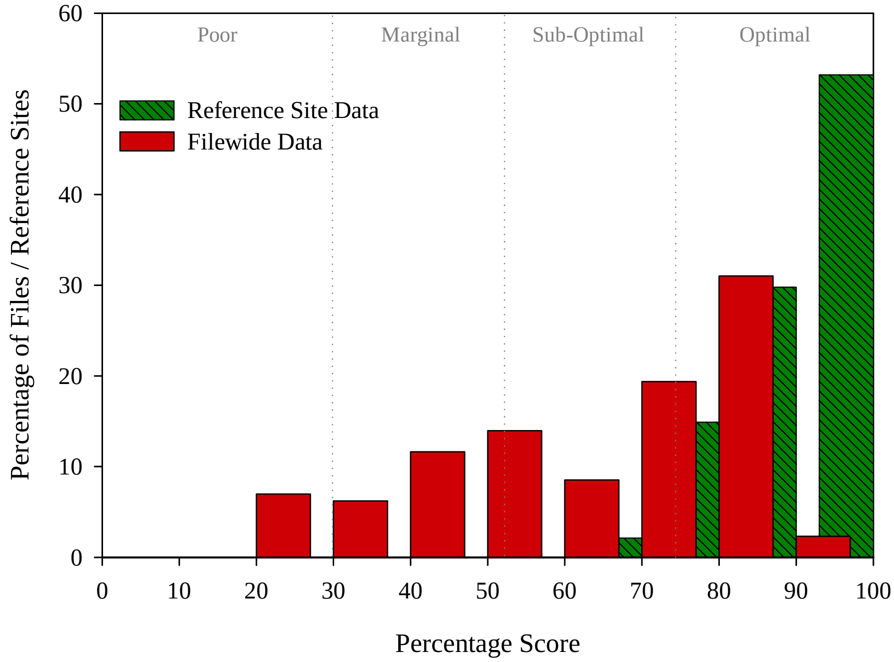

Figure 42. Landscape context metric CRAM scores compared to reference-site data.

All connectivity, percent of assessment area with buffer, average width of buffer, and buffer condition metrics data combined into a single landscape context score for each of the 129 files and 47 reference sites evaluated using CRAM.

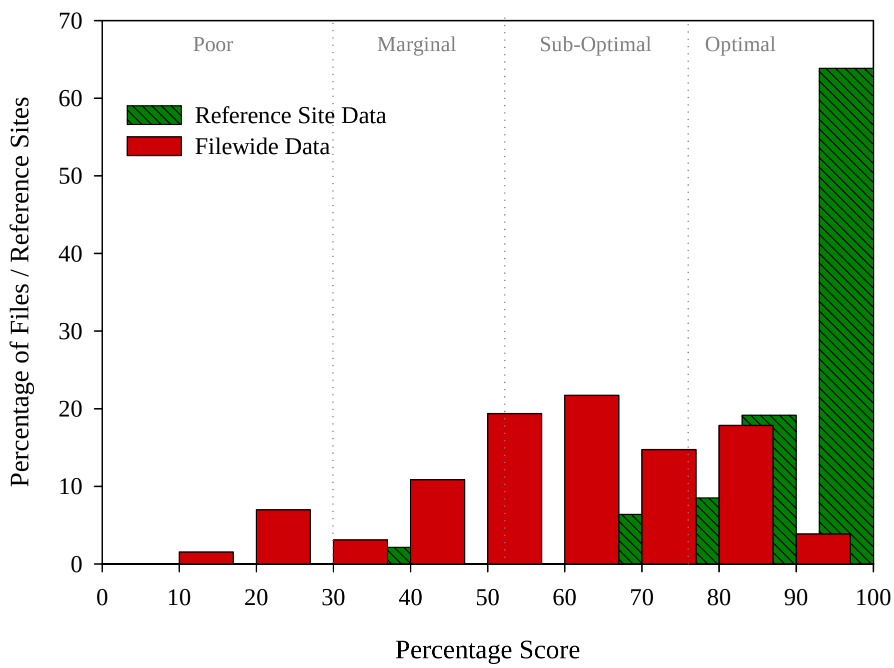

Figure 43. Hydrology metric CRAM scores compared to reference-site data.

All water source, hydroperiod, and hydrologic connectivity metrics data combined into a single hydrology score for each of the 129 files and 47 reference sites evaluated using CRAM.

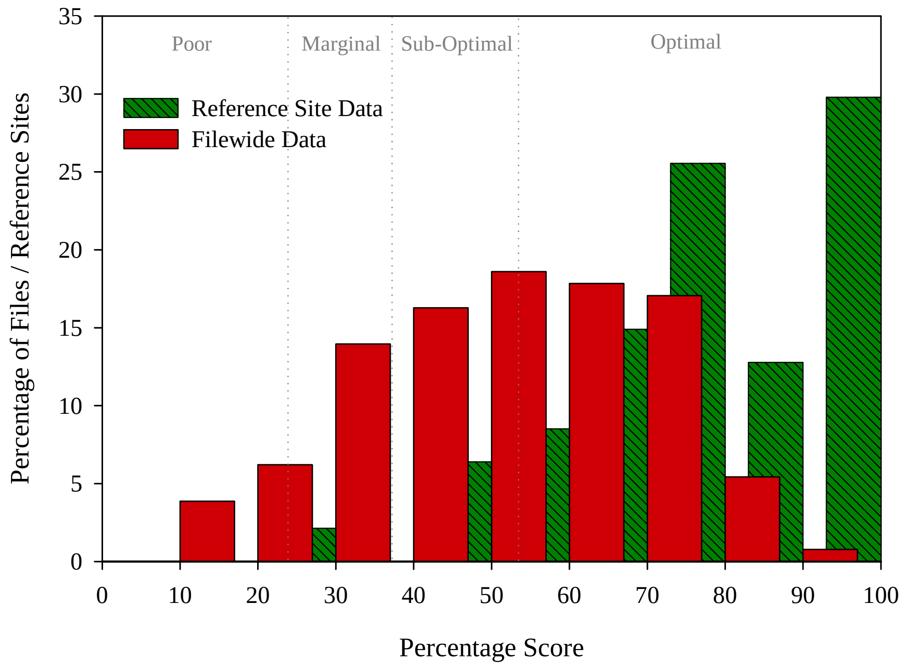

Figure 44. Physical structure metric CRAM scores compared to reference-site data.

All physical patch richness and topographic complexity metrics data combined into a single physical structure score for each of the 129 files and 47 reference sites evaluated using CRAM.

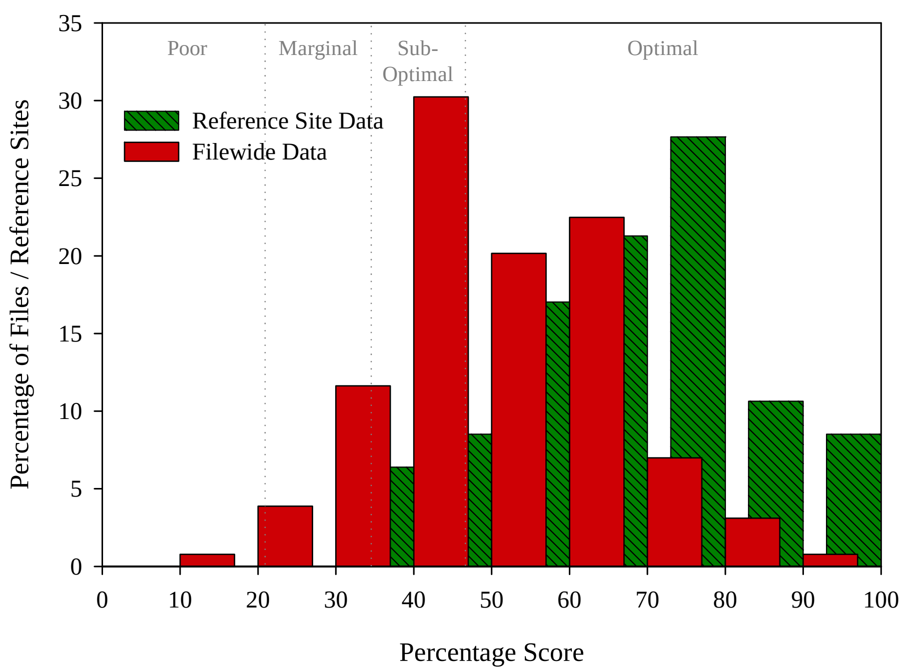

Figure 45. Biotic structure metric CRAM scores compared to reference-site data.

All organic matter accumulation, biotic patch richness, vertical biotic structure, interspersion and zonation, percent invasive plant species, and native plant species richness metrics data combined into a single biotic structure score for each of the 129 files and 47 reference sites evaluated using CRAM.

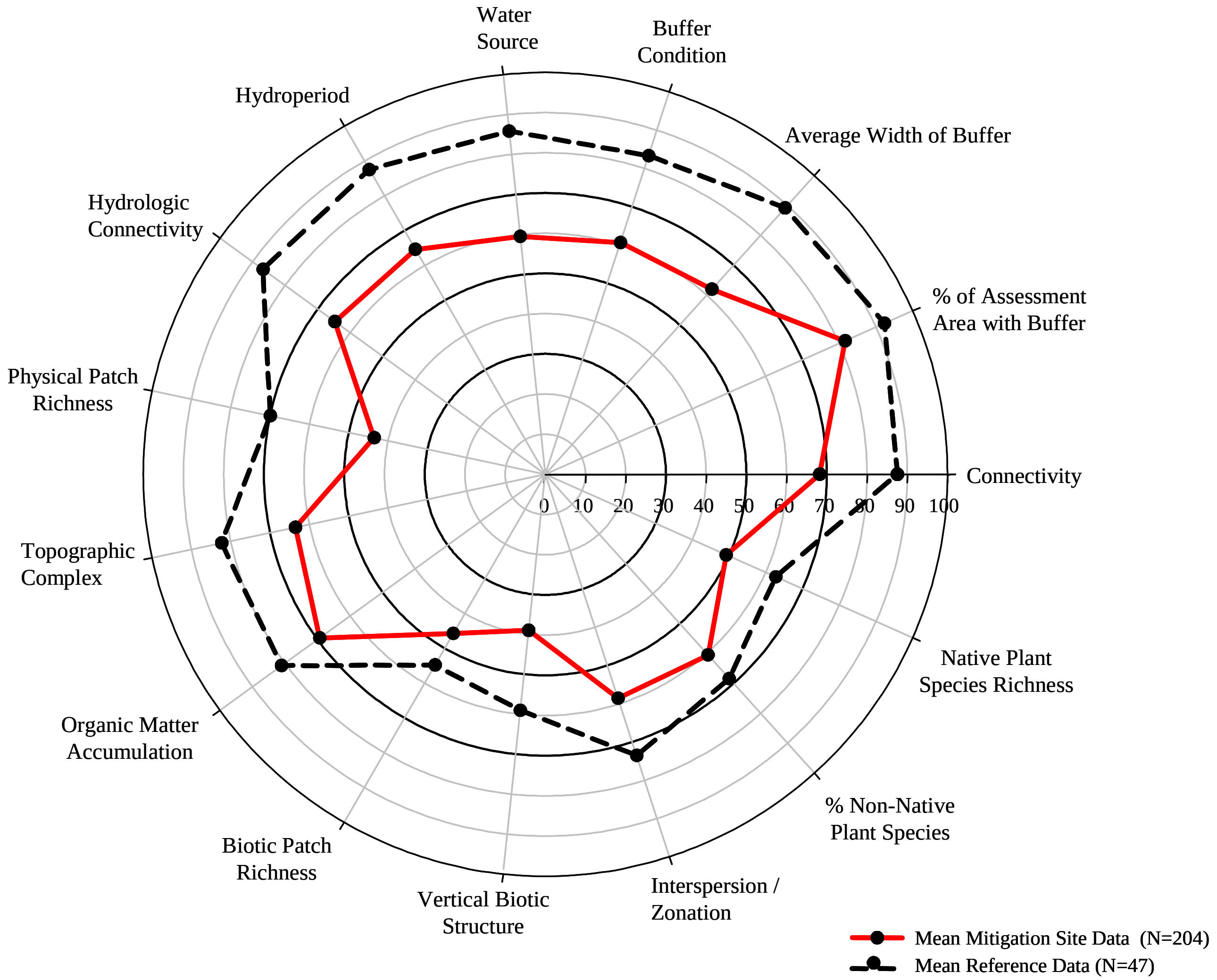

Figure 46. Mean percentage scores for each CRAM metric for mitigation sites (N=204) and reference sites (N=47).

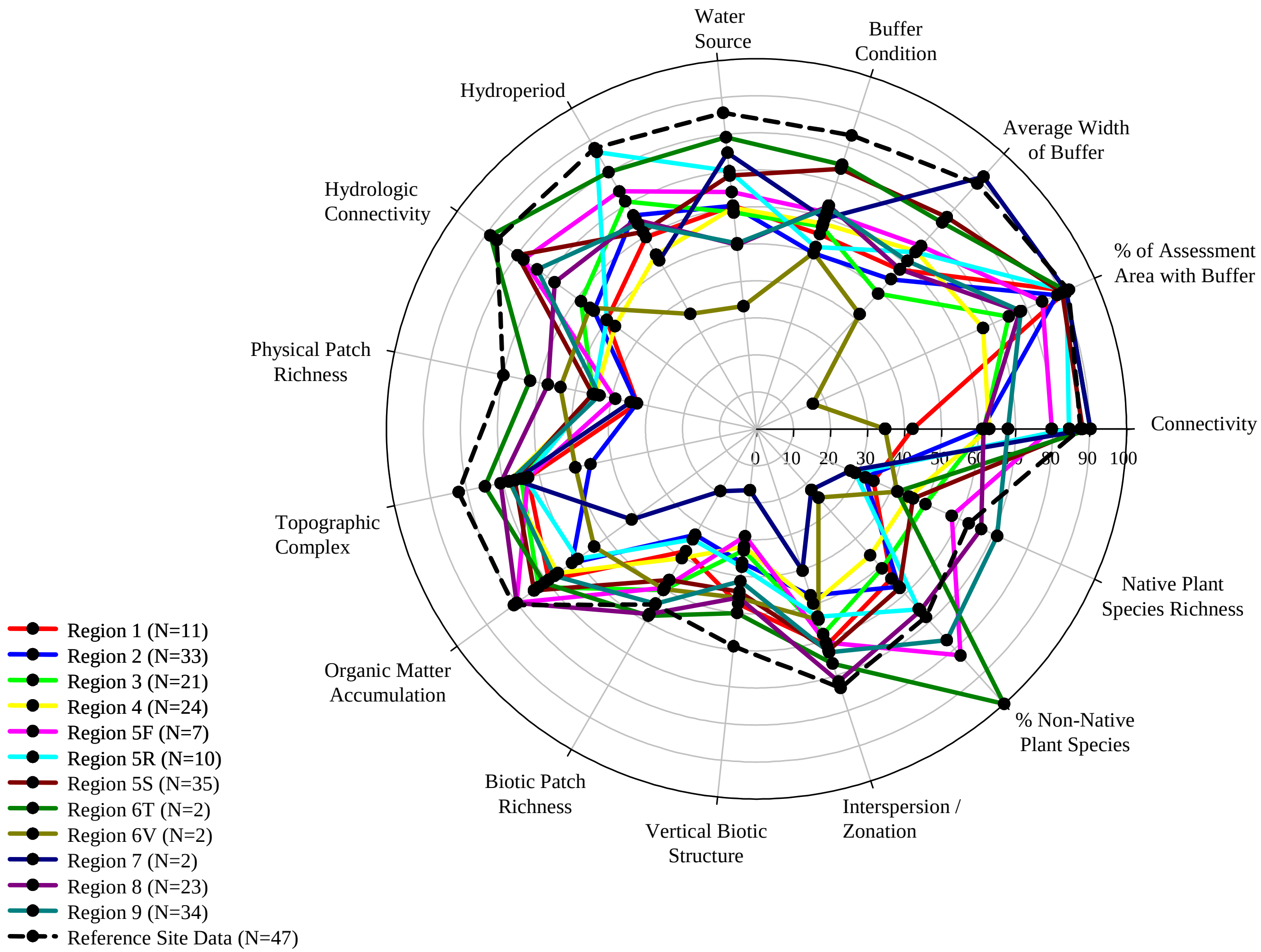

Figure 47. Mean percentage scores for each CRAM metric by state board region. (N=204 mitigation sites)

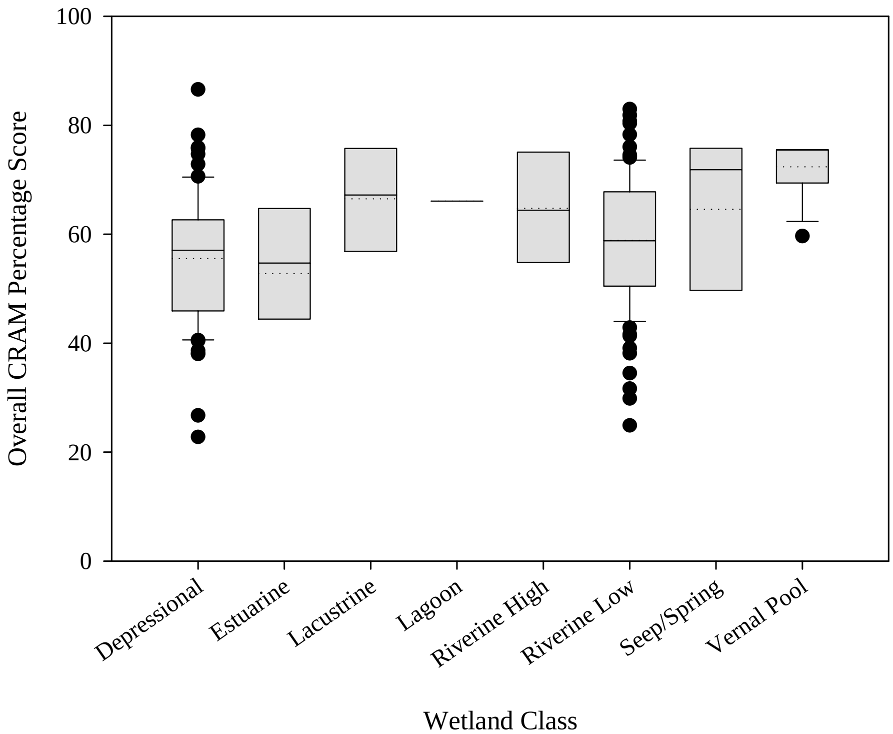

Figure 48. Overall CRAM percentage scores by wetland class (N=204 mitigation sites).

The dotted line represents the mean, the solid line the median. The 10th, 25th, 75th, and 95th percentiles are displayed.

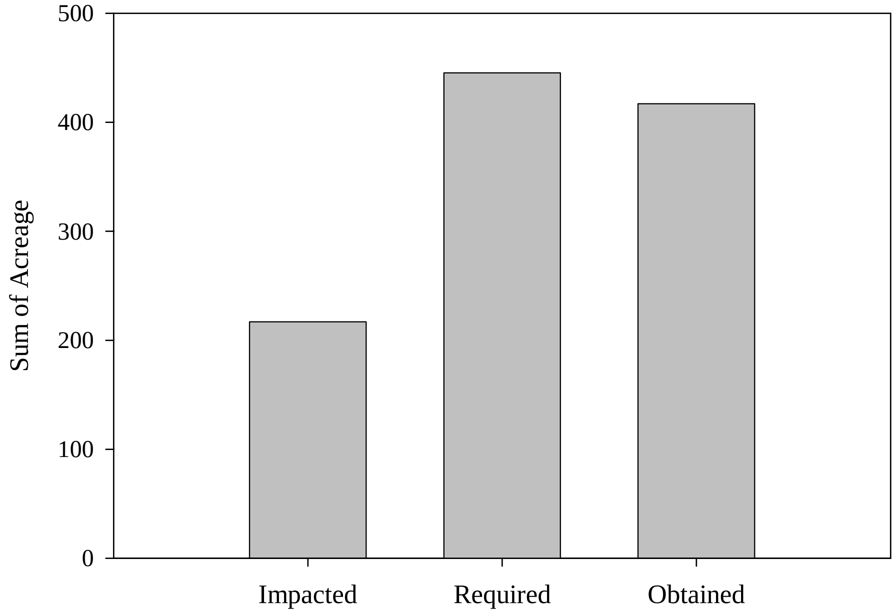

Figure 49. Overall acreage obtained compared to required and impacted (N=143 files).

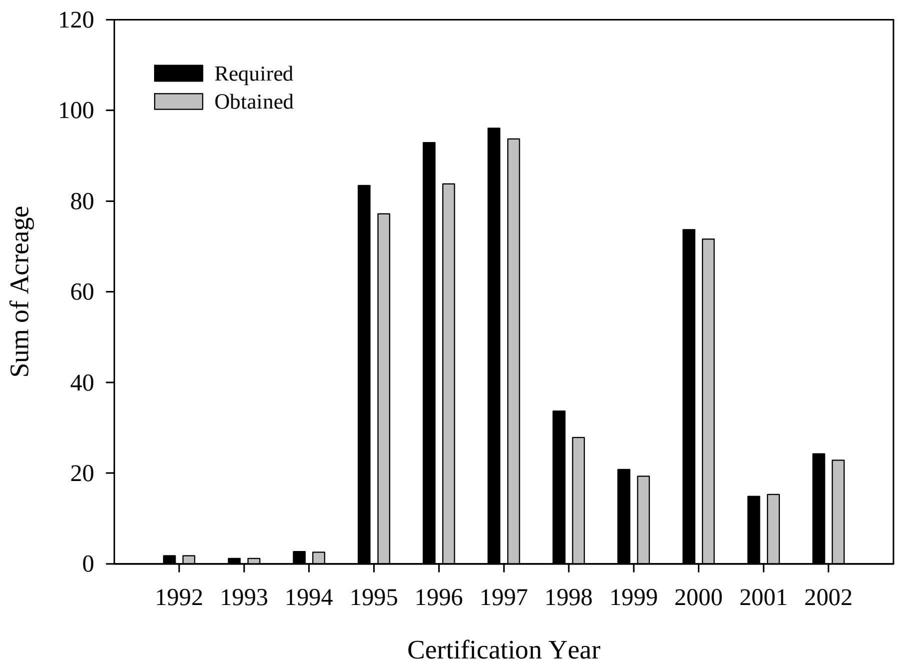

Figure 50. Acreage required and obtained by year (N=143 files).

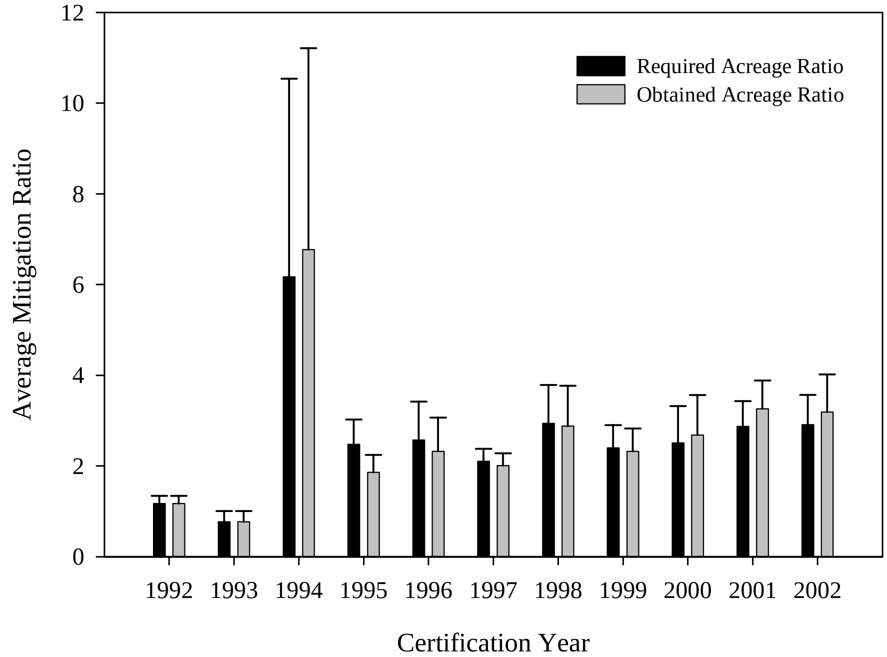

Figure 51. Average mitigation ratios of required and obtained acreage by certification year as determined from our detailed permit file review.

In 2002, one file was removed that had 0.035 acres of impact and 4.30 required and obtained acres, yielding an anomalous mitigation ratio of 122.9. The resulting sample size was N=142.

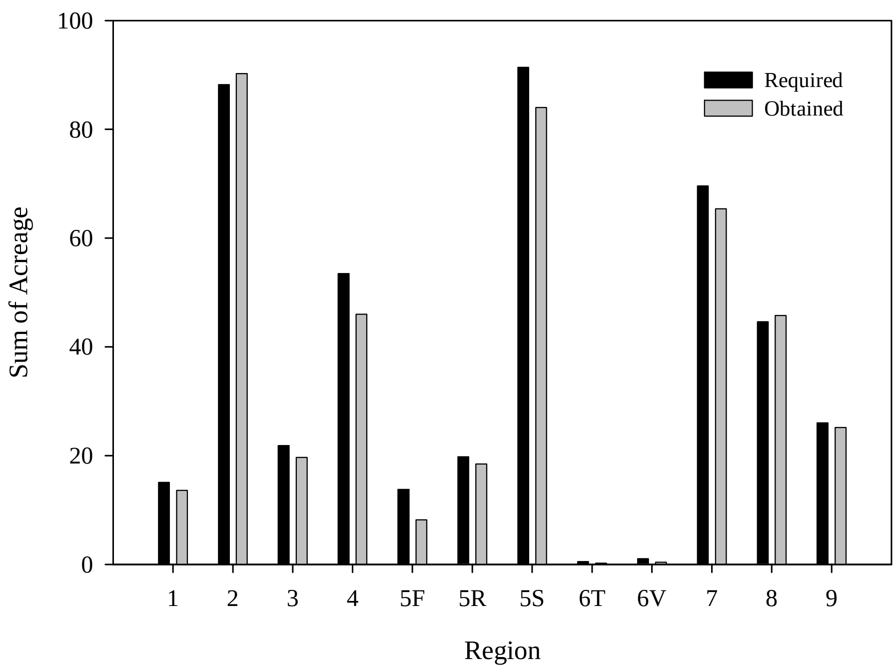

Figure 52. Acreage required and obtained by region.

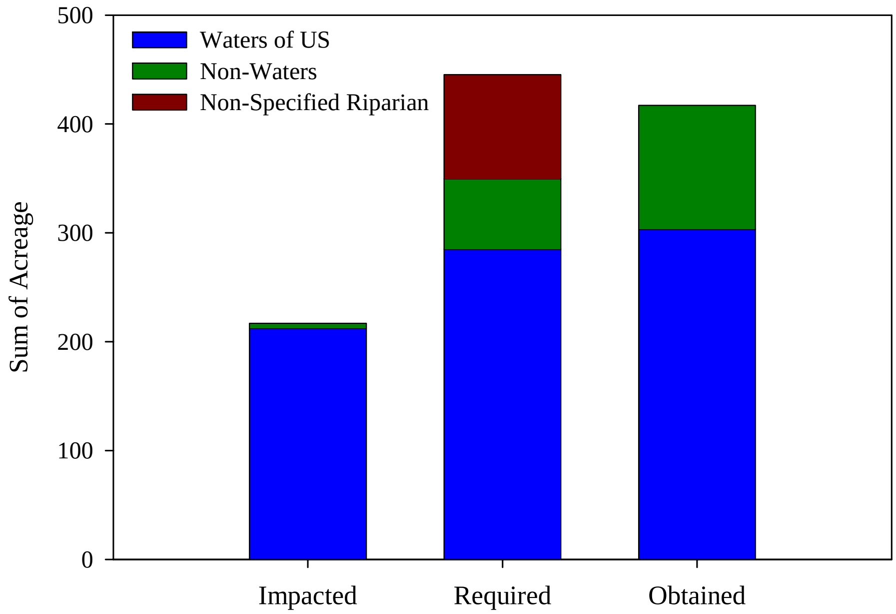

Figure 53. Total acreage impacted, required and obtained for 143 files assessed. Acreage also grouped by jurisdictional habitat classifications: "Waters of the US" and non-jurisdictional waters ("Non-Waters").

Required acreage also consists of a "Non-Specified Riparian" component, which represents a mitigation requirement of riparian acres, but non-specified jurisdiction (waters or non-waters).

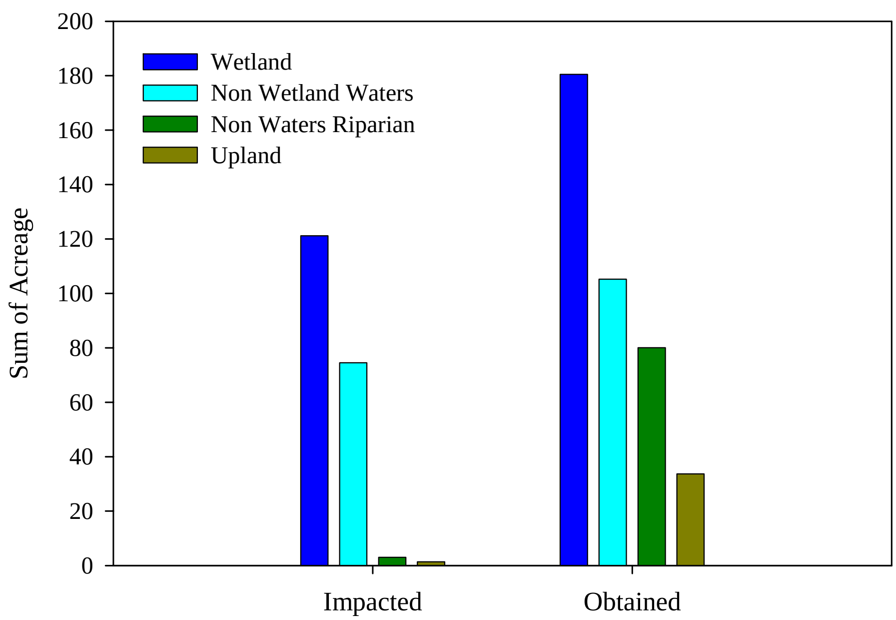

Figure 54. Total acreage impacted and obtained, with jurisdictional habitats data for "Waters of the US" proportioned into wetland and non-wetland waters habitats, and data for "Non-Waters" proportioned into riparian and upland habitats.

N=138 files (There are five files for which wetland acreage was not specified for waters of the US).

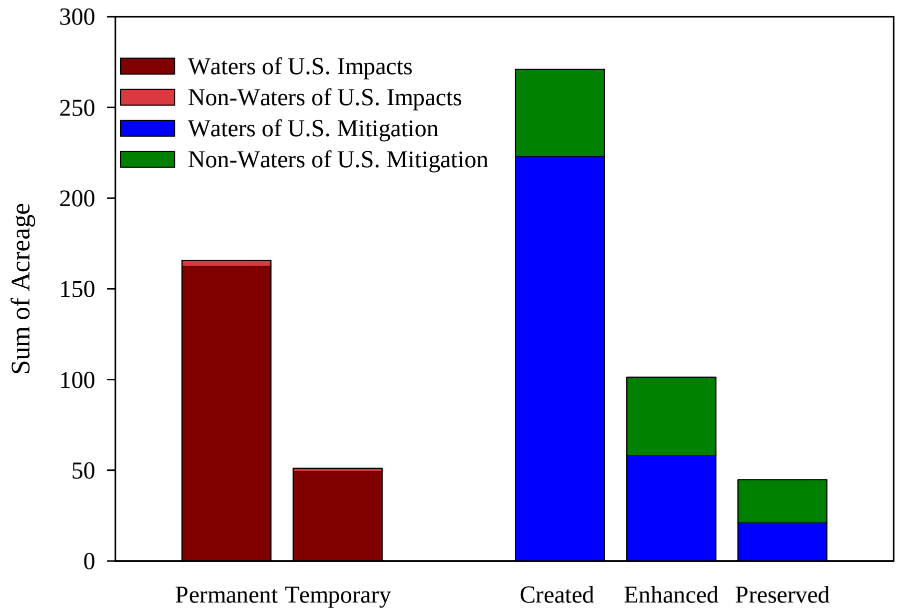

Figure 55. Total acreage impacted proportioned into permanent and temporary impacts, and obtained acreage proportioned into created, enhanced and preserved, each proportioned further into Waters of the US and Non-Waters of the US (N=143 files).

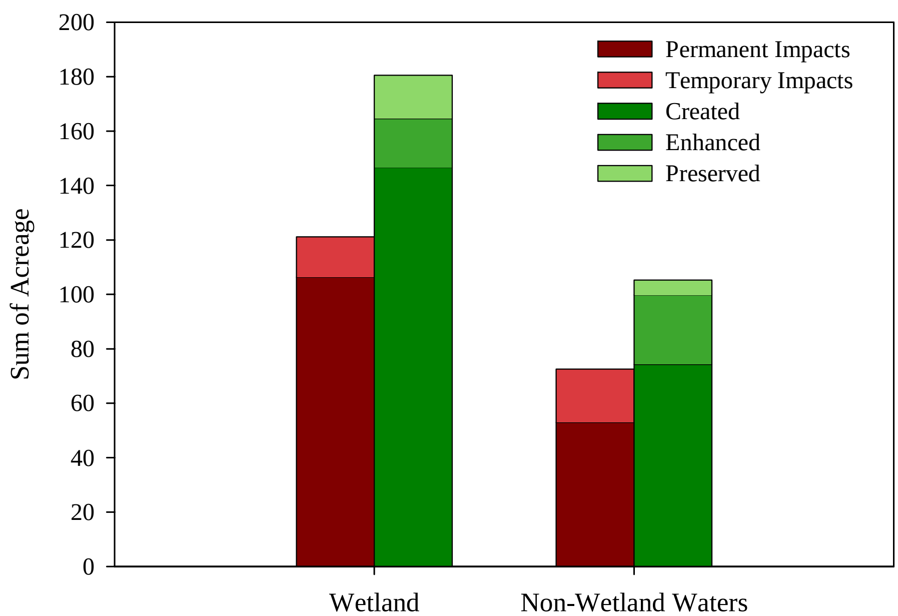

Figure 56. Total acreage for Wetland and Non-Wetland Waters, each displaying impacted and obtained acreage. Impacted acreage is proportioned into permanent and temporary impacts, while obtained acreage is proportioned into created, enhanced and preserved.

N=138 files (There are five files for which wetland acreage was not specified for waters of the US).

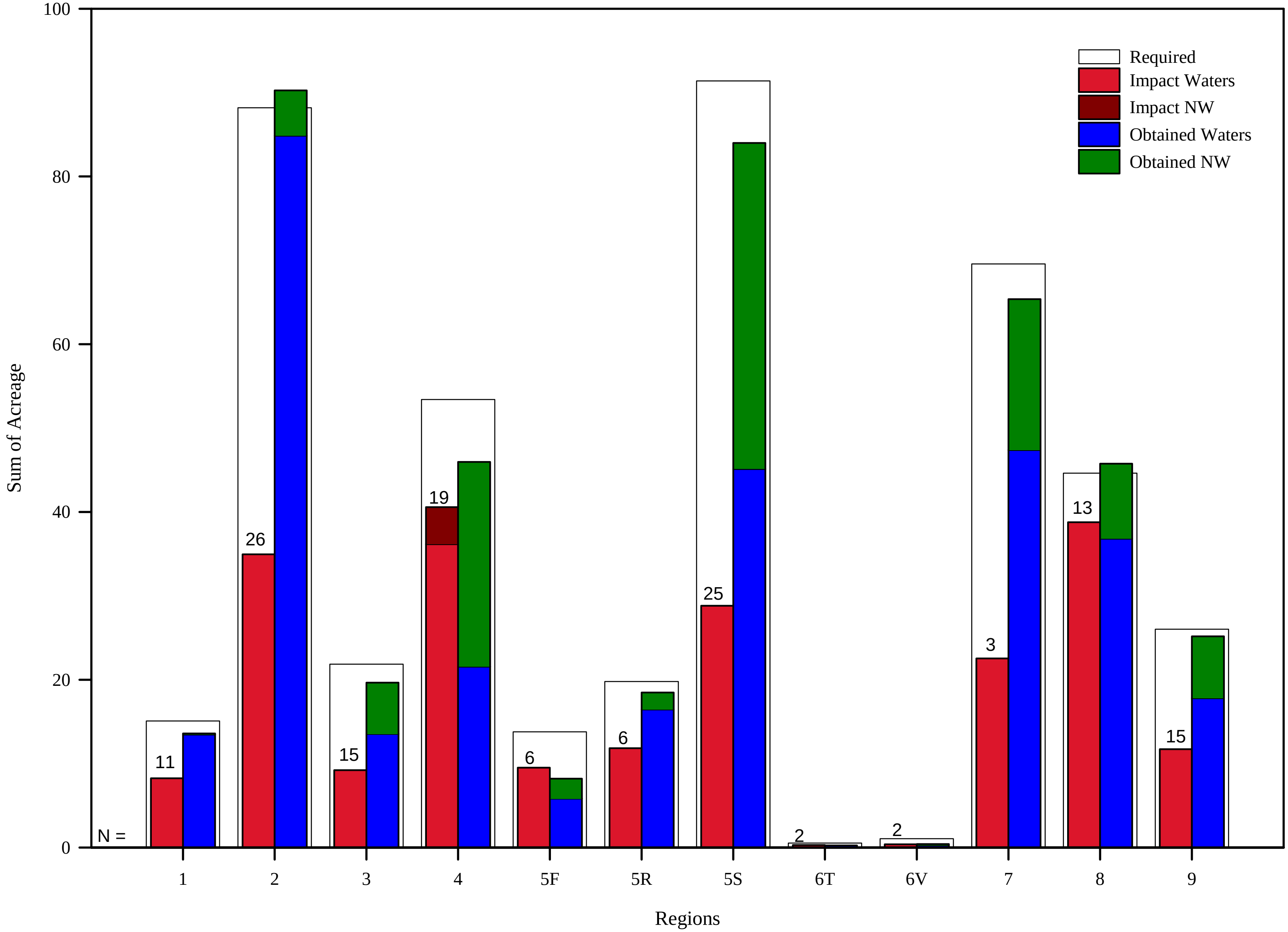

Figure 57. Total acreage impacted and obtained proportioned into Waters of the US and Non-Waters of the US by state board region (N=143 files). Total required acreage per region is also displayed. N displayed = number of files assessed per region for both impacted and obtained.

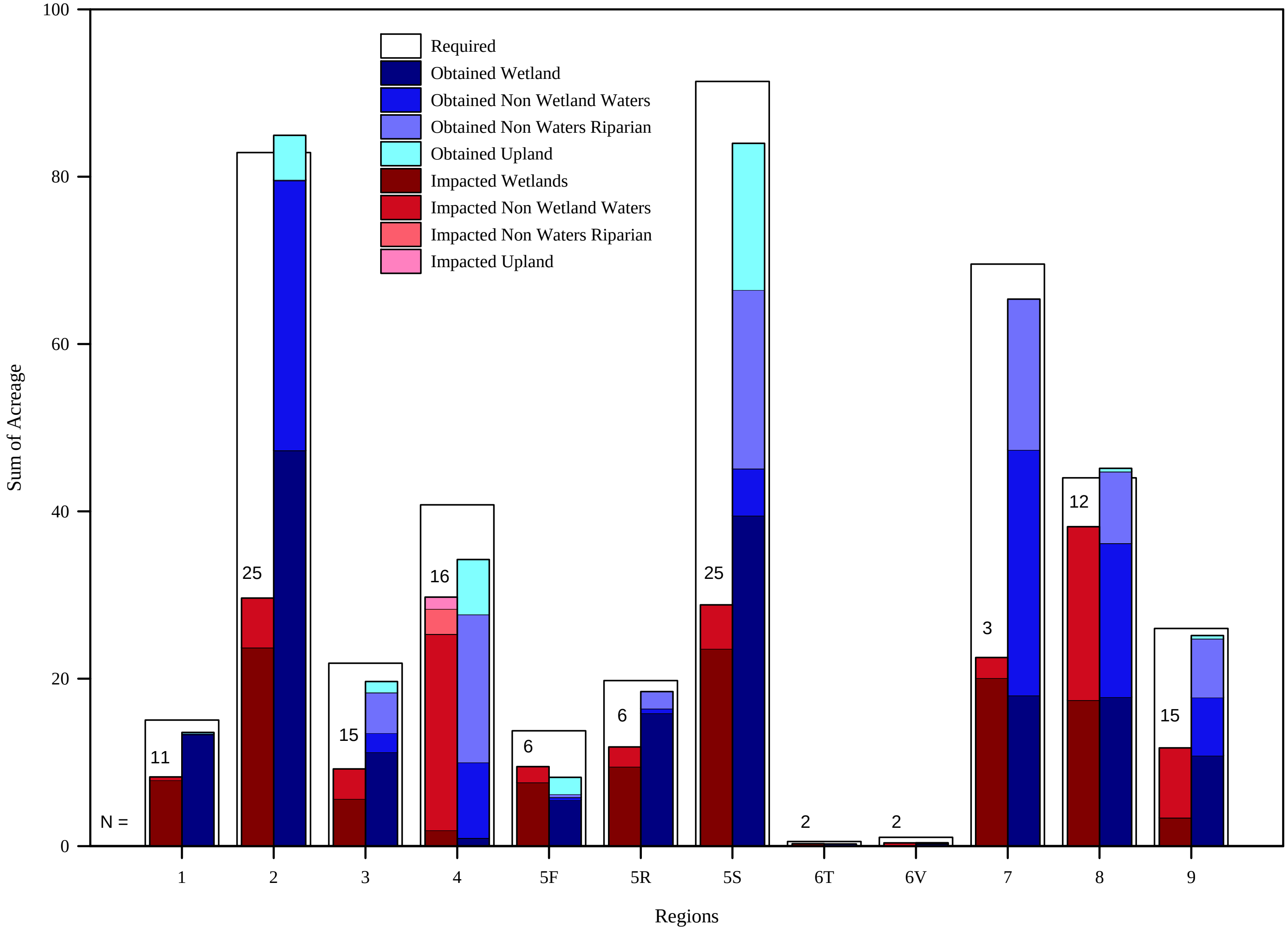

Figure 58. Total acreage impacted and obtained proportioned into Wetland, Non-Wetland Waters, Riparian and Upland jurisdictional habitats by state board region. Total required acreage per region is also displayed.

N displayed = number of files assessed per region for both impacted and obtained. Total N=138 files (There are five files for which wetland acreage was not specified for waters of the US).

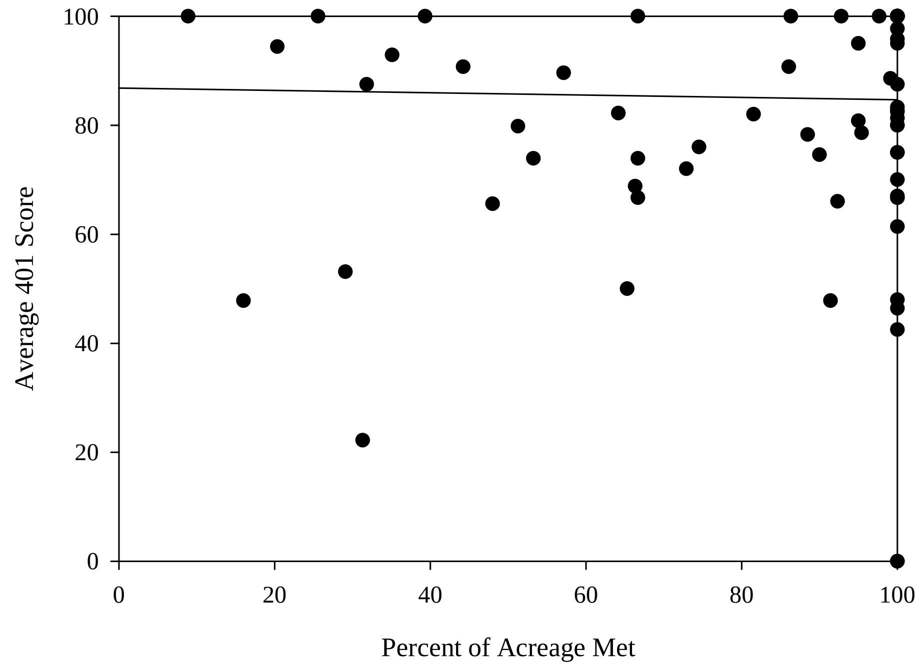

Figure 59. Correlation analysis between percentage of acreage requirement met and average 401 permit compliance score (N=123 files).

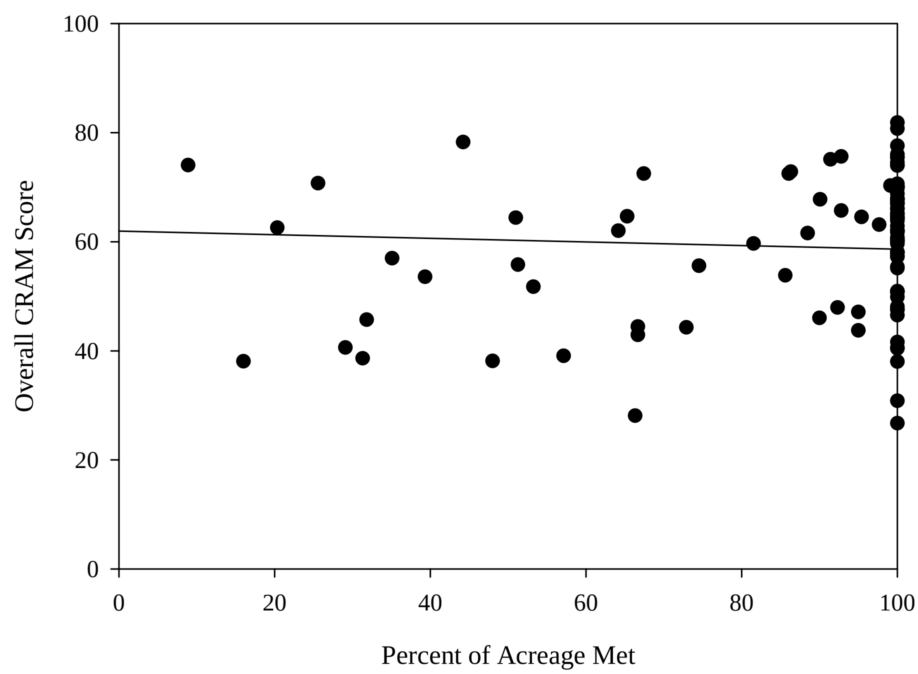

Figure 60. Correlation analysis between percentage of acreage requirement met and overall filewide CRAM score (N=128 files).

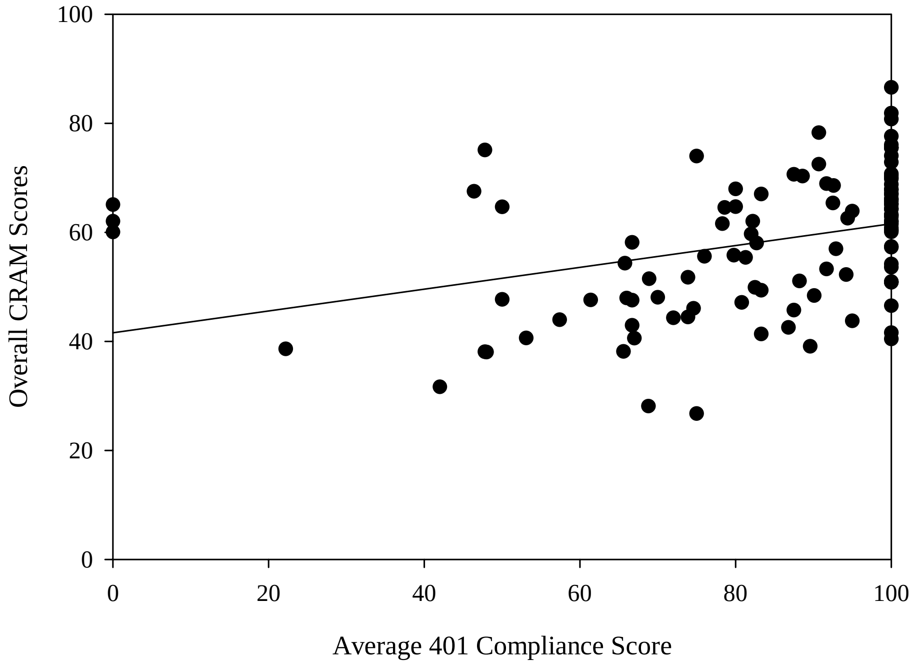

Figure 61. Correlation analysis between average 401 permit compliance score and overall filewide CRAM score (N= 110 files).

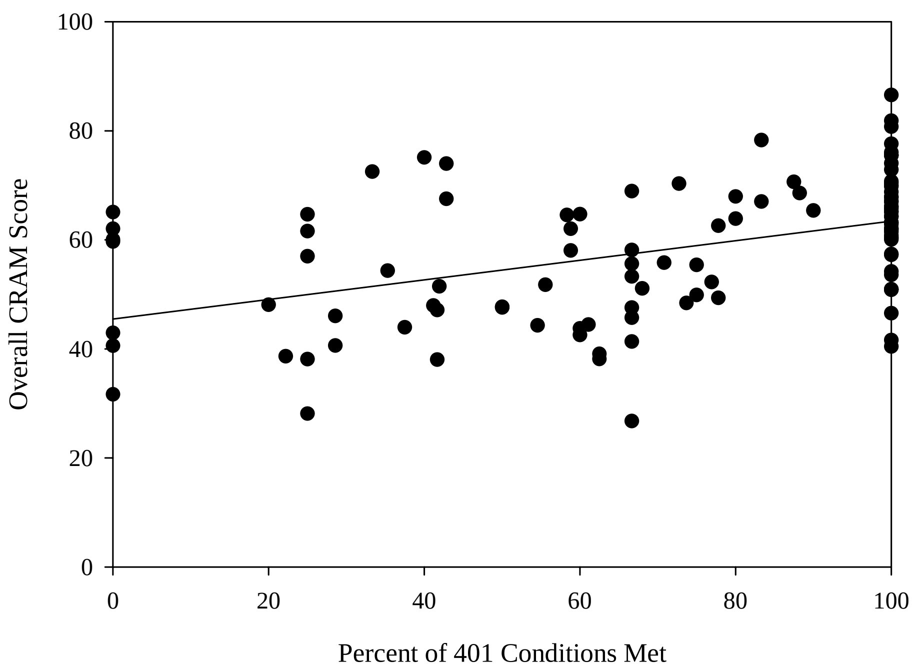

Figure 62. Correlation analysis between percentage of 401 permit conditions met and overall filewide CRAM score (N=110 files).

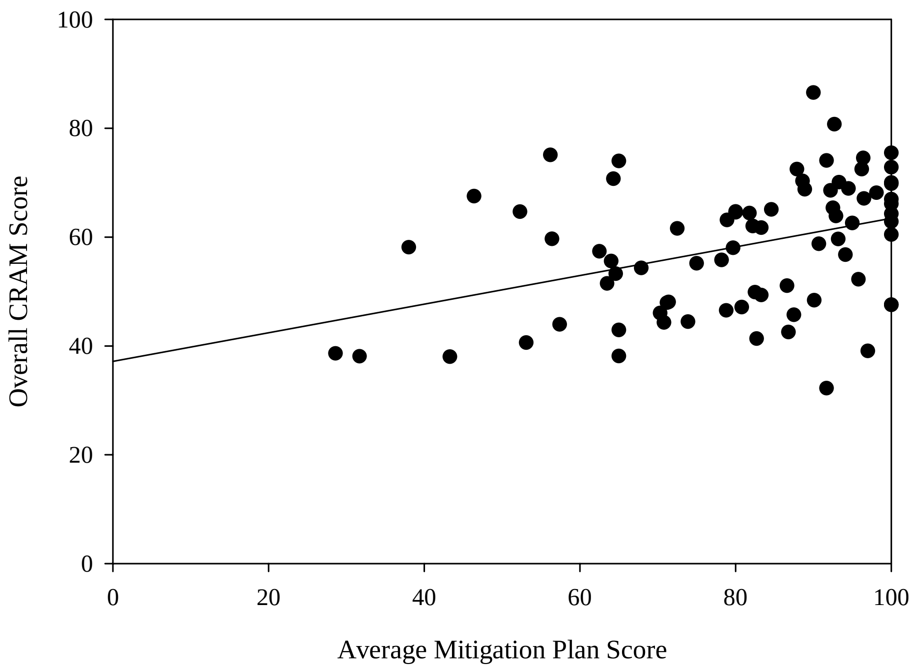

Figure 63. Correlation analysis between average mitigation plan compliance score and overall filewide CRAM score (N=77 files).

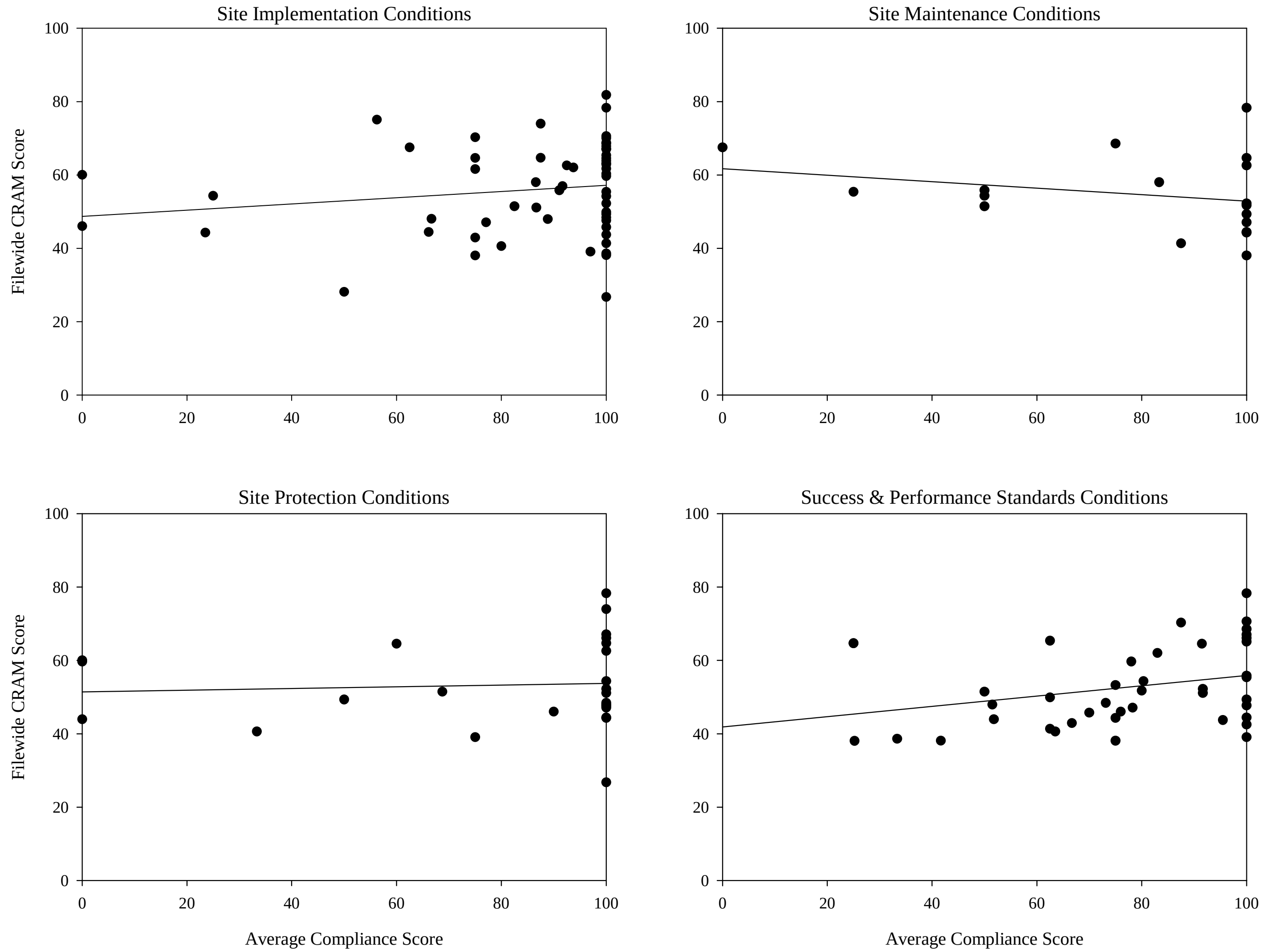

Figure 64. Correlation analysis between overall filewide CRAM percentage score and average 401 permit compliance score for four of the permit condition categories.

Sample sizes per condition category are as follows: for site implementation N=57, site maintenance N=18, site protection N=25, success/performance standards N=42. See Methods for description of permit condition categories.

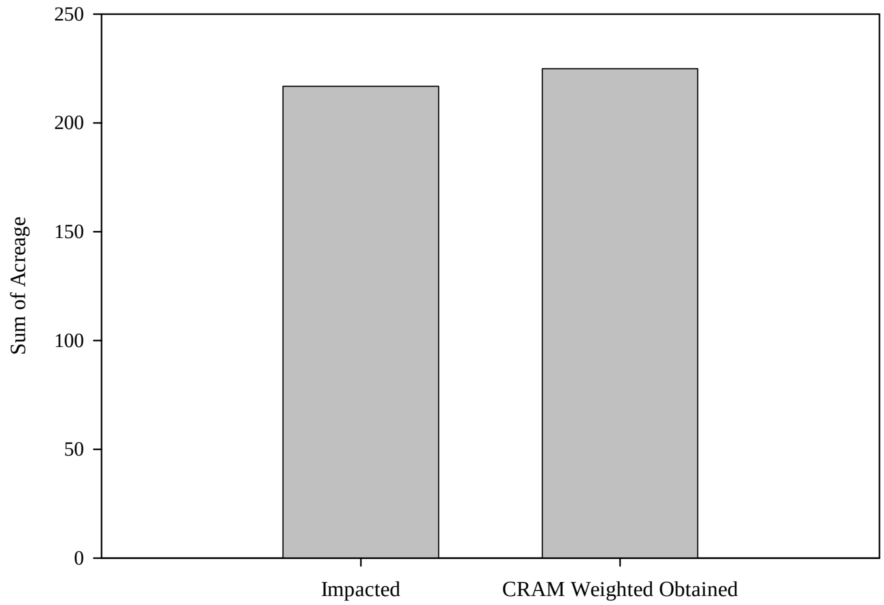

Figure 65. Total impacted acreage and obtained acreage weighted by condition score (N=129 files).

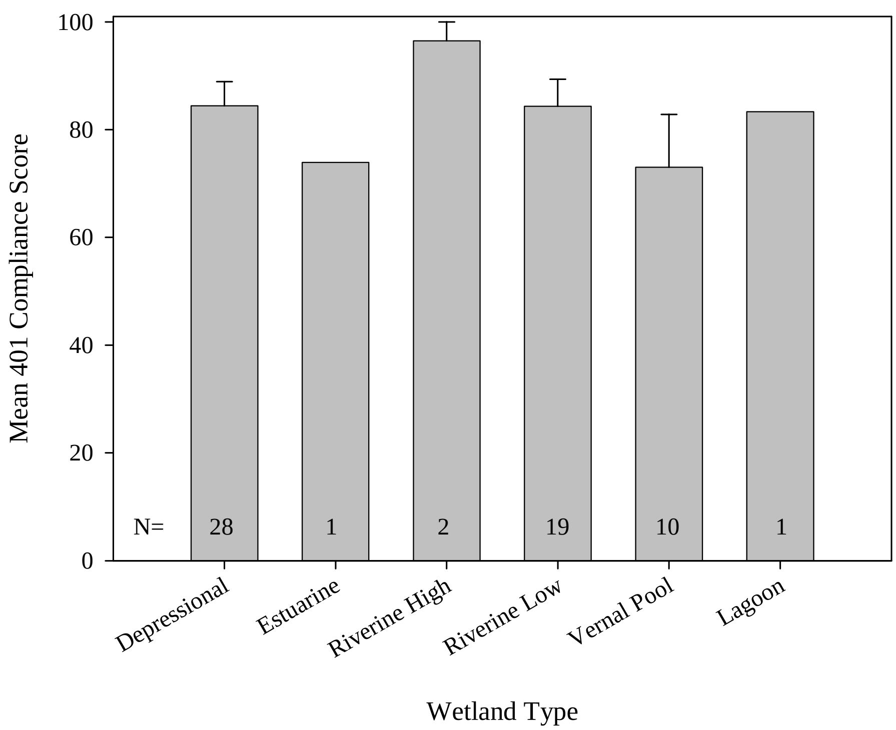

Figure 66. Mean 401 compliance score for different wetland types.

Includes invoked conditions; N=61 files

9. Appendices

1. Detailed Permit File Selection Methodology

For this study, our goal was to evaluate the mitigation actions associated with at least 100 Section 401 permit files issued in California between 1991 and 2002. The files to be evaluated were to be distributed across the twelve regions and sub-regions of the State Water Resources Control Board (SWRCB) in proportion to the total number of 401 permit actions issued within each region (Figure 1-1). For instance, if a particular region had issued 10% of the total statewide 401 permits in this timeframe, then 10% of our evaluations would occur in that region. While the approach was simple, identifying appropriate files was complicated for a number of reasons, as discussed throughout this appendix.

Early in the project, the SWRCB provided us with a recent version of their Microsoft Access permit tracking database (version dated 9/17/04). This database was queried to determine the total number of 401 actions issued within each region or sub-region from 1991 through 2002. Next, we calculated the proportion of the total statewide permits that had been issued within each region during this time frame. Then, using an initial target number of at least 100 files, target numbers of files were calculated for each of the twelve regions and sub-regions of the SWRCB (Table 1-1). Our initial plan was to use the SWRCB database to identify files with compensatory mitigation requirements, and then to select a random subset of these files, apportioned by region and year, for review and evaluation. Given the targeted number of files we hoped to evaluate, and the known difficulties in locating and reviewing regulatory permit files (NRC 2001, Ambrose and Lee 2003), we planned to over-sample by establishing a target number of 300 permit files for our initial permit review. To maintain an even distribution of permit files throughout the established time frame, we sought to obtain 150 files from before 1998 and 150 files from 1998 and later.

As stated earlier in the main report, each of the nine Regional Boards has its own permit tracking database. For every 401 action, a copy of the Regional Board's letter (i.e., certification, waiver, modification, etc.) is sent to the SWRCB, where the information is entered separately into the SWRCB database. There is no direct link between the SWRCB database and those at the various Regional Boards. While most of the Regional Boards use an alpha-numeric system of some form for the identification of their files, and these are included in their regional permit tracking databases, the SWRCB database does not include any such primary identification field. In order for the SWRCB database to be used for the generation of a random sample of permits, a numerical system of primary identification fields had to be added to the database. To do this, every record in our copy of the SWRCB Access database was assigned a number from 1 to about 12,000. These numbers followed the existing order of files in the database and bear no clear relation to the chronological order of the permits. After setting certain parameters in Access, list of files were generated at random by region and year.

The SWRCB database documents all 401 permit actions, including projects with and without compensatory mitigation requirements (Table 1-2). Projects without compensatory mitigation requirements were outside the scope of this study. Projects to be evaluated included those with explicit mitigation requirements delineated in the 401 letter (and thus, in the SWRCB database), and those for which mitigation was required by another regulatory agency (e.g., Corps, Fish and Game, Fish and Wildlife), but not directly by the Regional Board. In the latter case, the 401 permit often referred to these other agency requirements, or required they be followed, either through direct language (e.g., "…permittee must comply with the conditions of the mitigation plan *or* …404 permit") or indirect language (e.g., "…we have reviewed the mitigation plan, and have no objections…”). Given the presence of such phrases we considered these mitigation requirements as implicit conditions of the 401 permit because we presumed these other regulatory requirements had been a factor in the Regional Board’s decision to waive its regulatory authority under Section 401 or to exercise its authority without specifying compensatory mitigation. However, the database does not distinguish these projects from those with no compensatory mitigation requirements whatsoever.

As of June, 1998, projects with mitigation requirements specified in the 401 letters are usually indicated in the database by acreage values inserted within various mitigation-type fields (e.g., creation, restoration, enhancement, and preservation). In prior years, and in later years when the information was not clear, mitigation requirements were indicated by a more general “Comp” acreage field. These fields were useful in identifying files with potential mitigation requirements. Files from 1998 and after were selected exclusively through this approach as there were enough available mitigation-containing files to satisfy our regional and yearly targets for those years. Specifically, a random list of files was extracted from the subset of database records with acreage values indicating that compensatory mitigation was required, resulting in an initial list of 153 post-1997 files[1]. However, there were not enough files from before 1998 with indications of mitigation to satisfy our regional and yearly targets for those earlier years. Yet our permit review experience in a previous mitigation study (Ambrose and Lee 2004) suggested that many of these earlier files did involve compensatory mitigation projects which were required by other agencies, and were directly or indirectly part of the 401 permit requirements. Since we sought an adequate representation of these older, more established mitigation sites in this study, an alternative means of selecting pre-1998 files became necessary.

While there were over 250 pre-1998 files with indications of compensatory mitigation requirements, some regions had few to no such files, and only a single file could be obtained in the earlier years, from 1991 to 1994 (Table 1-3). After apportioning by region and year, only 38 files with indications of mitigation requirements were obtained[2]. In order to meet our regional and yearly file selection target numbers, we augmented this list by adding files with direct or indirect references to other agency mitigation requirements. Since the database did not contain such information, we identified potential files by physically reviewing hard copies of the 401 letters at the SWRCB office in Sacramento. To this end, we generated a list of 300 pre-1998 permit files using the SWRCB database. The list was generated at random, without regard to the mitigation acreage values, and exceeded our target number of 150 pre-1998 files to account for the inefficiencies of this general search (i.e., unlike post-1998 files, which were only selected if there was an indication that compensatory mitigation was required, many of the pre-1998 files likely did not require compensatory mitigation).

With this list, we visited the SWRCB office in early December 2004 and, again, in mid-January 2005. The 401 archives at the SWRCB consist of 401 letter hardcopies organized by date, but do not generally include supporting documents, such as planning information or permits from other agencies. While at the SWRCB office, each of the 401 letters indicated in our list was reviewed, in sequence, and categorized into the following groups: letters with explicit mitigation required by the Regional Boards (several files had

[1] This number deviated from the target of 150 in order to maintain a uniform age distribution.
[2] Those 250+ records with references to compensatory mitigation were predominantly issued within 2-3 regions, and mainly in 1996 and 1997 (fewer in 1995). Thus, using these files, we were not able to obtain enough files for all regions, and for all years.

mitigation requirements that weren't reflected in the database), letters with some reference to a mitigation acreage requirement (again, these weren't reflected in the database), letters with conditions mandating that the mitigation requirements of another agency be followed, letters with other indirect references to mitigation required by other agencies, and those with no reference to mitigation. Letters with no references to mitigation were excluded from further review.

After following these steps, the total number of potentially assessable files obtained through this physical review still fell short of our regional and yearly targets, especially for the earlier years (1991-1994). Due to time constraints, we were not able to augment these numbers by physically reviewing another list of files. Instead, we merged these files with the 38 previously mentioned files for which the database included indications of mitigation requirements, and this pursued the resulting files.

The resulting breakdown of pre-1998 files is given in Table 1-4. Of these files, 75 were selected from the years 1995, 1996, and 1997 (Table 1-5) and 60 files were selected from 1991, 1992, 1993, and 1994 (Table 1-3). The 1995-97 set was generated mostly from the random search of the SWRCB database, with 35 files containing specific SWRCB mitigation and 37 files with an indication of compensatory mitigation acreage; the remaining 3 files were generated from our physical SWRCB file review and consisted of files with references to other agency mitigation requirements. The 1991-94 set was generated mostly from the physical file review and consisted almost entirely of files with references to other agency requirements. Only one file in this set was obtained from the random search of the database. Of the targeted 75 1991-1994 files, 60 files were obtained.

The next stages of the permit review involved (1) the positive identification of the requested files using an agency's internal file numbering system; (2) physically locating the file folder; (3) reading through the files to determine all available information that would enable us to determine the functional losses that occurred through the permitted impacts, locate the impact and mitigation project sites, and understand the nature of the mitigation activities (including the specific boundaries of the mitigation site and determining the functional gains achieved through the mitigation actions); and (4) photocopying the necessary paperwork. The photocopied materials were retained for further office review and to bring to the site to assist with our field assessments.

Our previous experience (Ambrose and Lee 2003) suggested it would be more efficient to carry out our permit review using the Section 404 file archives at the Corps rather than with the Section 401 archives at the individual Regional Board offices. There are 3 Corps Districts in California compared to 12 SWRCB regions and sub-regions, and the regional boards appeared to lack the resources to assist us with such a review. As soon as our list of potential files was complete, it was categorized according to Corps District and submitted along with Freedom of Information Act (FOIA) requests to each of the three Corps District offices (Los Angeles, San Francisco, and Sacramento Districts). Despite the burdensome nature of these requests (especially from the perspective of the Sacramento Corps staff, given their limitations in staff resources), the three Corps Districts provided exemplary support of this project by assisting us in the identification and location of files and in providing us with the facilities for our review and reproduction of their permit paperwork. The identification and location of Section 404 permit files was an unexpectedly difficult task. After initial attempts to determine the relevant 404 permit numbers using the information provided in our lists, Corps staff informed us that the task would be nearly impossible for them to complete. The information provided in our lists included all the descriptive information available from the SWRCB database (e.g., applicant, water, project title, certification date, and region); the 404 project number was included for only a handful of files. For most files, this information was too general in nature for unambiguous identification of the target file. Searches in the Corps' RAMS database files resulted in several to thousands of possible 404 numbers for each file we were attempting to locate.

Through these attempts at cross referencing file numbers, it became apparent that the SWRCB database contained only a truncated version of the full 401 certification title. This truncated version seldom included the county name, and many key words that would have facilitated file cross-referencing had not been entered. Once we realized this, and following much communication on the matter, our lists of files were sent back to the SWRCB, where staff interns mined the associated 401 letters for any supplemental information that might help improve the efficiency of this file identification step. Once these augmented lists were returned to us, they were resubmitted to the Corps Districts for cross referencing in RAMS.

In the interim, as the lists were being updated at the SWRCB and resubmitted to the Corps, concerns about delays prompted us to pursue an alternative strategy. We submitted lists of our requested files by region or sub-region to each of the 12 regional board offices to see if the 401staff could assist in the identification and location of the files. The hope was that at least some of the files would be recognizable to the individuals who had generated the permits, and that we might obtain some file information directly from the source offices. Following these submissions, the project coordinator at UCLA engaged in extensive correspondence with representatives from each of the 12 offices. Through these communications we did have some successes, but it became clear that high rate of turnover has reduced institutional memory among the 401 staff, and that the limited information in the SWRCB database hindered the cross referencing of files at the Regional Boards just as it did at the Corps. Through this alternative strategy, all the Regional Board offices except Regions 1 and 8 were able to identify at least a few files. Nonetheless, most of the files identified could not be readily located, and a few did not meet this project's criteria and were excluded. We were able to obtain at least some information for a few files each from Region 6T (South Lake Tahoe office) and Region 5F (Fresno office).

Unique circumstances for Regions 4 and 9 improved the outcome of this alternative file acquisition strategy. For Region 9 (San Diego), file cross-referencing was more tractable because the information in the SWRCB database is more directly linked to that Region's database. This linkage results from the way this Regional Board copies the SWRCB on its permit actions. While other regions send to the SWRCB actual photocopies of the 401 letters they generate, Region 9 periodically submits information on multiple files in spreadsheet format derived from their permit tracking database. In addition staff from the San Diego Regional Board recently collaborated with the UCLA group on a similar mitigation success study (Quigley et al. 2006) performed for a set of their permit files. Their understanding of our project objectives, combined with their recent file review experience and improved file organization, resulted in most permits being identified, and the information from several files being provided to us. For Region 4, our previous study for the Los Angeles Regional Board (Ambrose and Lee 2003) provided us with a more direct linkage to that region's permit file information. Following that study, we had retained copies of all 250 files obtained during the permit review, plus a copy of their permit tracking database. After reviewing our records from that study we located four complete files and we were able search their database ourselves for file cross-referencing. Through this effort we identified 20 files (with archive box numbers), and this list, along with the remaining files we could not locate, was submitted to the Los Angeles Regional Board. Personnel from Region 4 were able to locate 18 of these files, and during an office visit made by the UCLA group, the information from 12 assessable files was obtained.

Once appropriate supporting information was identified for enough files, most of the permit files were identified, located, and reviewed at the three Corps District offices. At the Los Angeles and San Francisco districts, these tasks were facilitated through direct interactions between project researchers (UCLA and USF personnel) and various 404 project managers. Following our review of the relevant portions of the files, the appropriate documentation was photocopied and retained by our researchers. At the Sacramento district, our project was treated as a standard FOIA request and the effort was more directly coordinated by FOIA officers. The FOIA officers interacted with the Corps staff to identify and locate the files, assembled them *en masse* in advance of our office visit, and later photocopied and mailed all the individual pages flagged by our researchers. This arrangement was much less optimal because our initial access came much later than the other two districts, we were not able to provide feedback regarding potentially misidentified files, and our actual review of the files was delayed until all the photocopied materials arrived.

For each of the three Corps Districts, our initial file reviews yielded a return rate of approximately 50%. Ultimately, of the files we requested in each district (429 overall), about half were identified, located, deemed to have potentially assessable mitigation projects, and photocopied for further review (Table 1-6). As stated earlier, we planned to assess 100 permit files across the State and had requested 300 files to account for the expected low return rates. Yet we had hoped for higher returns at the initial file review stage since many of the photocopied files would prove un-assessable upon further office review and/or field reconnaissance. These initial return rates did not provide us with a buffer against further file exclusions, and for some SWRCB regions, the numbers obtained fell marginally to substantially short of our regional targets. We attempted to raise these numbers by generating supplemental lists of files, as needed, by region. For regions with greater disparities we included large buffers of requested files. The protocol for selecting these supplemental lists of files was similar to that of the initial lists: the files were generated randomly using the SWRCB database except that certain years were favored to maintain our initial age distribution. In some cases, limitations of available files forced us to take a more targeted approach. As before, the lists of files were first sent to the SWRCB to augment with information from the 401 archives, and then the resulting lists were sent to the Corps Districts or directly to the Regional Boards for the cross-referencing, identification, and location of the files.

For Regions 1, 2, and the northern portion of Region 3, all permit review efforts occurred at the San Francisco Corps District office through multiple visits by personnel from the USF research group. The UCLA project manager corresponded with 401 staff from each of these regions, but no file information was obtained from these Regional Board offices. Following the initial review, about half of the files were considered potentially assessable and thus photocopied for further review. The regional targets were met for Region 2 and the northern portion of Region 3, but we were short files for Region 1. Thus a supplemental list of files was generated for Region 1 and after an additional visit to Corps to review the files, the target was met.

For sub-Regions 5R (Redding), 5S (Sacramento), 5F (Fresno), and 6T (Tahoe), the majority of the permit review efforts occurred at the Sacramento Corps District office, but some follow-up work was done at Regional Board offices. An initial visit to the Sacramento Corps by UCLA and USF personnel yielded an adequate number of files for Region 5S, but only a few files were obtained for Region 5F, and none for Regions 5R, and 6T. A collection of files had not been available at the time of our first visit because some of the file archives were more deeply archived on microfiche. After a second visit by USF staff and the review of these additional files, the target for Region 5R was met, but no additional files were obtained for Regions 5F and 6T. To augment the files for these regions, lists of supplemental files were generated and submitted to the Fresno and Tahoe Regional Boards respectively. We decided to bypass the Sacramento Corps for this supplemental file review to avoid the lengthy FOIA process and to increase our chances of locating files for these regions. The Fresno and Tahoe Regional Boards staffs were able to identify and locate some of these supplemental files. During a visit to the Fresno office by a UCLA researcher, only a few of the located files were determined to be useful for this study (i.e., contained potentially assessable mitigation requirements). However, as he browsed through the archive storage boxes that had been made available to him, he was able to identify and locate another assessable file from the original list. With these files, we were close to our regional target, but without any buffer in the event that files were excluded upon further review. Fortunately, the availability of the entire set of archives presented an opportunity for the addition of more files. To this end, the files in each of the boxes were assigned numbers, and these were pulled randomly and scanned for compensatory mitigation requirements. Through this approach, we added three more potentially assessable files, which gave us the desired buffer. During their visit to the Tahoe Regional Board, members of the USF group were able to obtain enough potentially assessable files to meet the target for that sub-Region, but without any buffer.

For the remaining regions (Region 4, 6V, 7, 8, 9, and the southern portion of Region 3), the file review efforts were spread across four separate offices of the Los Angeles Corps District (plus two Regional Board offices, Los Angeles and San Diego, as mentioned earlier). Within the Los Angeles district the main file archives are located at the Ventura field office, though additional collections of files occur in the San Diego and Tucson field offices, and at the central office in downtown Los Angeles. The file archive in Ventura is reasonably well organized; however, most files that were generated at the other field offices had not been transferred to this location (at least the post-1990 files relevant to this study), and recent or problematic files tended to remain at the desks of the project managers. Because of this, and because of the various supplemental file lists that were generated, UCLA researchers made a total of six trips to the Ventura field office, two trips to the downtown office, one trip to the San Diego field office, and arranged to have one file photocopied and sent by the Tucson field office.

We experienced substantial difficulties gaining enough files for Regions 6V, 7, and 9. For Region 6V, there were ample files with mitigation requirements identified in the SWRCB database, but we had a very low success rate in the identification and location of these files. Anticipating this, we had requested about 5 times the desired number of files for this supplemental review, and still did not obtain an adequate number of potentially viable files. For Region 7, we could only generate a few more projects before exhausting the files identified in the SWRCB database as requiring mitigation. Had all of these been potentially viable files, we would have reached our target number for this region, but we had very poor success in the location of these files. This is due in part to one or more boxes of files that were apparently misplaced during their relocation to the Ventura archive following the closure of an old field office. While at the Corps, we attempted to locate more files from Region 7 using semi-random queries of the RAMS database (assisted by Corps staff), but these attempts did not yield any additional files. For Region 9, the cross-referencing of files at the Corps was difficult because, as mentioned earlier, the spreadsheets of recent 401 actions that are sent to the SWRCB are restrictive in terms of the information and key words they contain. Following our initial review, we had only obtained about one quarter of our regional target (equal to one eighth the number of files requested). To account for this, our supplemental list for that region included a large number of extra files to account for the expected low returns. Following our visit to the San Diego field office, we had obtained the target number of potentially assessable files, but with no buffer in case files were excluded upon further review. The list of files excluded upon further review and reasons for exclusion are listed in Table 1-7.

We compared the sample of files assessed to the overall sample of files in the SWRCB database using categories based on certification type and categories based on mitigation type. Our files assessed had a similar distribution of files in the certification-type categories (Figure 1-2). The biggest differences are that the sample of files assessed had several percent more waivers and a few percent fewer conditional certifications than the SWRCB sample. Since we did not actually consider the certification types beyond removing any denials from our random sample of files, we did not have expectations as far as the distribution of our sample of files assessed. We might have expected to have more files than the overall SWRCB sample in two categories—conditional certifications and conditional waivers—because these files are supposed to have mitigation requirements imposed by the State or Regional Boards. However, we ended up with a slightly lower proportion of conditional certifications and almost the same proportion of conditional waivers in our sample as compared to the total population of files in the SWRCB database. With regard to type of mitigation required, the distribution of files assessed compared with the files in the SWRCB database is as expected given that we targeted our sample towards files that required mitigation (Figure 1-3). Our sample contains over 60% more files that have mitigation requirements listed in the database compared to the entire sample of files in the SWRCB database. This proportion is not even larger because we included files that did not have explicit mitigation requirements listed in the SWRCB database in the hopes that we could augment our sample in the earlier years. The fact that the large difference in the percentage of files requiring mitigation is not accompanied by a correspondingly large difference in the percentage of files with conditional certifications suggests that certification type does not predict well whether or not mitigation is required. This result may be due to the fact that the mitigation sites we evaluated were not required by the State or Regional Boards, but by other agencies, and therefore were not listed in the SWRCB database.

Table 1-1. Distribution of permits issued and proportional targets by region. File # 3952 is not listed in this table because it is recorded in the SWRCB database as being issued in Region 6, but it is not specified whether it was issued in Region 6T or 6V. One file was recorded as being issued in Region “d” in the SWRCB database; it was assigned to the appropriate Region according to the location of it’s permittee/waterbody.

Region	# of Files from 1991-2002	Fraction of Total # of Files (9924)	# for 300 total	# of Files Requested	# of Files Assessed Fully Desired
1	618	0.062	19	21	6
2	2118	0.213	64	64	21
3	952	0.096	29	29	10
4	1199	0.121	36	36	12
5F (c)	237	0.024	7	7	2
5R (a)	557	0.056	17	17	6
5S (b)	1872	0.189	57	53	19
6T (a)	236	0.024	7	6	2
6V (b)	82	0.008	2	3	1
7	137	0.014	4	3	1
8	807	0.081	24	24	8
9	1088	0.110	33	25	11
SB	21	0.002	1	0	0
Total	**9924**	**1.000**	**300**	**288**	**100**

Table 1-2. Categories of files encountered during the file selection and review process showing which ones were included in our review.

<table>
<tr><th colspan="2">Category</th><th>Included in our review?</th></tr>
<tr><td colspan="2">1) Certifications and waivers with specific compensatory mitigation activities required by the Regional Board</td><td>Yes</td></tr>
<tr><td rowspan="2">2) No specific compensatory mitigation activities required by the Regional Board, but mitigation required by another or other agencies</td><td>A) Certifications and waivers with language indicating the existence of other agency mitigation requirements, and thus, implying that those requirements be followed.</td><td>Yes</td></tr>
<tr><td>B) Certifications and waivers containing conditions mandating that the mitigation requirements of another or various other agencies be followed as a condition of the 401</td><td>Yes</td></tr>
<tr><td colspan="2">3) No compensatory mitigation requirements</td><td>No</td></tr>
</table>

Table 1-3. Files selected from 1991-1994 (60 files). After each step, when more files were available in the desired category in a particular region, we selected the number of files needed from that step randomly and added these files. A "–" indicates that the number of files needed for that region had already been met, so no additional files from that particular category were acquired.

Region	**Needed for ~75 total**	**Files with COMP acreage in database**	**Files reviewed with explicit mention of mitigation and/or fee**	**Files reviewed with some mention of mitigation**	**Files reviewed that require compliance with other agencies/ requirements**	**Files reviewed that mention other agencies/ requirements**	**Total # of files selected**
1	5	0	1	1	2	1	**5**
2	16	0	0	12	3	1	**16**
3	7	0	0	4	1	2	**7**
4	9	1	1	6	1	–	**9**
5F	2	0	0	1	1	–	**2**
5R	4	0	0	2	1	1	**4**
5S	14	0	0	1	7	2	**10**
6T	2	0	0	1	0	0	**1**
6V	1	0	0	0	0	0	**0**
7	1	0	0	0	0	0	**0**
8	6	0	5	1	–	–	**6**
9	8	0	0	0	0	0	**0**
Total	**75**	**1**	**7**	**29**	**16**	**7**	**60**

Table 1-4. Region and certification years of files selected initially from 1991-1997 (135 files).

Region	1991	1992	1993	1994	1995	1996	1997	Total
1	0	1	2	2	1	1	3	**10**
2	0	1	5	10	4	5	7	**32**
3	0	1	2	4	1	3	3	**14**
4	0	3	3	3	3	3	3	**18**
5F	0	1	1	0	2	0	0	**4**
5R	0	0	2	2	0	2	2	**8**
5S	0	5	3	2	4	5	5	**24**
6T	0	1	0	0	0	2	0	**3**
6V	0	0	0	0	1	0	0	**1**
7	0	0	0	0	1	0	0	**1**
8	1	0	2	3	3	1	2	**12**
9	0	0	0	0	0	2	6	**8**
Total	**1**	**13**	**20**	**26**	**20**	**24**	**31**	**135**

Table 1-5. Files selected from 1995-1997 (75 files). A "–" indicates that the number of files needed for that region had already been met, so additional files from that particular category were not acquired.

Region	Needed for ~75 total	Files with COMP acreage in database	Files that explicitly mentioned mitigation reviewed at SWRCB	Files reviewed that mentioned mitigation	Total # of files selected
1	5	4	1	–	**5**
2	16	7	9	–	**16**
3	7	5	0	2	**7**
4	9	6	3	–	**9**
5F	2	2	0	–	**2**
5R	4	3	1	–	**4**
5S	14	8	6	–	**14**
6T	2	–	2	–	**2**
6V	1	1	0	–	**1**
7	1	0	0	1	**1**
8	6	1	5	–	**6**
9	8	–	8	–	**8**
Total	**75**	**37**	**35**	**3**	**75**

Table 1-6. Ultimate list of files requested, located, and photocopied by region (N=429 files). Two files in Region 4 that were selected initially had been evaluated in the LARWQCB study, so were removed before the FOIA requests for the remaining files were submitted.

Region	**Requested**	**Located**	**Photocopied**
1	32	15	14
2	75	46	46
3	43	27	27
4	44	38	29
5F (c)	18	8	8
5R (a)	27	10	10
5S (b)	54	41	40
6SLT (a)	23	9	9
6V (b)	10	6	6
7	11	4	4
8	25	18	17
9	65	32	21
SB	2	1	1
Total	**429**	**255**	**232**

Table 1-7. List of files located but excluded with reasons for exclusions (N=72 files). Only files that had compensatory mitigation requirements listed in the SWRCB database are listed in this table; 30 other files were excluded, but did not have compensatory mitigation requirements.

Overall ID #	Region	Reason for exclusion
1219	SB	Not enough info in file
1330	6T	Not enough info in file
1349	5R	Not enough info in file
1752	9	Not viable based on RB review; reason unspecified
1823	9	Not viable based on RB review; reason unspecified
1893	3	Access denied
1931	4	Impact project not done
2051	3	Mitigation project ongoing
2085	4	Mitigation project ongoing
2309	4	Evaluated in R4 study
2749	2	Mitigation not required
2840	9	Not viable based on RB review; reason unspecified
2844	9	Not viable based on RB review; reason unspecified
2906	3	Mitigation project ongoing
2970	8	Mitigation not required
3184	4	Impact project done; mitigation not done
3297	2	Mitigation not required
3313	6V	Impact project ongoing
3445	9	Not viable based on Corps review; reason unspecified
3533	5S	Permit denied/Project cancelled
3616	2	Access denied
3700	4	Impact project not done

Overall ID #	Region	Reason for exclusion
5155	8	Mitigation not required
5236	4	Not viable based on RB review; reason unspecified
5648	6T	Not enough info in file
5779	2	Access denied
5786	5F	Impact project done; mitigation not done
5823	5S	Not enough info in file
6425	6V	Impact project not done
6791	8	Not enough info in file
6993	9	Not enough info in file
7003	6T	Impact project done; mitigation not done
7384	9	Not viable based on Corps review; reason unspecified
7481	9	Mitigation not required
7531	9	Not viable based on Corps review; reason unspecified
7578	8	Not viable based on Corps review; reason unspecified
7682	4	Impact project ongoing; mitigation not done
7762	9	Not viable based on Corps review; reason unspecified
7846	1	Not enough info in file
7857	9	Impact project not done
7960	9	Mitigation project ongoing
7998	2	Permit denied/Project cancelled
8261	4	Conflict of interest
8323	3	Mitigation project ongoing
8324	3	Impact project ongoing; impacts avoided, so mitigation not required and file not viable
8522	9	Not viable based on Corps review; reason unspecified
8614	2	Not enough info in file
8671	7	Mitigation not required
8935	4	Evaluated in R4 study
9170	3	Not enough info in file
9177	3	Mitigation not required
9354	4	Evaluated in R4 study
9471	5R	Permit denied/Project cancelled
9498	6V	Impact project done; mitigation not done
9557	9	Not viable based on Corps review; reason unspecified
10355	4	Impact project not done
10428	1	Despite listing mitigation requirements, application denied
10572	6T	Not enough info in file
10628	4	Impact project not done
10860	2	Mitigation project ongoing
10887	6T	Mitigation requirements not met
10904	4	Impact project ongoing
10962	9	Despite listing mitigation requirements, application denied
10972	9	Impact project ongoing
11023	3	Permit denied/Project cancelled
11080	2	Mitigation project ongoing
11084	2	Mitigation project ongoing
11093	3	Impact project ongoing; mitigation not done
11149	5S	Permit denied/Project cancelled
11154	4	Not viable based on RB review; reason unspecified
11194	8	Impact project ongoing
11198	9	Impact project not done

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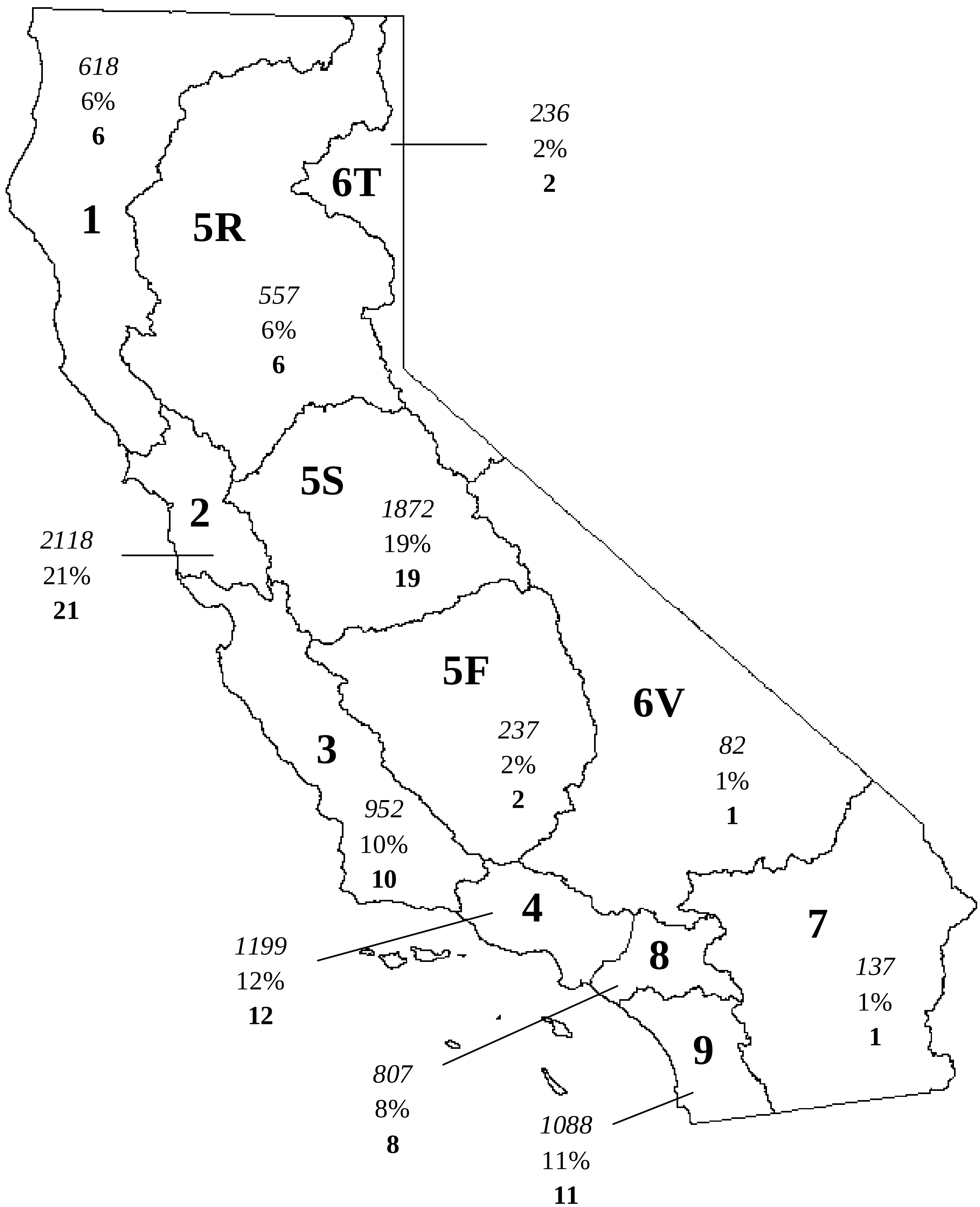

Figure 1-1. Map of state board regions with total number of files listed in the SWRCB database from 1991-2002, the percentage by region of the total number of files in the SWRCB database from 1991-2002 (9924 files), and the target number of files assessed fully by region for a total of about 100 files overall.

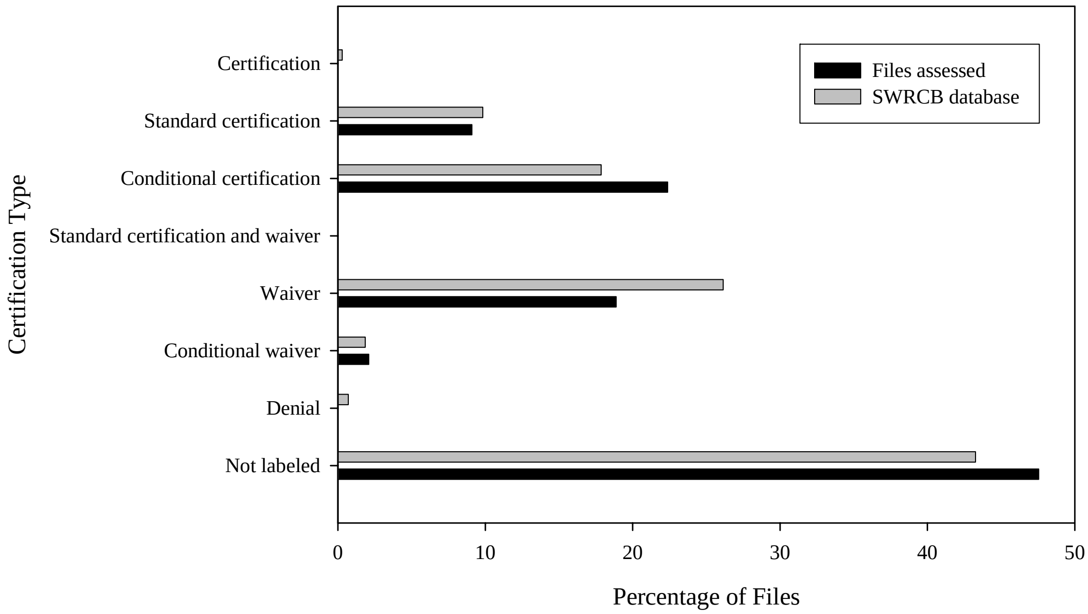

Figure 1-2. Percentage of files in each certification category listed in the SWRCB database from 1991 to 2002 compared with our sample of files assessed fully and for compliance only (N for files assessed=143, N for SWRCB database=9924).

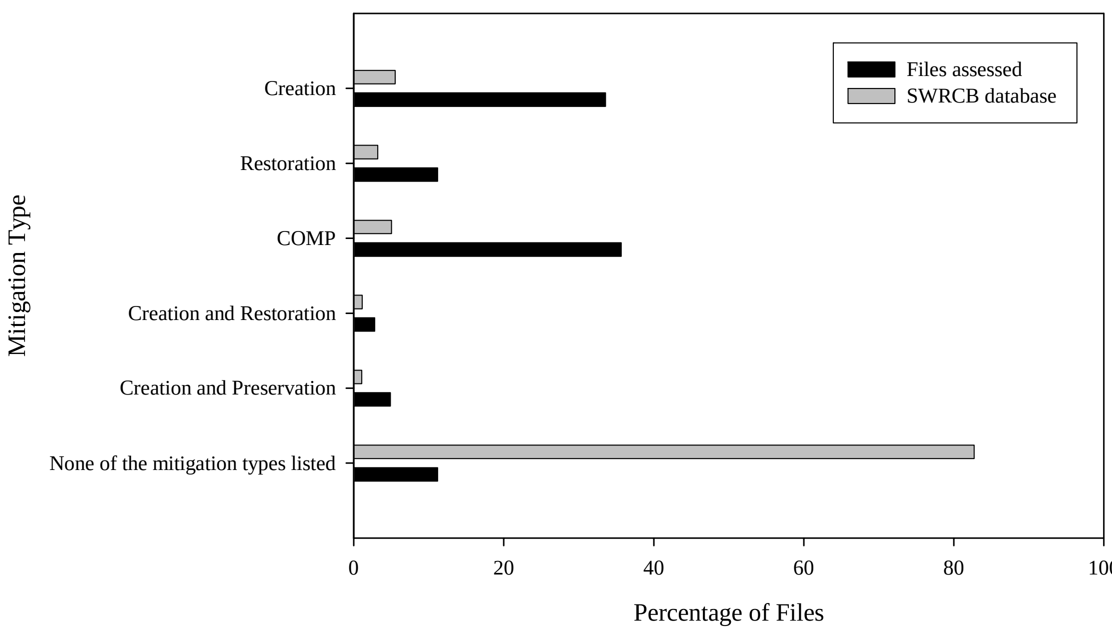

Figure 1-3. Number of files requiring each type of mitigation or combination of mitigation types listed in the SWRCB database from 1991 to 2002 compared with our sample of files assessed fully and for compliance only. Mitigation types and combinations of mitigation types that comprise less than one percent of the files in each of the two samples are not shown in this figure (N for files assessed=142, N for SWRCB database=9841).

2. Lists of Assessed Files by File Identification Number

Table 2-1. Final list of files assessed for compliance only (N=14 files). Files #1817, 5479, and 7902 were assessed for compliance only due to lack of time (i.e., they had mitigation sites that could have been assessed for CRAM); the rest of the files were assessed for compliance only due to lack of a mitigation site that could be evaluated using CRAM.

File #	Region	Water	Applicant	Project	Cert Date	1600	404	401
0	5F	Merced River	Caltrans	Highway 99/Merced River Bridge Replacement Project, Merced Cty	5/5/1998	4-017-98	199800099	82-036
1210	3	WETLAND, UNNAMED	CALTRANS	REALIGN SR 41 & EXTEND CULVERT	8/21/2000		200001618-TW	
1785	7	WHITEWATER R	INDIAN WELLS, CITY	REPLACE MILES AVE BRIDGE	1/31/2002	5-101-98	200200371RRS	
1817	1	SEAS WETLAND	LARKFIELD INVESTORS	RES DEVEL	2/11/2002		25694N	WDID No. 1B02001WNSO
2316	9	SANTA MARIA CK	WIER, BRIAN & LISA	RES DEVEL	10/15/2001		200000310-SAS	01C-099
3352	5F	WETLANDS, UNNAMED	VAL CHILDREN'S HOSPITAL	GRADE SITE FOR COMMERCIAL DEV	12/6/1999		199900295	
5479	3	BABBS CANYON CK	LSA ASSOCIATES	CULVERT AND FILL REPLACEMENT FOR RES SUBDIVISION	10/7/1994	74694	21098S92	
7014	4	SAN JOSE CK, UNNAMED TRIB	MICHAEL BRANDMAN ASSOCIA	GRADE FOREST LAWN MEMORIAL PARK	8/8/1996		19960019000 and 96-00385-AOA	
7902	2	ARROYO DE LAGUNA TRIB, UNNAMED	ALAMEDA CO PWA	INSTALL OUTFALL STRUCTURE	7/24/1997		23160S	File No. 2198.11, Site No. 02-01-C0240
8217	4	CAMARILLO HILLS DRAIN	VENTURA CO DEPT OF AIRPO	MAINTENANCE DREDGE	10/28/1997	5-067-97	97-50201-LM	
8890	4	PACOIMA WASH TRIBS, UNNAMED	WILSHIRE BUILDERS, INC	EL CARISO PARK DEVELOPMENT PROJECT	7/16/1998	5-474-97	199800516AOA	
9448	1	LAGUNA DE SANTA ROSA TRIB, UNNAMED	BURBANK HOUSING DEVELOP	CONSTRUCT 48-UNIT HOUSING COMPLEX	12/4/1998		24158	
10329	5S	WETLAND SWALE, UNNAMED	HARTFORD LAND MANAGEMENT	DEVELOP 10AC RESIDENTIAL SUBDIVISION	9/18/2002		200000120	
10356	4	San Antonio Creek	CALTRANS Dist 7	Extend Route 30 Culvert	10/17/2000		2000-01778-PJF	00-122

Table 2-2. Final list of files assessed fully (i.e., files for which both compliance and functional evaluations were made) (N=129 files).

File #	Region	Water	Applicant	Project	Cert Date	1600	404	401
470	4	ARROYO SIMI TRIB, UNNAMED	FIVE S PROPERTIES, LTD	UPGRADE AND WIDEN ROADS, INSTALL 2 BRIDGES TO REPLACE EXISTING CULVS	8/20/2002	5-2002-0166	200200232JWM	02-069
1412	6T	CARSON R, WFK	CDFG	CREA PARKING AREA, TWO CONCRETE PLATFORMS & PATHS	7/5/2000		200000135	
1464	5S	PLEASANT GROVE CK TRIBS, UNNAMED	HUFFMAN & ASSOC	COMMERCIAL, IND DEVEL	8/29/2001		200000077	
1484	3	SANTA YNEZ R TRIB, UNNAMED	CHANNEL ISLAND YMCA	CONSTR REC DEVEL AND PARKING	7/12/2001	SAA 5-277-00	200100050-LM	NA
1592	2	IGNACIO CK	NOVATO COMMUNITY PARTNERS LLP	CONSTR RES DEVEL, REPLACE CULVERT & OUTFALL	9/5/2001		25166N	Site No.: 02-21-C0283, File No.: 2158.04 (JRW)
1664	3	CHOLAME CK	CALTRANS	INSTALL ROCK SLOPE PROTECTION	9/24/2001	R3-2002-0293	237551S	
1775	5S	CLOVER VALLEY CK	BICKFORD HOLDINGS	RES DEVEL	1/9/2002		199400607	
1788	3	ORCUTT CK	SAN LUIS OBISPO, CITY DPR	CONSTR SPORTS FIELD	1/25/2002		2001000244-LM	
2055	5R	LITTLE DRY CK	W CANAL WD	CONSTR SIPHON W/INLET & OUTLET STRUC	6/7/2002	R2-2002-138	200200187	
2097	3	CHORRO CK, DAIRY CK	CA NATIONAL GUARD	REPLACE CAMP SLO BRIDGE	5/21/2002	R3-2002-0240 and R3-1600-2003-5165-3	975025400-BAH and 200201004-BAH	
2219	5R	SACRAMENTO R	M&T AND LLANO SECO RANCH	REMOVE GRAVEL BAR	11/5/2001	R2-2001-266	200100538	
2395	8	SHADY CK, BOMMER CK AND TRIBS	THE IRVINE COMPANY	SHADY CANYON GOLF COURSE AND RES DEV WVRMOD	2/24/2000	5-247-98	980060000-RLK	
2418	5S	MERCED R	MERCED CO DPW	CONSTR SHAFFER BRIDGE	12/14/2001	R4-2001-0082	199700166	RN.111
2443	2	SAN TOMAS	LEGACY	EXTEND GREAT AMERICA	12/4/2001		26191S	Site No.: 02-

File #	Region	Water	Applicant	Project	Cert Date	1600	404	401
		AQUINO CK, RETENTION PONDS, UNNAMED	PARTNERS	PKWAY				43-C0348, File No.: 2188.07 (BKW)
2456	5S	MINERS RAVINE CK	ROSEVILLE, CITY	CONSTRUCT BIKE PATH	1/9/2001	II-68-00	200000279	
2591	3	PETERSON CK	CURTIS DEVEL	INSTALL & COVER DRAINAGE PIPE FOR RES DEVEL	2/21/2001	5-345-00	200100420-JEM	
2593	2	SEAS WETLAND, UNNAMED	GIBSON & SKORDAL	RES DEVEL	2/26/2001		25272S	Site No.: 02-01-C0478, File No.: 2198.11
2667	5S	VERNAL POOLS, UNNAMED	LEWIS OPERATING CORP	RES DEVEL	4/23/2001		199900615	
2706	2	COYOTE CK	SANTA CLARA VAL TA	WIDEN US 880, REPLACE BRIDGE & INSTALL TWO CULV	5/2/2001	R3-2001-0141	25796-1S	File No.: 2188.07 (MYM), Site No.: 02-43-C0329
2726	5R	CHURN CK	JAD ASSOCIATES	WINDSOR ESTATES SUBDIVISION, GOLITI PROPERTY	8/6/1999		199500713	
2784	2	SEASONAL WETLANDS UNNAMED	CALTRANS	SR 37 WIDENING COMP, GUADALCANAL REST SITE	6/27/2000		25006	File No.: 2129.2080 (SLB), Order No. 00-047
2804	4	SANTA CLARA R TRIB, UNNAMED	VINTAGE PETROLEUM CORP	CONSTRUCT CONTAINMENT BASIN FOR OIL SPILLS	7/19/2000	178386	200001345	00-081
2841	9	WETLAND, UNNAMED	LAGUNA NIGUEL, CITY	LA PAZ PROJECT	8/9/1999	5-107-00	199915517Chung	
2940	2	LOS COCHES CK	PIEDMONT 237 LLC	PIEDMONT 237 LLC DEV PROJECT	7/23/1999		24466S	File: 2188.07 (GTG), Site: 02-43-C0237
2974	9	RATTLESNAKE CK	BARRARR AMERICAN	EASTVALE	7/7/1999		199915878-MAT	
2998	2	CARQUINEZ STRAIT TRIB, UNNAMED	GATEWAY DEV CMPY	FILL ASSOC W/ CLIPPER BAY HOUSING PROJECT	6/16/1999		24076N	2128.03 (SLB)
3079	2	WETLAND, UNNAMED	LEGACY PARTNERS	LEGACY PARTNERS DEV PROJECT	7/6/1999		23583S	File No. 2198.11 (KHL), Site

File #	Region	Water	Applicant	Project	Cert Date	1600	404	401
								No. 02-01-C0336
3109	3	GONZALES SLOUGH	OLBERDING, JEFF	EROSION PROTECTION, WEIR DAM, AND ACCESS ROAD	4/28/2000		24937S	
3252	5S		OMNI-MEANS	SR 12-THORNTON ROAD REALIGNMENT	9/1/1999		199900105	
3370	5S		NEW MILLENIUM DEV	ARBOR VIEW CORPORATE CENTER	12/23/1999		199900310	
3376	5S		GA KRAUSE & ASSOCIATES	LAKEHILLS CMTY COVENANT CHURCH	12/21/1999		199800215	
3417	9	MCGONIGLE CYN TRIBS, UNNAMED	HORTON, D.R.	TORREY DEL MAR	11/5/1999	5-312-99	199916076Baker	99C-068
3472	5F	DOG CK	CLOVIS UNIFIED SCHOOL	RELOCATE CK TO WIDEN LEONARD AVENUE	11/2/1999		199900342	
3536	5S	STUMPY MEADOWS RSVR	USFHA	RECONSTRUCT ROADWAY SURFACE	1/13/2000		199900665	
3617	2	MISSION CK MARINA CHNL	CATELLUS DEVELOPMENT	RIPRAP BANK AND CONSTRUCT OVERLOOK	2/8/2000		241991S	File No.: 2168.05 (JCH), Site No.: 02-38-C0043
3632	4	GABBERT CYN WASH, WALNUT CYN WASH, (MULT)	TOLL BROTHERS INC	MOORPARK ESTATES AND GOLF COURSE	2/14/2000	5-026-99	199915123JPL	99-163
3677	9	DRAINAGES, UNNAMED	KINDER MORGAN ENERGY	REPLACE PIPE, CONSTRUCT LAUNCHING FACILITY	3/23/2000		199916120-MAT	
3710	2	SEASONAL WETLAND, UNNAMED	JENMAR LAND CORPORATION	JENMAR GAS STATION CONSTRUCTION	2/21/2000		24434S	File No.: 2198.11 (KHL), Site No.: 02-01-C0430
4206	4	PIRU CK	CALTRANS	REPAIR BRIDGE	12/2/1992		19930017800	
4231	5S		SUGNET & ASSOCIATES	CONSTRUCT RACQUET CLUB ANNEXATION	12/16/1992		199800264	
4580	8	CAJALCO CANYON CK	WMWD	REPAIR LEAK IN IMPROVEMENT DISTRICT U-1 PIPELINE	8/27/1993		19930125500-Stein	
4858	4	SANTA CLARA R	NEWHALL LAND&FARMING	CONSTRUCTION OF GROINS AT NEWHALL RANCH BRIDGE	12/30/1993	5-187-93	1994139DN	
5136	3	CARBONERA CK	SCOTTS VALLEY, CITY	MT. HERMAN RD INTERCHANGE	5/20/1994		20391S93	

File #	Region	Water	Applicant	Project	Cert Date	1600	404	401
5217	3	SAN ROQUE CK	PENFIELD & SMITH	HITCHCOCK RANCH CONSTRUCTION PROJECT	7/8/1994	5-093-94	945-0829-00-AEM	
5401	8	ENGLISH CHANNEL, CARBON CANY0N CK	SAN BERNARDINO CO	RE-ALIGNMENT AND ROCK SLOPE PROTECTION	9/7/1994	5-255-94 and 5-282-94	19943082800	
5425	2	ADOBE CK	UNK	BANK STABILIZATION AT ADOBE CK GOLF COURSE	9/15/1994		20562N96	2148.04 (WBH)
5619	7	THREE FINGERS L	USFWS- CIBOLA NWR	DEEPENING, CONSTRUCTION OF CHNL, DIVERSION DIKE	1/4/1995		19954013500Blaine	
5625	4	ARROYO CONEJO TRIB	KAUFMAN & BROAD	EXTENSION OF RAMONA DRIVE	1/6/1995	5-474-94	95-50034-TS	
5747	8		MARCH AIR FORCE BASE	LANDFILL STABILIZATION	3/20/1995		9500086ES	
5815	2		HERCULES, CITY OF	STATE ROUTE 4 GRADE SEPARATION	4/17/1995		20490E76	2118.03 (MYM)
6002	8		SEACLIFF PARTNERS	HOLLY SEACLIFF SHERWOOD PARK (CERTMOD)	7/12/1995	5-095-93	1995009700BH	
6159	4	SAWTELLE CHNL TRIB, UNNAMED	JKBE ENGINEERS	CONSTRUCT STORM DRAIN, GRADING TO MINIMIZE EROSION	9/7/1995		199500266FT	
6280	4	MCDONALD CANYON DETENTION BASIN	VCPWA	CONSTRUCTION OF VARIOUS FLOOD CONTROL STRUCTURES	10/13/1995	5-516-94	199560047TS	NA
6367	1		GUGGIANA, RITZ	FILLING OF WETLANDS	11/17/1995		19316N96	
6369	8	BONITA CK AND UNNAMED TRIBS	ORANGE CO ENV MGNT AGCY	EXTEND NEWPORT COAST DRIVE	11/20/1995		19950047600-LTM	
6389	4	ARROYO LAS POSAS	VCPWA	STABILIZE CHNL	12/4/1995	5-174-94	199550372MSJ	
6451	2	NAPA R	CALTRANS	SEISMIC RETROFIT OF BRIDGE ON HWY 37	1/18/1996		22015N29	2128.03 (SLB)
6489	5S	UNNAMED WETLANDS	WRC ENVIRONMENTAL	RESIDENTIAL DEVELOPMENT, ROBBINS MEADOW UNIT #1	2/1/1996	II-545-95	199500044	
6668	2	REFUGIO CK	GELSAR	RESIDENTIAL/COMMERCIAL DEVELOPMENT OF 70 ACRES	4/1/1996	2000-006	File No.: 24064S, Permit No.: 21279S59	File No.: 2118.03 (MYM), Resolution No. 96-027
6709	2	HIDDEN POND II	SPROUL, MALCOM	FILLING AND GRADING OF HIDDEN POND II	4/10/1996	0013-90	18461S76A	

File #	Region	Water	Applicant	Project	Cert Date	1600	404	401
6789	5S	LITTLEJOHNS CK, N BRANCH OF S FK	JONES & STOKES ASSOC	EXPAND AUSTIN ROAD LANDFILL, RELOCATE CK	5/9/1996		199400974	
6845	4	ARROYO SIMI	SIMI VAL, CITY DPW	RECONSTRUCT RIPRAP AND CONCRETE APRON	6/11/1996	5-518-95	199650173TS	
6855	1	SMITH R	DEL NORTE SOLID WM AUTH	CLOSE LANDFILL	6/14/1996		21555N77	
6949	6T	WETLAND TRIBUTARY TO SQUAW CREEK	TRIALS END ASSOCIATES	CONSTRUCTING A BRIDGE OVER WETLANDS	7/17/1996		199500015	
6970	5F	SAN JOAQUIN R, ROOT CK, VERNAL POOLS	CALTRANS	EXTEND SR 41	7/24/1996		199206730	
7059	3	LOS BERROS CK	SLO CO	STABILIZE BRIDGE AND SLOPE	8/22/1996		97-5031300-TW	
7117	5R	PIT R, S FK	CALTRANS, DIST 2	CONSTRUCT OVERLOOK	9/10/1996		199600383 and 199700027	
7154	3	UNNAMED WETLANDS, POTRERO CYN CK, (MULT)	RANCHO SAN CARLOS PARTNE	RESIDENTAL DEVELOPMENT	9/23/1996		23295S	96-08
7270	1	WETLANDS, UNNAMED	DON DOWD CMPY	CONSTRUCT INDUSTRIAL PARK	10/28/1996		21281N96	
7371	4	EIGHT UNK BLUE-LINE STREAMS	GLEN LUKOS ASSOCIATES	CONSTRUCT FIRST STREET CROSSING/ LONG CYN DEVELOPE	12/3/1996	5-362-96	199750101LM	
7385	5R		RYAN'S LANDING LIMITED	LEVELING AND GRADING 29-ACRE SITE	12/9/1996		199401025	
7404	1		MCDONALD'S CORP	GRADING AND FILLING TO PLACE RESTAURANT	12/18/1996		22094N	
7456	1	SEASONAL WETLANDS, VERNAL POOLS, UNNAMED	SHILOH PARTNERS	CONSTRUCT COMMERICAL CENTER	1/16/1997		20349N96	
7497	8	SAN DIEGO CK	THE IRVINE COMPANY	RECONFIGURE DUCK POND	1/28/1997	5-068-97	19970005700-MFS	
7521	9	SWEETWATER R	SWEETWATER AUTHORITY	REPLACE PIPELINE	2/11/1997		19972011500Smith	
7528	1	WINDSOR CK, E WINDSOR CK	CALTON HOMES OF CA	CONSTRUCT RESIDENTIAL DEVELOPMENT	2/14/1997		17587N96	

File #	Region	Water	Applicant	Project	Cert Date	1600	404	401
7640	9	VIEJAS CK	SAN DIEGO CO DPW	SEISMIC RETROFIT WILLOWS RD BRIDGE	4/1/1997		19972010000Ledford	
7646	2	WETLANDS, UNK	BELMONT, CITY	EXPAND ORACLE CORPORATION CAMPUS	4/3/1997		21773S	File No.: 2178.07 (DGS), Resolution No. 87-053
7678	5F	WETLANDS, UNK	JAMES J STEVINSON CORP	DEVELOP RESIDENCES	4/17/1997		199100492	
7827	2	WETLANDS, UNNAMED	SOLANO GARBAGE CMPY	UNAUTHORIZED ROAD TO LANDFILL	6/18/1997		20527N	File No. 2128.03 (SLB), Resolution No. 87-053
7883	2	PACHECO CK TRIB, UNNAMED	CONTRA COSTA CO DPW	CONSTRUCT INLET AND OUTLET STRUCTURES	7/10/1997		22444S	File No. 2118.03 (JAM), Site ID: 02-07-C0111
7932	5R	COLD CK TRIBS, UNNAMED	MT SHASTA MEDICAL CENTER	EXPAND MEDICAL CENTER	8/4/1997		199400062	
7936	4	SANTA CLARA R TRIB, UNNAMED	VALENCIA COMPANY	INSTALL STORMDRAIN	8/5/1997		199700278AOA	
7942	9	TIJUANA R	SAN DIEGO, CITY	IMPROVE RECLAMATION PLANT, ROAD, AND BRIDGE	8/6/1997		19972001500Baker	
8044	5S	DRY CK	UNION PACIFIC RR	RECONSTRUCT RR YARD	9/8/1997	II-025-96 and II-581-93	199500726 and 199700315	
8061	9	CAMPO CK	VESTAR DEVEL CMPY	DEVELOP TOWNE CENTER	9/12/1997	5-018-97	96-20136-TCD	
8125	5S	CIRBY CK, LINDA CK, DRY CK	ROSEVILLE, CITY	COMPLETE FLOOD CONTROL PROJECTS	9/29/1997	II-767-97	199600514	
8156 and 8159	9	AGUA HEDIONDA LAGOON	CARLSBAD, CITY	CANNON RD REACH 1	10/10/1997	5-044-97	972013000-TCD and 9720131	
		AGUA HEDIONDA CK, AGUA HEDIONDA LAGOON		CANNON RD REACH 2				

File #	Region	Water	Applicant	Project	Cert Date	1600	404	401
8177	2	SILVERADO CK, SALVADOR DRAINAGE CHNL	THE O'BRIEN GROUP	DEVELOP RESIDENCES	10/15/1997		19247E87 and 22771N	File No 2138.03, Site ID 02-28-C0003
8185	9	LA ZANJA CYN, MCGONIGLE CYN TRIB	TAYLOR WOODROW HOMES	DEVELOP RESIDENCES	10/17/1997		97-20176-TCD	
8202	6V	WETLAND, UNNAMED	WESTERN CARE CONSTRUCTIO	CONSTRUCT CARE CENTER	10/23/1997	5-433-95	97-50012-BAH	
8215	5F	UNNAMED WETLAND	US DEPT OF JUSTICE	CONSTRUCT PENITENTIARY	10/28/1997		199400188	
8248	5S	WETLANDS, UNNAMED	GIBSON & SKORDAL	CONSTRUCTION PROJECT	11/4/1997	II-884-97	199600557	
8337	9	CHOLLAS CK	SANTA FE RR CO, CURLNGTN	REPLACE BRIDGE 270-9	12/10/1997	5-035-97	98-20020-JL	97C-087
8390	1	POOL CK	THE GREENS RESIDENTIAL	CONSTRUCT SUBDIVISION	9/16/1997		22695N	
8525	8	NEWPORT BAY, LOWER TRIB, UNNAMED	NEWPORT BEACH, CITY DPW	IMPROVED DRAINAGE CHNL AT NEWPORT BLVD & PCH	3/4/1998	5-142-98 and 5-371-98	98-00672-VAW and 19980037500RS	
8529	7	CATHEDRAL WASH	MCO PROPERTIES, INC	MIRANDA PROJECT:CONSTRUCT RES UNITS	3/5/1998		980026000-RSS	
8558	5S	HINKLEY RUN CK, MINE RUN CK	OHM REMEDIATION SERVICES	PENN MINE ENVIRONMENTAL RESTORATION PROJECT	3/19/1998	II-859/1072-97	199500580	WDID 5S05S014676
8587	8		UNOCAL (CAL PAC)	DEVELOP DETACHED RES UNITS & STABILIZE FOR EROSION	3/31/1998		200200380Chung	
8677	8	SANTIAGO CK	CALTRANS	SR 55 AND CHAPMAN AVE BRIDGE WIDENING	5/8/1998		19970004500RS	
8704	2	BERRYESSA CK AND ARROYO DE LOS COCHES	MISSION PEAK HOMES, INC	SINCLAIR HORIZONS DEVELOPMENT PROJECT	5/19/1998	R3-2000-0788	23252	2188.07 (BKW)
8793	4	CASTAIC CK TRIB, UNNAMED	LARWIN COMPANY	RECONFIGURATION/REDUCTION IN SIZE OF DEBRIS BASIN	6/12/1998	5-408-97	199800639PMG	
8800	2	BOLLINGER CK TRIB, UNNAMED	NEW CITIES DEV GROUP	THOMAS RANCH RES SUBDIVISION	6/17/1998	292-96	22514S	2118.03 (MYM)
8924	5S	WETLANDS,	ACTIUM	STONERIDGE 63 RESIDENTIAL	7/22/1998		199700771	

File #	Region	Water	Applicant	Project	Cert Date	1600	404	401
		UNNAMMED	DEVELOPMENT CORP	DEVELOPMENT				
8947	2		DEAD STRAIGHT CORP	CONSTRUCT GOLF DRIVING & PRACTICE RANGE	7/27/1998		23566N	
8980	5S	WETLANDS, UNNAMED	LINCOLN, CITY	SR 65 WIDENING & INTERCHANGE PROJECT	8/4/1998		199800081	
9193	4	CASTAIC CK, SAN MARTINEZ GRANDE, (MULT)	CALTRANS DIST 7	REPLACE OR WIDEN BRIDGES ALONG SR 126 (CERTMOD)	9/30/1998	5-100-96	9600167AOA and 980002600	96-075
9211	8	DRAINAGE, UNNAMED	MWDSC	SOIL BERM CONSTRUCTION, STORM DRAIN IMPROVEMENTS	10/5/1998		98-00651-YJC	
9392	4	MATILIJA CK, N FK	CALTRANS, DIST 7	BRIDGE REPLACEMENT, RT 33, BRIDGE #52-71	11/18/1998	539098	199950036LM	98-123
9404	8		CORONA, CITY DP&R	INSTALL FLOOD PROTECTION	8/22/1997		19980050900RRS	
9430	3	PISMO L	FIRMA	ON/OFF RAMP CONTRUCTION, RT 101	11/30/1998	R3-2000-1430	199850316TW	
9432	9	CARMEL CK	BRE BUILDERS INC	RIPARIAN FILL	12/1/1998		19982008200Dean	
9510	1	REDWOOD CK	COPPERHILL DEVEL CORP.	CONSTRUCT FOUR BUILDINGS	12/23/1998		23336N	
9597	9	TELEGRAPH CYN CK	CHULA VISTA, CITY	TELEGRAPH CYN CK CHNLIZATION	2/5/1999	5-489-98	962014500-TCD	
9671	5S	WETLAND, UNNAMED	MELLERUP, BILL	BUILD SINGLE FAMILY HOME	3/10/1999		199700650	
9691	3	ZACA CK	SANTA BARBARA CO ASS GOV	CONSTRUCT INTERCHANGE	3/17/1999		985031500-JEM	
9857	2	WETLAND, UNNAMED	BOULDER RIDGE GOLF CLUB	CONSTRUCT GOLF COURSE, DRIVING RANGE, ROADS, ETC	5/25/1999	6-113-00	20467S92	
10274	5S	GEORGIANA SLOUGH	CUMMINGS, DEBBIE	CONSTRUCT RECR DOCK & ACCESS	10/18/2000		200000299	2188.07 (GTG)
10304	2	SEASONAL WETLANDS, UNNAMED	KYLE, STEPHEN	RESIDENTIAL DEVELOPMENT	10/25/2000		25388N	2148.04 (ECM)
10347	8	ELDER GULCH, GULLY, UNNAMED	SPRING PACIFIC PROPERTIE	RESIDENTIAL DEVELOPMENT E HIGHLAND RANCH	10/30/2000		200100020AS	
10399	6V	WETLANDS, UNNAMED	THE HIDEAWAY CMPY	RESIDENTIAL DEVELOPMENT	11/3/2000		200001040GAH	
10409	1	MARK W CK, COLGAN CK,	CALTRANS	WIDEN SR 101 FROM WILFRED AVN TO SR 12	11/20/2000		25062N	

File #	Region	Water	Applicant	Project	Cert Date	1600	404	401
		WETLANDS, UNNAMED						
10453	5S	WETLANDS, UNNAMED	LONGMEADOW DEVEL CORP	CONSTRUCT INDUSTRIAL PARK	11/28/2000		199700605	
10495	3	SAN BENITO R TRIBS, UNNAMED	THE LARWIN CMPY	RESIDENTIAL DEVEL	12/28/2000		24144S	
10530	5S	PLEASANT GROVE CK, WETLANDS, UNNAMED	ROSEVILLE, CITY	CONST JUNCT BOX TO OUTFALL STRUC FOR PLEASANT GROVE WASTEW TREAT PLANT	1/5/2001		200000456	
10843	9	MURRIETA CK TRIB, UNNAMED	WELLS, ROBERT	CONSTRUCT SELF STORAGE UNITS	8/29/2002	06-2002-141	200201351Swensen	02C-088
10938	5S	SEAS WETLANDS, UNNAMED, VERNAL POOLS, UNNAMED	M.A.M. LLC	SINGLE FAMILY RES DEVEL	5/30/2001		200100318	
11208	5S	FOLSOM L, WEBER CK, SLATE CK TRIB, UNNAMED	SHINGLE SPRINGS RANCHERIA	CONSTRUCT INTERCHANGE FROM SR 50 TO SHINGLE SPRINGS RANCHERIA	11/1/2002		200200212 and 199300362	
11224	2	FISHER CK, COYOTE CK	CALPINE CORP	CONSTRUCT STORMWATER OUTFALL STRUCTURE	11/21/2002		27067S	2188.07 (BKW)

3. Detailed Discrepancy Analysis Results

Table 3-1. Results of of our discrepancy analysis regarding permit files for which the impact and/or mitigation acreage values reported in our study (based on our detailed file reviews) differed from the corresponding values recorded in the State Board's permit tracking database. The impacted and required acreage values from various sources (including the State Board database, 401 permit, 404 permit, Department of Fish and Game's 1600 permit (Streambed Alteration Agreeement), Fish and Wildlife Service's Biological Opinion, and the Mitigation Plan) are listed along with our reported values which reflect the actual impacts that occurred and the mitigation acreage that was required as a result of the greater regulatory process. The source(s) upon which our reported values were based (i.e., contained the most accurate and up-to-date information) are also provided. The next table (Table 3-2) includes brief narratives for each permit file which describe the reasons for the discrepancies (page formatting issues forced the division of these two tables).

File ID	Database		401 Cert			404			DFG		FWS		MP		Reported by UCLA			Source
	Impacted	Required	Date	Impacted	Required	Date	Impacted	Required	Impacted	Required	Impacted	Required	Impacted	Required	Impacted	Required	Obtained	
470	0.040	0.700	9/24/03	0.099	0.700	9/30/03	0.059	0.575	1.070	NS	NA	NA	0.053	0.625	0.099	0.700	0.700	401
1210	0.027	0.000	9/29/00	0.027	NS	10/25/01	0.009	0.009	ND	ND	NS	NS	ND	ND	0.009	0.000	0.000	401+404
1412	0.237	0.517	7/5/00	0.273	0.518	ND	ND	ND	ND	ND	NA	NA	ND	ND	0.270	0.520	0.230	401
1464	0.980	1.090	8/29/01	0.980	1.090	2/10/03	0.890	0.960	ND	ND	1.300	3.010	NA	NA	1.870	4.030	4.030	401+404+FWS
1664	0.000	0.004	9/24/01	0.002	0.005	12/17/02	0.040	0.028	NS	NS	NA	NA	0.002	0.005	0.040	0.033	0.033	404+MP
1775	2.670	8.490	1/9/02	2.660	9.150	3/21/00	2.840	9.180	ND	ND	ND	ND	ND	ND	2.660	9.180	9.350	401+404
1785	0.532	1.010	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	0.532	1.010	1.010	SB DB/Corres
1788	0.820	2.460	1/25/02	1.010	2.650	4/2/02	1.010	NS	ND	ND	NA	NA	1.010	4.690	1.010	4.690	4.800	MP
1817	0.313	0.913	2/11/02	0.313	0.900	12/20/01	0.310	1.500	ND	ND	ND	ND	NA	NA	0.310	1.500	1.500	404
2055	1.020	1.640	6/7/02	1.020	1.640	6/13/02	0.960	0.960	ND	ND	0.240	0.160	ND	ND	0.960	1.200	0.639	404+FWS
2219	0.100	2.000	11/5/01	0.100	2.000	11/5/01	0.022	0.022	NS	NS	2.000	2.000	2.000	2.000	2.022	2.022	2.022	404+MP
2395	2.500	5.440	2/24/00	3.020	5.440	4/24/00	2.740	4.500	4.370	7.740	ND	ND	2.740	4.660	2.740	4.660	5.360	MP
2418	0.310	1.110	12/14/01	0.310	1.110	3/18/02	0.212	NS	ND	ND	NA	NA	0.312	1.100	0.312	1.110	1.000	MP
2443	0.144	0.154	12/4/01	0.077	0.154	10/25/01	0.082	NS	ND	ND	NA	NA	0.095	0.208	0.095	0.208	0.500	MP
2591	0.120	0.360	12/21/00	ND	ND	3/28/01	0.094	0.282	NS	NS	NA	NA	0.094	0.570	0.090	0.570	0.610	404+MP
2593	0.050	0.100	2/26/01	0.050	0.100	7/21/00	0.048	0.100	ND	ND	NA	NA	0.048	0.100	0.048	0.100	0.090	404+MP

File ID	Database		401 Cert			404			DFG		FWS		MP		Reported by UCLA			Source
	Impacted	Required	Date	Impacted	Required	Date	Impacted	Required	Impacted	Required	Impacted	Required	Impacted	Required	Impacted	Required	Obtained	
2706	0.140	0.180	5/2/01	0.140	0.180	9/12/02	0.140	0.180	ND	ND	NA	NA	0.090	0.180	0.140	0.200	0.200	404
2726	1.450	1.450	8/6/99	1.450	1.450	8/25/99	1.450	2.900	ND	ND	NA	NA	NA	NA	1.450	2.900	2.900	404
2784	13.750	29.350	6/27/00	14.550	43.900	ND	ND	ND	ND	ND	NA	NA	14.600	43.900	11.170	43.900	43.900	401, MP, Corres
2841	1.740	3.300	8/9/99	ND	ND	3/9/00	1.740	3.300	0.010	0.030	NA	NA	1.740	3.500	1.740	3.500	3.630	MP
2974	0.122	0.230	7/7/99	ND	ND	10/7/99	0.150	0.150	ND	ND	0.150	0.150	ND	ND	0.150	0.150	0.220	401+FWS
3252	2.120	3.510	9/1/99	2.120	2.120	8/25/99	2.120	2.120	NA	NA	NA	NA	NA	NA	2.120	2.120	1.580	404+401
3370	0.150	0.200	12/23/99	0.150	0.200	10/8/99	0.150	0.200	ND	ND	NA	NA	NS	0.700	0.150	0.700	0.700	404+ MR+Corres
3417	0.398	0.730	11/5/99	0.350	0.685	12/28/99	0.340	1.180	0.390	1.180	NA	NA	0.390	1.180	0.390	1.180	1.180	DFG+404+MP
3472	0.390	0.330	11/2/99	0.390	0.330	NS	0.390	0.390	ND	ND	NA	NA	0.390	0.390	0.390	0.390	0.390	MP
3632	1.150	2.150	2/14/00	1.150	2.150	5/2/02	1.520	3.320	NS	NS	NA	NA	1.420	2.820	1.520	3.320	2.420	404
3677	0.160	0.400	7/2/99	0.160	0.400	5/3/00	0.200	0.400	ND	ND	NA	NA	0.200	0.400	0.200	0.400	0.400	MP+404
4206	2.100	0.000	12/2/92	1.700	NS	10/21/93	1.500	1.500	NS	NS	NA	NA	1.500	1.500	1.500	1.500	1.500	404
4231	0.000	0.000	12/16/92	NS	NS	9/30/98	0.190	0.190	ND	ND	0.032	0.254	NA	NA	0.190	0.254	0.254	FWS+404 Corres
4580	0.000	0.000	8/27/93	NS	NS	7/24/94	NS	NS	ND	ND	NA	NA	ND	ND	0.600	0.600	0.600	401+404
4858 & 5371	0.960	0.000	8/30/94	0.560	0.000	8/15/94	NS	NS	0.980	0.580	NA	NA	ND	ND	1.090	0.580	0.580	DFG
5136	0.520	0.000	5/20/94	0.520	0.500	5/4/94	0.520	NS	ND	ND	NA	NA	0.330	0.100	0.520	0.500	0.080	401
5217	1.000	0.000	7/11/94	1.000	1.000	8/1/94	NS	NS	NS	1.000	NA	NA	ND	ND	1.500	1.500	1.500	404 PDN, DFG
5401	0.510	0.000	9/7/94	0.510	1.000	11/1/94	NS	NS	0.083	0.420	NA	NA	ND	ND	0.083	0.420	0.730	DFG+404+MP
5425	0.000	0.000	9/15/94	NS	NS	8/10/94	0.220	0.120	ND	ND	NS	NS	ND	ND	0.220	0.120	0.120	404
5479	0.000	0.000	10/7/94	NS	NS	9/1/94	0.006	NS	ND	ND	NA	NA	NS	0.140	0.006	0.140	0.140	404+MP
5619	0.000	0.000	1/4/05	NS	NS	4/6/95	NS	NS	NA	NA	NA	NA	20.000	60.000	20.000	60.000	60.000	MP+ MonRep
5625	0.100	0.000	8/10/95	0.140	NS	1/18/95	0.100	NS	ND	ND	NA	NA	0.140	0.903	0.140	0.903	0.288	Corres+MP+401
5747	1.000	0.000	3/20/95	1.000	1.000	10/16/95	0.010	NS	1.000	1.000	NA	NA	ND	ND	0.300	0.600	0.690	As Built Report
5815	0.420	0.000	4/17/95	0.42	0.6	3/8/95	0.42	0.6	ND	ND	NA	NA	0.42	0.6	0.420	0.600	0.4	401+404+MP
6002	1.200	0.000	7/12/95	1.361	4.170	1/3/95	1.340	4.170	0.840	4.170	NA	NA	ND	ND	1.361	4.170	3.870	401, Corres
6280	0.200	0.100	10/13/95	0.200	0.100	6/3/96	0.200	0.200	0.190	0.200	NA	NA	0.090	0.100	0.190	0.200	0.090	404+Corres
6369	1.490	5.690	11/20/95	1.490	5.690	12/18/95	1.490	5.690	ND	ND	NA	NA	ND	ND	1.490	5.690	5.961	401

File ID	Database		401 Cert			404			DFG		FWS		MP		Reported by UCLA			Source
	Impacted	Required	Date	Impacted	Required	Date	Impacted	Required	Impacted	Required	Impacted	Required	Impacted	Required	Impacted	Required	Obtained	
6389	13.100	0.000	12/4/95	12.900	6.100	11/28/95	NS	NS	7.100	7.100	NA	NA	12.900	6.100	12.900	6.100	2.400	401+MP+MR
6451	0.650	0.000	1/18/96	0.65	0.65	1/10/96	NS	NS	NS	NS	NA	NA	4.81	0.65	0.650	0.650	0.53	401+MP+MR
6668	12.650	13.000	4/1/96	12.650	13.000	9/28/99	10.070	NS	ND	ND	ND	ND	10.070	14.080	10.070	14.080	15.490	404+MP+MR
6789	2.895	4.650	5/9/96	2.895	44.050	5/12/97	2.895	42.295	ND	ND	ND	ND	ND	ND	2.900	44.050	37.710	401
6845	0.170	0.170	6/11/96	0.400	0.170	ND	ND	ND	NS	NS	NA	NA	ND	ND	0.400	0.170	0.170	401
6949	0.010	0.000	7/17/96	0.006	0.009	8/16/95	NS	NS	ND	ND	NA	NA	ND	ND	0.006	0.009	0.009	401
6970	4.210	4.210	7/24/96	4.210	4.210	ND	ND	ND	ND	ND	NS	NS	4.210	4.650	4.210	4.650	1.190	MP+Corres
7014	1.400	2.800	8/8/96	1.490	2.800	8/12/96	1.490	2.800	ND	ND	NS	NS	ND	ND	1.490	2.800	2.800	401+404
7059	0.000	0.000	9/5/97	0.000	0.000	1/28/99	NS	NS	ND	ND	0.100	0.100	0.520	0.520	0.100	0.100	0.100	401+MP+MR
7117	0.600	4.000	9/10/96	0.600	4.000	5/22/97	0.670	4.000	NA	NA	NA	NA	ND	ND	0.670	4.000	4.000	404
7154	5.400	13.800	9/23/96	5.400	14.600	1/28/98	2.540	7.620	ND	ND	ND	ND	3.050	5.800	2.840	8.520	8.730	MR
7270	0.340	0.340	10/28/96	0.340	0.340	6/21/99	0.340	0.400	ND	ND	ND	ND	NA	NA	0.340	0.400	0.400	404+PMNT
7385	5.400	5.800	12/9/96	5.400	5.800	3/31/00	5.410	6.330	NA	NA	5.410	6.330	5.400	5.800	5.410	6.330	6.040	404+FWS+Corres
7404	0.370	0.370	12/18/96	0.370	0.370	12/9/96	0.370	0.400	NA	NA	NA	NA	NA	NA	0.370	0.370	0.370	401
7456	1.680	1.700	1/16/97	1.680	1.700	2/26/97	1.700	3.400	ND	ND	NA	NA	1.680	3.400	1.700	3.400	3.370	404+MP
7497	14.600	14.600	1/28/97	14.600	14.600	3/3/97	NS	NS	ND	ND	ND	ND	NS	16.800	14.600	14.600	14.600	401+MR+other
7521	0.600	0.680	2/1/97	ND	ND	4/28/97	NS	NS	ND	ND	0.940	NS	0.340	0.680	0.340	0.680	0.680	MP
7528	1.300	0.500	2/14/97	0.580	0.500	7/15/04	0.580	1.300	ND	ND	NA	NA	NA	NA	0.580	1.300	1.300	404+PMNT
7640	0.960	0.360	4/1/97	ND	ND	6/3/97	0.120	0.120	ND	ND	NA	NA	0.360	0.360	0.120	0.120	0.120	404+Corres
7678	1.900	2.940	4/17/97	1.900	2.940	9/10/96	1.960	NS	ND	ND	NA	NA	2.800	4.230	1.960	2.940	1.920	401+404+Corres
7827	1.400	7.700	5/30/97	1.400	7.700	6/17/98	0.500	NS	ND	ND	0.500	7.000	1.900	9.600	1.900	9.600	9.600	404+MP+MR
7902	0.000	0.000	9/14/98	NS	NS	10/20/98	NA	NA	ND	ND	NS	NS	5.300	5.300	5.300	5.300	5.300	MP+MR's
7932	0.940	3.200	8/4/97	0.940	3.300	1/5/95	NS	NS	9.000	3.320	NA	NA	ND	ND	0.940	3.330	2.866	401
7936	0.480	0.960	8/5/97	0.480	0.960	10/27/97	0.480	0.980	NA	NA	NA	NA	NS	0.980	0.480	0.980	0.980	404
7942	7.500	0.450	8/6/97	ND	ND	9/4/97	0.780	2.850	ND	ND	ND	ND	ND	ND	0.780	2.850	2.850	404
8044	2.200	2.200	9/8/97	2.200	2.200	ND	ND	ND	NS	NS	ND	ND	ND	ND	2.560	2.560	2.560	Corres+Bank PMNT
8061	2.450	3.910	9/12/97	ND	ND	6/15/98	2.450	5.960	2.270	5.960	2.630	3.650	2.270	5.960	2.450	5.960	4.020	404
8125	0.840	1.100	9/29/97	0.840	1.100	9/25/02	NS	NS	NS	NS	ND	ND	0.840	5.360	0.840	5.360	5.360	MP+401

File ID	Database		401 Cert			404			DFG		FWS		MP		Reported by UCLA			Source
	Impacted	Required	Date	Impacted	Required	Date	Impacted	Required	Impacted	Required	Impacted	Required	Impacted	Required	Impacted	Required	Obtained	
8156 & 8159	3.310	3.310	10/10/97	3.310	3.310	4/20/98	2.580	6.340	3.320	6.340	3.310	6.340	3.320	6.520	3.320	6.340	7.160	404+MP+Other
8177	0.041	0.080	10/15/97	0.041	0.080	10/1/97	0.335	NS	ND	ND	ND	ND	0.335	NS	0.335	0.140	0.310	404+MP
8215	1.840	4.340	10/28/97	1.840	2.500	10/22/97	1.840	1.840	NS	NS	ND	ND	2.500	2.500	1.840	2.500	2.500	401+Corres
8217	9.300	0.000	10/23/97	9.300	NS	11/13/97	9.300	NS	NS	NS	NA	NA	ND	ND	9.300	9.300	9.300	401+DFG
8248	1.090	1.110	11/4/97	1.090	1.110	5/1/98	1.090	1.420	NS	NS	NA	NA	NA	NA	1.090	1.420	1.420	404
8337	0.142	0.050	12/10/97	0.152	0.043	1/20/98	NS	0.042	0.070	NS	ND	ND	ND	ND	0.042	0.042	0.042	404+Corres
8390	1.320	1.320	12/23/97	1.320	1.320	11/12/97	1.320	1.350	NA	NA	NA	NA	NA	NA	1.320	1.350	1.350	404
8525	0.090	0.090	3/4/98	0.090	0.090	6/26/98	0.070	0.210	ND	ND	NA	NA	0.070	0.210	0.070	0.210	0.210	404+MP
8529	0.630	0.000	3/5/98	ND	ND	2/17/00	NS	NS	ND	ND	NS	NS	2.000	8.550	2.000	8.550	4.360	MP
8558	7.130	1.000	3/19/98	7.130	1.000	4/28/99	NS	NS	NS	NS	NA	NA	6.900	0.140	6.900	0.140	0.190	MP+Corres
8677	5.300	1.000	5/8/98	5.300	1.250	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.300	1.250	1.250	401
8793	2.270	1.400	6/12/98	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	2.270	1.400	1.400	401
8800	0.400	0.850	6/17/98	0.400	0.850	6/17/98	0.400	NS	0.600	0.600	NA	NA	0.400	0.830	0.400	0.830	0.260	404+MP
8890	0.620	1.860	7/16/98	0.620	1.860	7/17/98	0.620	NS	4.350	13.050	NA	NA	0.660	10.000	0.660	10.000	10.000	MP
8980	1.570	2.530	8/4/98	1.570	2.530	6/26/98	1.570	2.010	NA	NA	1.570	1.590	NA	NA	1.570	2.010	2.010	404+FWS+PMNT
9193	3.155	2.280	9/30/98	3.155	4.030	3/20/00	2.920	3.900	ND	ND	NA	NA	ND	ND	2.955	3.940	2.020	401+404+MR
9211	0.130	0.000	10/5/98	0.130	0.250	10/26/98	0.130	0.250	ND	ND	NA	NA	NA	NA	0.130	0.250	0.250	401+404
9392	0.350	0.110	11/18/98	0.350	0.350	ND	ND	ND	ND	ND	NA	NA	ND	ND	0.350	0.350	0.320	401+MR
9404	12.950	0.000	11/23/98	12.950	12.950	9/15/00	11.940	11.940	ND	ND	11.940	11.940	11.940	11.940	11.940	11.940	11.940	404+FWS+MP
9430	0.016	0.230	1/23/01	0.016	0.230	8/2/01	0.044	0.230	NS	NS	NS	NS	ND	ND	0.044	0.230	0.230	404
9432	0.040	0.080	12/1/98	ND	ND	1/20/99	0.040	0.210	NS	NS	NA	NA	0.040	0.210	0.040	0.210	0.270	404+MR
9448	0.299	0.310	12/4/98	2.990	0.310	2/10/99	0.036	0.370	NA	NA	NA	NA	NA	NA	0.036	0.370	0.400	404
9510	0.615	0.615	12/23/98	0.615	0.615	11/19/98	0.615	0.650	ND	ND	0.615	0.615	NA	NA	0.615	0.650	0.650	404+PMNT
9597	1.630	1.630	2/5/99	ND	ND	5/21/99	1.630	3.000	ND	ND	1.630	2.130	1.630	3.000	1.630	3.000	2.930	404, MP, Corres
9691	0.010	0.090	3/17/99	0.010	0.090	4/30/99	0.100	0.900	NS	NS	NA	NA	0.100	0.900	0.100	0.900	0.900	404+MP+Other
10347	0.060	0.060	10/30/00	0.060	0.060	2/21/01	0.060	0.060	0.080	0.140	NA	NA	0.130	0.210	0.050	0.200	0.180	401+DFG+Other
10356	0.099	6.930	10/17/00	3.130	6.930	4/13/01	1.840	NS	ND	ND	NA	NA	NA	NA	3.130	6.930	6.930	401

File ID	Database		401 Cert			404			DFG		FWS		MP		Reported by UCLA			Source
	Impacted	Required	Date	Impacted	Required	Date	Impacted	Required	Impacted	Required	Impacted	Required	Impacted	Required	Impacted	Required	Obtained	
10399	0.095	0.101	11/3/00	0.095	0.101	11/17/00	0.090	0.090	NA	NA	NA	NA	0.095	0.101	0.095	0.101	0.670	401
10409	0.542	0.558	11/20/00	0.594	0.558	9/12/00	0.560	0.500	NS	NS	NA	NA	0.560	0.600	0.560	0.600	0.570	404+MR
10453	0.520	1.630	11/28/00	0.520	1.630	11/24/98	0.520	NS	ND	ND	0.390	8.110	NA	NA	0.520	8.670	8.670	404+FWS+PMNT
10495	1.500	3.000	12/28/00	1.500	3.000	3/16/01	1.500	3.000	ND	ND	NA	NA	1.465	3.098	1.465	3.098	1.988	MP
10530	1.120	1.150	1/5/01	1.120	1.800	11/29/00	0.210	NS	ND	ND	0.944	2.990	0.940	1.150	1.124	3.170	3.170	401+FWS+PMNT
10843	0.041	0.063	1/2/03	0.041	0.063	9/12/02	0.040	NS	NS	NS	NA	NA	0.041	0.123	0.041	0.123	0.290	401+DFG
10938	0.151	0.453	5/30/01	0.151	0.453	8/29/01	0.151	1.356	NA	NA	0.151	1.356	NA	NA	0.151	1.356	1.359	404+FWS+PMNT
11208	0.088	0.021	11/1/02	0.088	0.021	10/31/02	0.088	0.088	ND	ND	NA	NA	NA	NA	0.088	0.088	0.088	401+404+ Bank PMNT
11224	0.035	9.600	11/21/02	0.035	9.600	7/29/02	0.008	NS	ND	ND	ND	ND	NS	4.300	0.035	4.300	4.300	401+MP

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Table 3-2. Reasons for the reported discrepancies between our reported impact and/or mitigation acreage values and the corresponding values recorded in the State Board's permit tracking database. As indicated, each file was assigned one or more codes indicating the relevant discrepancy categories. The table is a continuation of the previous one (Table 3-1) and was separated merely for page formatting resons.

File ID	Reason for Discrepancy **1=No DB Discrepancy 2=Discrepancy due to rounding errors; 3=SB DB entry error, permit OK; 4=Error or lack of info in the 401 permit text; 5=Discrepancy due to accounting difference (ex: permanent vs temporary impacts, or wetlands vs non-wetland waters; 6=Other agency required more mitigation than RB, but 401 not outdated; 7=Mitigation planning modified, 401 outdated; 8=401 permit info outdated, impacts reduced after 401 issuance mitigation same; 9=401 outdated, impacts lower, mitigation different; 10=401 outdated, impacts greater than 401 approved, mitigation different; 11=No 401 permit obtained; 12=UCLA/USF data change since draft final report; 13=Redundant DB record/CertMod; 14=No 401 permit discrepancy; 15 No real regulatory issue with the file.**	CODE
470	Discrepancy due to SB DB entry/CertMod confusion errors. There are redundant DB records caused by re-entry of CertMod information (original permit: File ID# 10907; Cert. date 8/20/02; impacts 0.04ac; mitigation 0.7ac). The new permit (File ID# 470; data herein) contained confusing text with the old information and new information blended together (seems that old permit used as a template and some of the old text was not deleted or written over). The new DB entry was based on the original information rather than the new information. The MP reported here was outdated and the 404 permit did not include temporary impacts and did not include the whole amount of planned mitigation.	3,4,12,13 ,14,15
1210	The 401 permit contained a typo/incorrect data (indicated 0.02ac of permanent streambed impacts and 0.007ac of permanent wetland impacts while the permanent streambed impacts should have been 0.002ac, so the total impacts should have been 0.009ac vs. 0.027ac). No compensatory mitigation was required for these permanent impacts; only a 5:1 revegetation for lost trees was required. In the end, one willow tree was removed and for mitigation, we found five little dead cuttings on the bank in a 2 foot long straight line. In addition, part of the discrepancy was caused by an incorrect file ID number We changed permit numbers for this project (File ID: #1210 instead of original #10159) because we realized the numbers in the SB DB didn't match up. These are two records in the SB DB with the same cert date, same permittee(Caltrans), same waterbody (Morro Ck) and same project description (extend box culvert), but with slightly different acreage data. The cross referencing during our file selection process led us to the incorrect cert letter/file. We presume that these two records are for separate culverts (large stretch of road widening with two crossings), but they may reflect a DB redundancy.	4,12,13
1412	SB DB entry error. Data input as 0.237ac instead of 0.273ac. Correct information in permit	3,15
1464	No Discrepancy in 401 permit information. Through the Biological Opinion, which was an inferred requirement of the 401 permit, the FWS considered both direct and indirect impacts (0.41 direct + 0.89 indirect) and thus the overall mitigation requirement was higher than in the 401 permit.	6,15
1664	RB permit and SB DB only included permanent wetland impacts; actual impacts included permanent and temporary impacts to both wetlands and non-wetland waters. Corps only required restoration and reveg of temporary impacts, but not permanent impacts. The mitigation project accounted for both temporary and permanent impacts.	5
1775	RB impact discrepancy was due to simple DB entry rounding issue. For the mitigation discrepancy, the 401 permit contained a typographical error resulting in an incorrect mitigation acreage value (pre-401 information submission contained correct value). The actual mitigation acreage obtained (credits purchase) was 0.03ac higher, as required by 404.	2, 4, 6,12,15
1785	No 401 permit obtained. No discrepancy. Information based on SB DB; initial confusion regarding temporary versus permanent impacts was corrected.	1, 11, 12,14,15
1788	Project involved impacts to a creek (complete relocation) and adjacent seasonal wetlands. The 401 permit included acreages for both impacts but only specified the seasonal wetland impacts under the "fill" section. Mitigation was to be 3:1 for wetland impacts and 1:1 for other waters. The mitigation figure in the SB DB was only for the 3:1 seasonal wetland mitigation (not the 1:1 for other waters. In addition, there were delineated wetlands in the stream that weren't considered in those data. Our reported figures include all impacts and mitigation, as distinguished in the	5

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	Mitigation Plan.	
1817	Project involved acreage credit purchases as mitigation (0.31ac creation, 0.60ac preservation, and either 0.6ac additional preservation or conduct public education effort. The data for these mitigation credit purchases were seen by RB and included in 401 permit, but the language suggested that the public education effort would be undertaken instead of the additional 0.6ac of preservation. Therefore, the SB DB entry did not include that acreage requirement. In the end the additional preservation credits were purchased instead of the education effort.	4
2055	Permanent impacts had been avoided prior to 401 issuance, but the changes were not incorporated into the 401 letter. The letter itself did not include any acreage information, but the attached information included the outdated data. It is not clear whether or not the RB staff was aware of the changes (though they were copied on the earlier 404 permit). Furthermore, additional FWS requirements were invoked by the 401, and were included in our "reported" results. For clarification, these are removed here in the "401 regulatory" columns.	4, 6
2219	RB and Corps only reported a 0.1ac temporary crossing as impacts while FWS and likely DFG considered losses to 2 acres of wetland/riparian habitat on a gravel bar (within waters) that was removed and converted to open water to protect a downstream structure from siltation. In addition, the RB reported the crossing area at 0.1 acre while if was clearly designed at .022 acres (~15ftX60ft). Compensatory mitigation (2ac) was required in the 401 permit for these reported temporary impacts (an accounting issue since this was the total mitigation acreage required by FWS and DFG for permanent losses of the bar wetlands).	4,5,12
2395	Multiple causes for discrepancy. 1. The SB DB reflected a misinterpretation of the permit information: permit listed 1.4ac permanent streambed impacts plus "wetland: 1.1ac permanent, 0.52ac temporary." This latter phrase was interpreted as .52ac of the 1.1ac, whereas it actually was 1.1ac plus additional 0.52ac. 2. The 401 permit text listed the individual habitat acreages (impacts and mitigation) incorrectly (too complicated to describe here, but the data were all jumbled up). 3. The actual mitigation planned and implemented was less than indicated in the 401 letter (4.66ac vs 5.44ac); the actual acreage was very clearly delineated as the mutually agreed upon mitigation. 4. We (UCLA/USF) made a minor addition error (now corrected) in the total required datum used for this aspect of our analyses. In addition, the 401 permit was outdated: later DFG amendments during project construction (3 of them) approved additional impacts to stream and wetland resources (at least 0.72ac combined). These (and the corresponding additional mitigation requirements) were not included in our analysis because they were discovered too late to include in this study. There is no evidence in the file that the RB staff were copied on these amendments. In addition, all submission documents referenced only the Corps and DFG as responsible parties (including their permit numbers). It is not clear how much involvement the RB staff had in the planning after 401 issuance.	3, 4, 5, 10,12
2418	401 permit included .31 acres of temp impacts, but not the 0.002 acres of permanent impacts associated with the installation of a bridge pier/piling (the actual footprint).	5,15
2443	SB DB entry error based on misinterpretation of permit info (a pair of "totals" and their inclusive values were all added together). However, the 401 information differed from that of the mitigation plan. We used the data from the mitigation plan because it was referenced by both the Corps and RB. In addition, there was a UCLA/USF data error (now corrected) for this file's acreage analysis.	3,4,12

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2591	No 401 permit obtained. Impacts and mitigation reduced after 401 issuance through communications between permittee, Corps, and DFG. There is no evidence that the RB was copied on any of the changes. The submission documents only reference the Corps and DFG, as overseeing agencies, submission recipients, and list only their permit numbers. Mitigation acreage was large enough to cover the initial 401 mitigation requirement, but fell short on waters by ~50% (most was non-waters riparian and upland).	9,11
2593	Simple rounding issue in the 401 permit.	2,15
2706	Discrepancy does not reflect a regulatory problem with the RB. The Corps had mandated removing 0.02 acres of pier pilings from the riverbed as part of mitigation. However, the 401 permit had an error: the wetland versus non-wetland impact acreage were reported in reverse order.	4,6,15
2726	Discrepancy does not reflect a regulatory problem with the RB. The Corps required a 2:1 ratio while the RB only required 1:1. Our reported results follow from the Corps requirements as that is what the mitigation project was based on.	6,15
2784	The SB DB included only wetland impacts and mitigation instead of all jurisdictional impacts and mitigation (the project impacted wetlands and shallow tidal channels as part of a huge tidal wetland restoration area). Actual impacts reduced from 14.55 to 11.17 after 401 issued, mitigation stayed same.	5,8
2841	No 401 permit obtained. Discrepancy does not reflect a regulatory problem with the RB. The mitigation plan included more acreage than required by the Corps or RB.	6,11,15
2974	No 401 permit obtained. Impacts were greater than expected from the 401 DB values. Little information in file. 401acreage information was based on a jurisdictional determination document in the file, but the 404 permit issued later showed a greater impact acreage. The Corps either disagreed with part of that determination, or the project increased in size after 401 issuance.	10,11
3252	SB DB entry errors (several in record). Database indicates 2.14 creation plus 1.37 credit purchase instead of 2.12 total (0.75 creation plus 1.37 credit) as listed in the 401 permit.	3,14,15
3370	The 401 permit information was outdated. Through some unknown correspondence the Corps approved a change in mitigation planning (a July 2003 letter from the Corps referenced the modified requirements). This resulted in a total acreage (0.70) greater than required by the RB, but instead of a 0.1 acre onsite creation and a 0.1 acre creation credit purchase from an approved bank, the Corps approved a 0.60 acre of permittee owned preservation area around the 0.1 acre creation site.	7
3417	404 considered only permanent impacts; 401 considered temp and perm impacts as did DFG. However, 401 permit included obvious data mistakes (i.e. .005 instead of .05) and didn't reflect the planning documents. The SB DB also had data entry errors with values different from the permit.	3,4,5
3472	The 401 permit only included the wetland component of the total mitigation site acreage as a mitigation requirement though both wetland and non-wetland waters impacts were listed.	5
3632	The 401 permit information was outdated. The original 404 permit (dated 3/2/00) already had impacts of 1.42 acres (0.27ac more than 401), and MP was based on these impacts. The final 404 permit reflected additional impacts (0.1ac more) and additional mitigation (1.17ac more).	10
3677	Prior to permit issuance, the RB was given information showing 0.20 acres of impacts, but the 401 permit only stated 0.16 acres. Though all file information was scrutinized for clues, there was no indication of the source of that value. Probably a typo.	4

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4206	401 permit did not specify any mitigation, though mitigation was required by the Corps. In addition, there was a SB DB entry error: the 401 permit specified a total impact acreage of 1.7 ac including 0.6ac for construction and 1.1ac for diversion activities. A separate statement was made that the project would include 0.4ac of impacts to wetland vegetation. These values were summed (2.1ac inputted) though those wetland impacts were included in the 1.7ac value. Through later amendments approved by the Corps (no evidence the RB was copied), the actual impacts were reduced to 1.5ac (still including the 0.4ac of wetland impacts), and the mitigation followed from that figure. In addition, the SB DB includes redundant records regarding this project. Two separate 401 permits were issued (12/2/92 and 12/24/92). These were for slightly different regulatory actions (diversion under NWP3, and NWP 33 respectively), but both related to the creek diversion for the repair of a bridge abutment, and the same impacts (1.1ac) are listed twice in the DB.	3,6,9,13
4231	401 permit did not include any acreage information and none reflected in DB. However, permanent impacts did occur including vernal pools and seasonal wetlands as did compensatory mitigation for those impacts. The 401 permit was issued in December 1992 and an early Corps permit was issued in 1991. A new 404 permit was issued in 1998 along with DFG and FWS permits/opinions. It seems that the RB must have been contacted about the resumed project because the 404 stated it would be denied without prejudice without 401 Cert. or waiver. However, there is no evidence in the file of any correspondence with the RB, and through an exhaustive search of the SB DB (permittee, project, date, etc), it seems that no new 401 was issued. There is no evidence that the RB was copied or referenced on any of the correspondence, permits, or document submissions. The Corps, DFG, and FWS were copied and referenced on these.	10
4580	No impact or mitigation acreage specified by 401 or 404, but there were temporary impacts, revegetation requirements, and the 401 permit provided length times width info from which area could be determined. Our analysis included such temporary impact/mitigation acreages, even when no mitigation specified. This is because many permits do require mitigation for temporary impacts, often this is listed and recorded in the SB DB as compensatory mitigation (examples herein), and many compensatory mitigation projects have mitigation for temporary impacts built into them. So we include projects like this one to maintain a consistent scientific approach.	5,15
4858 & 5371	This project involved permanent and temporary impacts to riparian waters associated with the installation of 6 riprap groins. This project was originally issued a 401 waiver on 12/30/03 (with then impacts of 0.46ac). This modification waiver approved an additional 0.10ac of impacts, which means the total impacts would be 0.56ac. however, the SB DB indicates 0.96ac of impacts. This CertMod information was entered into the SB DB redundantly (two records, including acreage, exist in the DB). The actual impacts, as represented on a mitigation planning document approved by DFG were greater (1.09ac) and the required acreage specified on that document was 0.58ac. Our initial file selection was for a different, though similar permit (same permittee, waterbody, cert date, essentially same project type), but has since been changed to reflect the file we actually located and assessed.	3,10,12,13
5136	SB DB entry error. The 401 permit language was not that clear, but mitigation for the permanent impacts was required (text stated restoration and enhancement of riparian habitat within a 0.5ac degraded channel and banks). MP was created over two years later and included reduced impacts and mitigation. There were no other supporting documents in the file to verify regulatory approvals for the different numbers so we used the information from the 401 letter.	3,14,15
5217	The 401 permit specified temporary impacts to 1.0ac of waters with revegetation of the area required. No mitigation acreage was entered into the SB DB (likely not considered compensatory mitigation). The later 404 permit indicated 1.5ac of impacts with revegetation (no mention of temporary vs permanent). We applied the Corps 1.5ac impact value, and assumed all impacts were temporary (so the mitigation acreage would be 1.5ac as well).	5,15

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5401	The SB DB contained a data entry error, and the 401 permit information was outdated. This project involved permanent impacts to riparian waters. In the 401 permit, the required mitigation acreage was clearly delineated (1.0ac), but was not entered into the DB. After 401 issuance, and prior to 404 issuance, the planned impacts were reduced through discussions with DFG. The 404 permit did not include any acreage data, but the DFG permit reflected these changes. There is no evidence in the file that the RB was made aware of the changes. Some of the reported impacts (.014 acres) were to vegetation only. Remaining 0.069 acres were for fill relating to federal permits.	3,9
5425	401 permit mentioned permanent fill, but did not specify any acreage data. Therefore, the DB indicated zero acres for impacts and mitigation. The 404 permit paperwork did include impact and mitigation acreage information; the 404 permit was issued prior to the 401.	4
5479	Project involved permanent impacts to riparian waters though 401 permit did not specify any acreage data, so the DB indicated zero acres for impacts and mitigation. Data for impact and mitigation acreage did exist in the 404 permit and in the Mitigation Plan and these are what we report.	4
5619	This project involved a large restoration project undertaken by FWS along the Colorado River, which would dredge 20 acres of wetlands to deepen a backwater lake for wildlife and boaters/fisherman. The "mitigation" was to include the new 20 acres of lake, plus 40 acres of riparian revegetation and exotics removal. The regulatory permits were minimal and did not specify any impact or mitigation acreage data despite the expected conversion of wetlands to deep water. The main condition of the Corps permit was that the FWS would guarantee funding of the project through its completion. The project, in fact, suffered from funding shortages, and this contributed to the many problems with design, implementation and monitoring. For our "no net loss" analysis, we report as impacts the 20ac of lost wetlands and the 60 acres of planned restoration. While the required acreage of restoration activities was met, the site does not receive the expected hydraulic connection to the Colorado River, and the site is currently dominated by tamarisk.	5,15
5625	SB DB entry error caused by redundantly entered CertMod. Original 401 letter (1/6/05; Kaufman and Broad) listed 0.1ac of impacts while the redundant CertMod record (8/10/95; Impact Sciences) indicated 0.14ac of impacts. Permits didn't specify mitigation acreage, but said follow MP. MP said enhancement of 500' by approx. 75' stream (0.863ac.) plus 0.04ac (total acreage=0.903ac).	6,13
5747	This project involved the cleanup of military landfill debris from an old quarry pit that had developed into wetland. The impacts were temporary disturbance; the mitigation was restoration of disturbed areas along with excavation to increase the extent of wetlands. The 401 permit listed the impact and mitigation acreage. The SB DB included the impact, but no mitigation acreage (presumably because it wasn't considered compensatory mitigation). Through project implementation, the actual impacts were less than expected (0.3ac vs. 1.0ac), so the mitigation acreage was reduced accordingly (2:1 ratio, with 0.6 acres of mitigation required). Our analysis included mitigation for temporary and permanent impacts.	5
5815	SB DB entry error. Project involved permanent wetland impacts (0.42ac). While the mitigation acreage (0.60ac) was clearly delineated in the 401 permit, it wasn't entered into the DB (which reflected 0.00ac mitigation).	3,14,15
6002	SB DB entry error likely caused by improper Certmod DB update. Original 401 indicated 1.34ac impacts and 4.17ac mitigation, while CertMod indicated an additional 0.021ac impacts and stated that the existing MP would be adequate. The SB indicated an errant impact acreage of 1.2ac and did not include any mitigation acreage. Additional correspondence with the Corps (with no evidence or RB notification) reflected a change in performance standard conditions after permits were issued (these aren't reflected in these acreage values).	3,4,7,13, 14,15
6280	401 permit and DB only included mitigation for permanent impacts while mitigation for temporary impacts also occurred. In addition, mitigation planning changed (no cc to Regional Board) to skip excavation of wetland and plant 0.09 acres of oak trees instead. This was for permanent impacts...the mitigation for temporary impacts also included oak and riparian plantings only.	5,7

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6369	No Discrepancy. The reported discrepancy was due to a simple UCLA/USF calculation step that required the addition of 0.001ac to the required and obtained acreages so that the habitat acreages would add up to the total. This was corrected.	1,12,14,15
6389	SB DB entry error/incompleteness. The 401 permit listed 12.9ac of impacts, including 7.1ac of permanent impacts, but 13.1ac was entered into the DB. The information on mitigation was clearly delineated in the 401 permit ((6.1ac) but the DB indicated zero acres of mitigation.	3,14,15
6451	SB DB entry error. This project involved a major bridge retrofit (Hwy 37 span of the Napa River Estuary/San Pablo Bay). There were temporary impacts, as well as permanent impacts associated with the increased footprint of multiple large pilings, most in deep open water, but several in wetlands and shallow tidal water. Only the temporary impacts were considered by RB and Corps (no compensatory mitigation for permanent impacts). Mitigation (revegetation of temporary impact areas) was required, and while clearly delineated in the 401 permit, it wasn't entered into the DB (which reflected 0.00ac mitigation).	5,14,15
6668	The 401 permit information was outdated. Later reduction of impacts and an increase in mitigation was required by the Corps. The Corps, DFG, and FWS were involved in these planning decisions, included on distribution lists, and their permits were referenced on the documents/submissions. There is no evidence that the RB was included in the planning discussions or made aware of the changes.	9
6789	Project involved relocation of a ~1 mile long stream around a landfill. The 401 letter included information on "waters" impacts and floodplain impacts, and "waters" mitigation and floodplain mitigation. Only the "waters" acreage data were included in the SB DB. Since the floodplain acreage was clearly part of the mitigation requirements and because the flood waters seem to be ordinarily extending beyond the constructed "waters" zone, we included this additional acreage as required and obtained mitigation.	5,15
6845	SB data entry errors. 401 permit included temporary and permanent impacts, but only the permanent impacts were entered into the DB. The compensatory mitigation was assigned as 1:1 for total impacts (permanent + temporary) The 401 permit was the only informative document in file.	3,14,15
6949	SB data entry errors. 401 permit was most recent document in file. The DB impacts were rounded up from 0.006ac to 0.01ac and the DB record did not indicate any mitigation acreage even though mitigation was included in the permit. The impacts were temporary and required a 1.5:1 ratio of "creation or restoration" mitigation. This is an example of the often unclear distinction between creation, restoration, and enhancement. In addition, the SB DB listed the impacts under wetland rather than WTemp.	2,3,14,15
6970	Due to heavy agency input and the involvement of DFG in the planning and implementation of part of the mitigation (site deeded to a natural resources entity and DFG was paid to implement the restoration activities), the planned mitigation acreage ended up being greater than indicated in the 401 permit. In the end, the mitigation project implemented by DFG changed substantially from the plans and did not meet the acreage or habitat type expectations (less wetland creation/restoration, more upland elderberry plantings to provide habitat for the endangered longhorn beetle). In addition, in kind mitigation for vernal pool losses was to be carried out by the permittee (CalTrans) on a nearby property, but this still has not occurred.	7
7014	401 and 404 permits included mitigation for "waters" fill, and unpermitted impacts to gnatcatcher habitat (non-waters Coastal Sage Scrub labeled "riparian"). Wording in 401 permit was vague regarding impacts. Permit could be interpreted as having 0.09ac of "waters" impacts and an additional 1.4ac of gnatcatcher, or the 1.4ac could include the 0.09ac of waters. We determined that these were additive rather than inclusive. Based on this, the discrepancy was due to the 0.09ac "waters" portion not included in the SB DB. This file provides a clear example of non-waters impacts being considered by the RB and Corps with compensatory mitigation required for those impacts.	3,14,15
7059	The 401 permit did not include references to temporary impacts, which were planned and which occurred. The 404 referred to these, but didn't	4

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	specify acreages. FWS specified the acreage. The actual mitigation site acreage was 0.52ac, but this included non-waters revegetation that clearly wasn't part of the permits.	
7117	The 401 permit information was outdated. After 401 issuance, but prior to 404 issuance, an additional 0.07ac of fill was planned which was incorporated into the Corps permit requirements. DFG was notified of the change and approved it, but there was no evidence in the file that the RB was made aware of the change. The mitigation requirement did not change. This 4.0 acre mitigation site was an enhancement of an existing wildlife area that was pre-planned and would have taken place despite the permit requirement.	10
7154	The 401 permit included temporary and permanent wetland impacts. While the mitigation requirements included 3:1 for permanent impacts and 1:1 restoration of temporary impacts, the SB DB only listed mitigation for temporary impacts (again, this is not a regulatory issue, but our "no net loss" acreage analysis included restoration of temporary impacts as gains to offset the reported losses). Also, the 401 permit information was outdated. Due to endangered species and other issues, the impacts were reduced significantly after 401 issuance, as was the required mitigation. The acreage values of the 404 permit and MP were outdated as well. This was a controversial project; the final impacts came after substantial scrutiny and much planning and correspondence. The final monitoring report provided us with the clearest representation of acreage values (impact, and required); these and the obtained acreages were based on this report (the latter with field confirmation).	5,9
7270	After 401 issuance, some time went by before the project planning was finalized. The 401 reflected the plan for onsite mitigation to be undertaken but as it happened, the Corps allowed the permittee to purchase mitigation credits at a local bank with a slightly higher mitigation acreage requirement (0.40ac vs 0.34ac).	7
7385	The 401 permit information was outdated. The impacts listed in 401 included a minor rounding issue (5.4 vs. 5.41) which meant no discrepancy, however, the mitigation acreage requirement increased following much correspondence between permittee and Corps & FWS. The RB was copied on the changes, but the 401 permit was not modified.	2,6
7404	No discrepancy. The reported discrepancy was due to a interpretation error by UCLA/USF in completing the acreage analysis form.	1,12,14,15
7456	Impact discrepancy due to simple rounding issue (1.68 vs 1.70). However, 401 permit did not include a additional 1.7ac vernal pool preservation area that was required by the Corps.	3,6,15
7497	Confusing file, and the reason for the majority of the acreage discrepancy of impacts between SB DB, and our reported values (>60ac discrepancy). The discrepancy was due to our interpretation for our "no net loss" consideration, but it is now removed. The 401 permit indicates 15ac of impacts and 96.3ac of creation mitigation which is the entire project area acreage. The mitigation plan also indicated 96.3ac of creation. This project involved the conversion of a series of old duck hunting ponds (with existing jurisdictional wetlands and other waters) for use as the permittee's internal mitigation bank. Some of the credits were to be applied to this project (for lost acreage/habitat), and the rest were to be used by the permittee for other projects. In addition to the jurisdictional impacts, the project involved impacts to large areas of open water that were not deemed jurisdictional. However, after the work was finished, much of this same open water acreage was to be "sold" as mitigation credits. Since this didn't seem appropriate with respect to "no net loss," we balanced the equation, by applying the existing open water acreage to the "impacts" side of the equation. Upon further consideration for this discrepancy analysis, and after reinterpreting the language of the 401 permit ("acreage exceeding impacts to be used as mitigation bank for other projects"), we reversed this decision and assigned the expected regulatory acreage (1:1 ratio) as impacts and mitigation (14.6ac, which is the RB's 15ac value minus 0.4ac of open water that the permittee apparently considered non-regulatory. While the initial language of the mitigation planning indicated that all 96.3ac would be used for credits, only 36.8ac ended up being	1,4,7,12,14,15

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	available for "sale." However, this still includes 22.2ac of open water. In the annual monitoring reports for this permit, the permittee discusses the mitigation success for two habitat credit types: willow/mulefat and river terrace. However, the credits applied to this permit's 14.6ac of impacts were to bulrush and mudflat habitat, which actually includes at least 11.1ac of open water...thus, the more valuable mitigation credits (habitat acreages) remained available for other projects.	
7521	No 401 permit obtained. Impacts were lower than expected from the 401 DB values. 401 is out of date because a second delineation was performed that reduced the "waters" jurisdiction to 0.34ac. The remaining 0.26ac was under DFG jurisdiction only. However, the mitigation was the same (0.68ac), consisting of plantings in non-waters areas.	8,11
7528	SB DB entry error. Streambed impacts recorded as 0.8ac rather than the correct 0.08ac which was listed in the 401 permit. Additionally, the project was delayed for several years and after permit reissuance, the mitigation changed to include credit purchases totaling 1.3 acres. RB staff were aware of the changes, though no new permit was issued and the DB reflects the old information.	3,7
7640	No 401 permit obtained. Impacts and mitigation were lower than expected from the 401 DB values. 401 appears out of date. In addition to "waters" impacts, there was 0.66ac of impact within DFG jurisdiction. Based on correspondence, this was later increased by 0.45ac to total 1.11ac. Because we didn't have the permits to verify the context, and because these numbers still didn't match those in the SB DB, we included only the known "waters" impacts and mitigation in our analyses.	9,11
7678	401 permit was most recent document, but did not include an additional 0.06ac of permanent wetland impacts which were part of planning prior to 401 issuance (impacts occurred). MP outdated. New mitigation planning documents developed and implemented with no apparent RB approval and uncertain Corps approval. Mitigation seasonal wetlands created, but with poor success due to sandy/well drained soils.	4,7
7827	401 permit did not include additional 0.5 acres associated with an unanticipated increase in road construction permanent fill. This was given an after-the-fact 404 permit from the Corps with no evidence that the RB was part of the planning discussion or copied on the changes. In addition, the MP included as compensation the original 7.7ac mitigation, plus an additional 1.9 acre brackish marsh restoration resulting from flood gate removal (required by other agencies, in part, for the additional impacts).	10
7902	Discrepancy not a regulatory problem. Project involved channel desilting and mitigation was to monitor regrowth within the channel, plus plant riparian vegetation atop the channel banks. No acreage was specified for the bank plantings. Even though some of the plantings occurred (these were in upland and had low survivorship), this mitigation action wasn't factored into the acreage determination. Only the redevelopment of the channel itself, following temporary impacts, was included.	5,15
7932	Minor DB entry error, likely due to improper rounding of individual mitigation acres.	2,15
7936	Mitigation acreage in the 401 letter (0.96ac) is different from all the other planning and reporting documents that consistently indicate 0.98ac. This is suggestive of a typo since no other information was found to support that 0.96ac value.	4,15
7942	No 401 permit obtained. Impacts and mitigation acreage in the SB DB appear to be out of sync with the rest of the file paperwork (substantial acreage differences: Impacts - 7.5ac vs 0.78ac; mitigation - 0.45ac vs 2.85ac). It is not known if this is due to outdated 401 permit information, or SB DB entry errors/misinterpretation, or both. However, information in a 2001 final monitoring report suggests that the acreage data in the 404 permit were valid.	9,11

File ID	Reason for Discrepancy **1=No DB Discrepancy 2=Discrepancy due to rounding errors; 3=SB DB entry error, permit OK; 4=Error or lack of info in the 401 permit text; 5=Discrepancy due to accounting difference (ex: permanent vs temporary impacts, or wetlands vs non-wetland waters; 6=Other agency required more mitigation than RB, but 401 not outdated; 7=Mitigation planning modified, 401 outdated; 8=401 permit info outdated, impacts reduced after 401 issuance mitigation same; 9=401 outdated, impacts lower, mitigation different; 10=401 outdated, impacts greater than 401 approved, mitigation different; 11=No 401 permit obtained; 12=UCLA/USF data change since draft final report; 13=Redundant DB record/CertMod; 14=No 401 permit discrepancy; 15 No real regulatory issue with the file.**	CODE
8044	The 401 permit information seems outdated. No 404 permit located. However, mitigation bank payments and paperwork clearly for this project indicated greater impacts and mitigation than reflected in 401 permit. The reason for the differences aren't clear since permit info is vague, but seems that RB did not include impacts to vernal pool habitats (0.04ac). This would only partially account for the difference (2.56ac vs 2.2ac).	10
8061	No 401 permit obtained. The impact acreage increased from 2.27ac to 2.45ac with the 6/15/98 amendment to the 404 permit (all previous documents indicated 2.27ac). That the SB DB indicates 2.45ac suggests that the RB was notified of the changes but that no CertMod was generated (1997 permit date in DB). The mitigation acreage was also higher than reflected in the SB DB (5.96ac vs. 3.91ac). It is unclear where the 3.91ac figure came from, given all the permit info available.	6,11
8125	Additional DFG impacts and mitigation. Impossible to distinguish 401 and 404 mitigation from total mitigation due to vague accounting in planning documents. Our required and obtained acreages reflected the total mitigation. For the purposes of clarifying the discrepancy between the SB DB and our reported values, we assumed that the 401 requirement for 1.1 acre of mitigation has been met and this was reported separately here.	6,14,15
8156 & 8159	After 401 issuance, some time went by before the project planning was finalized. In the end, more mitigation was required than by the 401 permits. Later, the mitigation actions were amended substantially though without a change in total acreage. One site was dropped and another was added which was different in habitat and in the nature of the mitigation activities. The Corps, FWS, DFG, and Coastal Commission were all copied on the changes and their permits were referenced on all documents. There was no evidence that the RB was copied on any changes/submissions after permit issuance. The impacts in the 401 were different from other permits, but only by a small amount (3.31ac vs. 3.32ac). There were two 401 permits issued for this project (both dated 10/10/97; permittee: Carlsbad, City) that had to be evaluated together (acreages combined) because other regulatory agencies treated as one and it was not possible to separate the mitigation(s). The acreage discrepancy was partly due to our inclusion of information for only one of the permits. We did not obtain physical copies of either 401 permit (common for RB 9 permits).	7,11,12
8177	401 permit only included wetland impacts (0.041ac), but not permanent streambed impacts(0.294ac). And the mitigation acreage included a wetland creation project, but not a streamside enhancement portion of the required mitigation (no acreage was specified for this area, but we measured it at 0.06 acres, so this amount was added to the requirements).	5
8215	SB DB entry error based on misinterpretation of permit info. The phrasing was ambiguous and was interpreted as being 1.84ac plus additional 2.5ac, but it meant 1.84 plus additional mitigation to yield a total of 2.5ac, as evidenced from all other permit file information.	3,14,15
8217	No regulatory issue. Project involved extensive desilting of a long earthen channel. RB did not specify any mitigation but said to follow the DFG SAA. That document did not specify any acreage, but specified invasive removal and bank reveg within the impacted channel, which was done. Therefore, for our no net loss analysis, we assigned required and obtained acreages that were equal to impact acreage.	6,15
8248	The 401 permit reflected a 1:1 mitigation ratio. When the 404 permit was issued 6 months later, the Corps assigned a 1:1 mitigation ratio for most of the impacts, but assigned a higher ratio for functional losses, deemed more significant, from one of the impact sites.	6,15
8337	The plans were modified after the original 401 permit was issued (9/15/97) but prior to the final 401 permit included here. During the intervening time the Corps, FWS, and permittee agreed upon the mitigation actions and acreage. A fax was sent to the RB to notify them of the changes, which eliminated all temporary impacts replaced them with 0.042ac of permanent wetland fill (along with 0.042ac of mitigation). It is unclear if a CertMod was issued; the SB DB reflects the new date but the impact and mitigation data weren't changed (0.142ac of temporary impacts and 0.05ac of mitigation were from the original permit).	9

File ID	Reason for Discrepancy **1=No DB Discrepancy 2=Discrepancy due to rounding errors; 3=SB DB entry error, permit OK; 4=Error or lack of info in the 401 permit text; 5=Discrepancy due to accounting difference (ex: permanent vs temporary impacts, or wetlands vs non-wetland waters; 6=Other agency required more mitigation than RB, but 401 not outdated; 7=Mitigation planning modified, 401 outdated; 8=401 permit info outdated, impacts reduced after 401 issuance mitigation same; 9=401 outdated, impacts lower, mitigation different; 10=401 outdated, impacts greater than 401 approved, mitigation different; 11=No 401 permit obtained; 12=UCLA/USF data change since draft final report; 13=Redundant DB record/CertMod; 14=No 401 permit discrepancy; 15 No real regulatory issue with the file.**	CODE
8390	Prior to 401 issuance, the Corps had required a slightly larger mitigation acreage (1.35ac vs. 1.32ac). However the RB included the 1.32ac mitigation value in the permit. Our original permit file selection was for a different project which was related (same permittee, same general project description, slightly different area, cert date 9/16/97), but our cross referencing led us to this one. These projects were so similar that we didn't realize it until investigating these discrepancies. We have changed the File ID number and the SB DB values now more closely match our reported values (this discrepancy analysis is the only place in the report where these SB DB values were used, so all other results were not affected).	6,12,15
8525	The 401 permit information was outdated. Changes occurred prior to the issuance of the 404 permit resulting in lower impacts and greater mitigation. This project is a good example of net functional losses despite net gains in acreage. A earthen stream in a heavily urbanized area which would provide good biochemical functions was converted to a concrete box channel with little function. The mitigation was the vegetative enhancement (plantings) beyond the banks of an existing, well vegetated stream.	9
8529	No 401 permit obtained. The DB lists 0.63ac of permanent streambed impacts and no compensatory mitigation, but references 1313ac of preservation within the notes column. Based on the MP (Dec. 1999), the project involved 2.0ac of permanent impacts to jurisdictional waters. Mitigation involved two large preservation areas (1155ac and 321ac) that contained a total of 7.85ac of jurisdictional waters. The jurisdictional waters acreage(s) seem(ed) the more relevant figures to be used in an acreage analysis such as the present one though we recognize that such non-wetland areas normally part of preservation sites and are often considered and listed as compensatory mitigation. In addition to these preserved waters, the permittee was required to pay for 0.70ac of Tamarisk removal in another location. The Corps and FWS and their permit numbers were copied and referenced on all documents. No evidence that the RB was part of any planning discussions after 401 issuance.	4,5,10,11
8558	The 401 and other permits only required mitigation for impacts to wetlands (1.00ac mitigation for 0.25ac impact). During project construction, only 0.02ac wetland impacts occurred, and the mitigation plan changed to 0.14ac of mitigation. The RB was copied on this change, though no new permit was generated, and the DB reflects the original acreage values.	5,9
8677	SB DB entry/interpretation issue. Mitigation for 2.5ac of permanent impacts and 2.8ac of temporary impacts was to be 1.0ac Arundo removal and 0.25ac mulefat plantings. Only the 1.0ac Arundo removal was entered into the SB DB as a mitigation requirement.	3,14,15
8793	No discrepancy. While the mitigation site we assessed is correct, the 401 and 404 permits we had included were for a related (same permittee, nearly identical project name, slightly different aspect of greater project) but separate permit action. Our cross referencing at the Corps led us to the other project and we obtained those permits, which didn't specify any compensatory mitigation. But the SB DB referenced 1.4ac of in lieu fee payments which we verified, so we assumed that a change had occurred that wasn't reflected in the permits. Through this discrepancy analysis, we realized there two separate projects. We changed the information to reflect the originally selected permit, and assumed that the in lieu fee purchase was the only condition of the 401.	1,12,14,15
8800	Minor discrepancy…401 permit indicated 0.85ac mitigation while all other documents indicated 0.83ac. In any case, the mitigation fell far short of expectations as was identified by a DFG site visit and confirmed by our site visit. And the mitigation that did occur was riparian plantings in an upland area that were failing.	4,15

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8890	This is one example where the RB required compensatory mitigation for temporary as well as permanent impacts, and this was documented in the permit and recorded in the SB DB. The 401 permit information was outdated. The DFG permit had previously approved greater impacts but these were reduced to 0.62ac prior to 401and 404 permit issuances. However, through later discussions between the permittee and Corps and DFG, these impacts increased to 0.66ac (a small, but documented increase). And the mitigation changed from on site creation to a 10.0ac preservation of a portion of the project site as indicated in the 2/9/99 mitigation plan. There is no evidence that the RB was copied on any of these latter changes that occurred after 401 issuance. The 404 and DFG permits were referenced in the mitigation plan, and those agencies were cited as responsible parties to which submissions were due, but the 401 permit and RB were not.	5,10
8980	The 401 permit reflected a higher mitigation acreage credit purchase than other agency requirements (Corps and FWS). Based on a clear accounting of what was purchased, it was apparent that the other agency requirements were applied rather than the 401 requirements. The 401 permit provided the expected mitigation ratios without specifying the actual acreages expected (1:1 creation ratio and 2:1 preservation ratio for vernal pools. This was interpreted in the SB DB as 2.53ac, but could easily be interpreted as 3.49ac due to vague wording in the identification/delineation of impacts. The other agencies considered direct vs. indirect VP impacts and that was factored into their mitigation requirement calculations. Again, the purchases reflected the Corps + FWS requirements.	3,4,5,7
9193	Extremely confusing file! Project involved three stream crossing bridge replacements, a single 401 permit, three 404 permits 3 DFG permits, and several modifications. The 401 and 404 permits corresponded in some aspects, but not in others. The confusion stemmed from rounding differences (0.84ac vs. 0.80ac), vague language in the 401 that translated to misinterpreted data in the SB DB (0.78ac portion of 0.84ac mitigation read and was interpreted as 0.84 + 0.78ac), a typo in the 401 permit for a separate impact/mitigation (0.64ac listed as 0.84ac), and partially different impact and mitigation figures between permits. The available monitoring report information supports our reported acreage figures. There were only monitoring reports for 3 of the 5 expected mitigation actions. One (0.28ac of plantings in a relocated tributary confluence) was assumed completed (by us), while there was no evidence of another (in lieu fee payment of 1.68ac for riparian restoration). This confusion led to errors in our initial acreage analysis figures which have been corrected.	2,3,4,5,12
9211	SB DB entry error. Payment for 0.25ac of Arundo removal offsite was clearly delineated in permit, but not entered into DB record.	3,14,15
9392	The 401 permit listed 0.35ac restoration as compensatory mitigation, but only 0.11ac was entered into the SB DB as mitigation for permanent impacts. Revegetation was to take place next to two bridges (another 401 permit covered the other bridge). There was no evidence of onsite restoration for temporary impacts. The only revegetation occurred at a third bridge not listed in the permit, and consisted mainly of upland plantings on a terrace above the bank slopes.	5,14,15
9404	Following 401 issuance, impacts and mitigation reduced following much correspondence between permittee, Corps, FWS, and DFG. All these agencies were copied on all the correspondence and their permit numbers were referenced on the documents. No evidence of continued correspondence with RB after 401 issuance. We had originally selected a different 401 permit issued for a related project.	9,12
9430	The 401 permit information was outdated. A new delineation that occurred after 401 issuance indicated greater impacts (0.044ac vs.0.016ac). Those changes were communicated to the Corps, but there is no evidence that the RB was made aware. In fact, the RB issued a standard certification on 1/23/01 to replace the earlier waiver of 11/30/98 (due to regulatory change of 6/30/00 eliminating waiver issuance), and this new permit referenced the old permit's information without any indication of the changes. The mitigation acreage didn't change. The RB and 401 permit were referenced on a later completion report, but no acreages were given in that report.	9

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9432	No 401 permit obtained. Based on the SB DB, the RB had required a 2:1 mitigation ratio. There doesn't appear to have been any change in planning after 401 issuance…the Corps just required more mitigation acreage despite claims in the 401 permit of low value/quality habitat. However the mitigation site was not a wetland and was not jurisdictional. It consisted of mulefat plantings in an upland area kept alive by artificial irrigation and was heavily influenced by an eroding barren sandstone hillside.	6,11,15
9448	The 401 permit information was outdated. After 401 issuance, a new delineation was done that showed fewer jurisdictional wetlands, and thus lower impacts. While the 401 had mentioned onsite wetland creation and a preservation purchase as mitigation, the only mitigation required in the end (and obtained) was the purchase of preservation credits. The RB was copied on the more recent documents, but these didn't result in any change to the 401 permit, and the SB DB reflects the outdated permit information.	10
9510	The actual mitigation credits purchased were 0.650 because they were only available in increments of 0.05. This was established after 401 issuance, but prior to 404 issuance, so the correct mitigation acreage was reflected in the Corps permit. In addition, our reported values changed following the discovery of an error in the acreage analysis.	6,12,15
9597	No 401 permit obtained (though we did obtain an earlier 12/4/98 version that was nullified). Based on the SB DB, the RB had required a 1:1 mitigation ratio. After more planning and consultation with FWS, the Corps assigned a greater mitigation acreage requirement (3.00ac vs. 1.63 or 2.13ac from MP). After the mitigation site had an acreage shortfall, a new plan to use 1.0ac of mitigation from another permittee owned mitigation site was approved by the Corps. The RB was copied on this planning change.	7,11
9691	The 401 permit contained a typo/incorrect data (indicated 0.01ac impact with a 9:1 mitigation ratio instead of 0.1ac, which was part of the 401 info packet). All other permits etc. included the correct value (0.1ac) and clearly listed 0.9ac as mitigation.	4
10347	No regulatory problem based on "waters" acreage. Project involved permanent and temporary impacts. Temporary impacts (0.01ac) were avoided during construction (though in doing so, the stream grade became improper and a erosion/incision problem has developed). Our acreage analysis figures include DFG acreage requirements which were invoked by the 401 permit. These are separated out here.	8
10356	No regulatory issue. Project involved impacts to .099ac of jurisdictional streambed/alluvial fan scrub (AFS) but the reported compensatory mitigation of 6.93ac to an AFS mitigation bank was also for 3.031ac of non-jurisdictional AFS impacts (total impact acreage 3.13ac). Originally we reported just the jurisdictional impacts, but we now include the other AFS impacts because they are entwined in the reported mitigation acreage. The Corps acreage of 1.84ac included an existing concrete channel replaced with an underground box culvert. Only the non-lined areas were included in RB values.	5,12,15
10399	No discrepancy. The 401 permit had indicated mitigation of 0.101ac while our reported value was rounded to 0.100ac. We changed our figure to match the 401.	1,2,12,14,15
10409	401 permit had DB entry/interpretation errors and the permit information was based on outdated information. The SB DB included the stated permanent and temporary impacts to wetland and streambed habitats, but not the stated permanent impacts to other jurisdictional "waters." In any case, the 404 permit (issued after 401) indicated different impact and mitigation acreage (both overall, and among wetland and other habitats), and these were applied, as reported in the mitigation monitoring report.	3,5,10

File ID	Reason for Discrepancy **1=No DB Discrepancy 2=Discrepancy due to rounding errors; 3=SB DB entry error, permit OK; 4=Error or lack of info in the 401 permit text; 5=Discrepancy due to accounting difference (ex: permanent vs temporary impacts, or wetlands vs non-wetland waters; 6=Other agency required more mitigation than RB, but 401 not outdated; 7=Mitigation planning modified, 401 outdated; 8=401 permit info outdated, impacts reduced after 401 issuance mitigation same; 9=401 outdated, impacts lower, mitigation different; 10=401 outdated, impacts greater than 401 approved, mitigation different; 11=No 401 permit obtained; 12=UCLA/USF data change since draft final report; 13=Redundant DB record/CertMod; 14=No 401 permit discrepancy; 15 No real regulatory issue with the file.**	CODE
10453	The RB permit information was outdated. After 401 issuance, extensive communications between the permittee and the Corps and FWS modified the existing project to avoid indirect impacts to vernal pools and additional direct impacts to non-jurisdictional wetlands. A large portion of the impact site became an open space preserve. There was no evidence that the RB was copied on any of the planning decisions or proof of payment submissions.	9,12
10495	No Discrepancy; difference due to simple rounding/approximation in permits. However, there are redundant impact and mitigation acreage data recorded in the SB DB for this project. This is not due to a CertMod, but was caused by the nullification of the original 401 permit (File ID # 1301; Cert. date 8/31/99; 1.4ac impacts and 3.0ac mitigation), and issuance of the present permit after re-application.	2,13,15
10530	SB DB did not include mitigation for temporary impacts, yet the permit mandated reveg of this area and the acreage was included in our "no net loss" acreage analysis. There is also a 0.004 acre discrepancy in impact acreage which was a simple rounding issue. The FWS required greater mitigation acreage than the RB due to incidental/unauthorized vernal pool fill that occurred during construction(per City of Roseville Letter 9/27/00). The required acreage we report includes the 0.18ac of temporary impact restoration, however, the specified regulatory acreages are given here as well.	2,3,5,6,12,15
10843	Through additional discussions and correspondence after 401 issuance between RB and permittee, and likely due to some violation notices, the mitigation acreage requirement was increased (.128 vs. .063), and the mitigation plan reflected this increase. There was at least one 401 letter generated which approved changes from original 401 permit, but this did not result in a CertMod., and the SB DB reflects the outdated mitigation information.	3
10938	The 401 permit information was outdated. After 401 issuance, the FWS opinion resulted in greater mitigation acreage (an additional preservation area), which was adopted by the Corps and implemented.	7,12
11208	The 401 permit required less than 1:1 ratio (only 0.021 acres) of compensatory mitigation, while 404 required 1:1 ratio (0.088). A total of 0.088 acres were purchased through a mitigation bank.	6,15
11224	The mitigation acreage reflected in the 401 permit was inaccurate. The permit called for the enhancement of a 9.6ac riparian corridor. Only 3.3ac of riparian corridor existed at the site. The mitigation plan calls for riparian plantings (4.3 acres) within an 8.6ac 100ft setback/landscape buffer area which was upland, not riparian. This is what was done.	4

4. GPS Information

Included in this appendix is a table of representative mitigation site GPS coordinates for each of the permit files (Table 4-1), and a CD containing all the GPS-related computer files associated with this project.

Table 4-1. Representative mitigation site GPS coordinates for each permit file.

File #	Mitigation Site	Impact Latitude	Impact Longitude	Mitigation Latitude	Mitigation Longitude
470	470-3	34° 16' 55"	-118° 39' 17"	34° 16' 55"	-118° 39' 17"
470	470-1	34° 17' 8"	-118° 39' 28"	34° 17' 8"	-118° 39' 28"
470	470-2	34° 17' 17"	-118° 39' 19"	34° 17' 17"	-118° 39' 19"
1412	1412	38° 46' 43"	-119° 55' 24"	38° 46' 43"	-119° 55' 24"
1464	1464-1	38° 48' 15"	-121° 18' 42"	38° 59' 18"	-121° 24' 13"
1464	1464-2	38° 48' 15"	-121° 18' 42"	38° 59' 24"	-121° 24' 38"
1484	1484	34° 36' 25"	-120° 5' 47"	34° 36' 25"	-120° 5' 47"
1592	1592	38° 3' 16"	-122° 31' 39"	38° 3' 16"	-122° 31' 39"
1664	1664	35° 42' 13"	-120° 19' 15"	35° 42' 13"	-120° 19' 15"
1755	1775-BK	38° 53' 14"	-121° 14' 21"	38° 59' 24"	-121° 24' 38"
1755	1775-onS	38° 52' 43"	-121° 14' 9"	38° 52' 43"	-121° 14' 9"
1788	1788-3	35° 15' 3"	-120° 38' 52"	35° 15' 3"	-120° 38' 52"
1788	1788-1	35° 15' 6"	-120° 38' 44"	35° 15' 6"	-120° 38' 44"
1788	1788-2	35° 15' 7"	-120° 38' 51"	35° 15' 7"	-120° 38' 51"
2055	2055-1	39° 33' 3"	-121° 56' 21"	39° 27' 44"	-121° 52' 44"
2055	2055-2	39° 33' 3"	-121° 47' 30"	39° 33' 3"	-121° 47' 30"
2097	2097-4	35° 19' 18"	-120° 43' 42"	35° 19' 18"	-120° 43' 42"
2097	2097-2	35° 19' 19"	-120° 43' 46"	35° 19' 19"	-120° 43' 46"
2097	2097-1	35° 19' 41"	-120° 43' 55"	35° 19' 41"	-120° 43' 55"
2097	2097-3	35° 19' 45"	-120° 43' 51"	35° 19' 45"	-120° 43' 51"
2219	2219	39° 42' 4"	-121° 56' 21"	39° 42' 4"	-121° 56' 21"
2395	2395-3	33° 38' 4"	-117° 47' 47"	33° 39' 47"	-117° 50' 44"
2395	2395-1	33° 38' 4"	-117° 47' 47"	33° 38' 4"	-117° 47' 47"
2395	2395-2	33° 38' 6"	-117° 47' 42"	33° 38' 6"	-117° 47' 42"
2418	2418-1	37° 27' 17"	-120° 36' 32"	37° 27' 17"	-120° 36' 32"
2418	2418-2	37° 27' 17"	-120° 36' 31"	37° 27' 17"	-120° 36' 31"
2443	2443-2	37° 25' 1"	-120° 1' 21"	37° 24' 58"	-121° 58' 44"
2443	2443-1	37° 25' 1"	-120° 1' 21"	37° 25' 4"	-121° 58' 33"
2456	2456-T	38° 45' 19"	-121° 16' 2"	38° 59' 17"	-121° 24' 27"
2456	2456-3	38° 45' 19"	-121° 16' 2"	38° 59' 17"	-121° 24' 27"
2591	2591	34° 37' 20"	-120° 12' 5"	34° 37' 20"	-120° 12' 5"
2593	2593	37° 37' 43"	-122° 2' 17"	37° 37' 43"	-122° 2' 17"
2667	2667-T	38° 39' 60"	-121° 31' 52"	38° 59' 24"	-121° 24' 38"
2706	2706-1	37° 20' 25"	-121° 53' 58"	37° 12' 19"	-121° 43' 7"
2726	2726-T	40° 39' 36"	-122° 22' 23"	40° 23' 33"	-122° 13' 36"
2784	2784-T	38° 7' 8"	-122° 17' 25"	38° 7' 8"	-122° 17' 25"
2804	2804	34° 21' 7"	-119° 0' 50"	34° 21' 8"	-119° 0' 50"
2841	2841-2	33° 33' 14"	-117° 42' 40"	33° 31' 51"	-117° 42' 30"
2841	2841-4	33° 33' 14"	-117° 42' 40"	33° 31' 54"	-117° 42' 27"
2841	2841-3	33° 33' 14"	-117° 42' 40"	33° 31' 56"	-117° 42' 14"
2841	2841-5	33° 33' 14"	-117° 42' 40"	33° 32' 38"	-117° 42' 55"

File #	Mitigation Site	Impact Latitude	Impact Longitude	Mitigation Latitude	Mitigation Longitude
2841	2841-1B	33° 33' 12"	-117° 42' 39"	33° 33' 12"	-117° 42' 39"
2841	2841-1A	33° 33' 13"	-117° 42' 45"	33° 33' 13"	-117° 42' 45"
2841	2841-1C	33° 33' 16"	-117° 42' 38"	33° 33' 16"	-117° 42' 38"
2841	2841-1D	33° 33' 12"	-117° 42' 42"	33° 33' 12"	-117° 42' 42"
2940	2940	37° 26' 18"	-121° 52' 14"	37° 26' 18"	-121° 52' 14"
2974	2974	32° 59' 37"	-116° 59' 47"	32° 59' 37"	-116° 59' 47"
2998	2998	38° 3' 30"	-122° 10' 8"	38° 3' 30"	-122° 10' 8"
3079	3079	37° 30' 45"	-121° 59' 55"	37° 30' 19"	-121° 59' 57"
3109	3109	36° 31' 30"	-121° 26' 59"	36° 31' 30"	-121° 26' 59"
3252	3252-OFS	38° 7' 4"	-120° 36' 13"	38° 25' 13"	-121° 3' 11"
3252	3252-3	38° 7' 4"	-121° 23' 47"	38° 7' 4"	-121° 23' 47"
3370	3370	38° 46' 15"	-121° 18' 45"	38° 46' 15"	-121° 18' 45"
3376	3376-T	38° 37' 59"	-121° 4' 46"	38° 25' 13"	-121° 3' 11"
3417	3417	32° 58' 4"	-117° 9' 58"	32° 58' 4"	-117° 9' 58"
3472	3472	36° 47' 45"	-119° 38' 12"	36° 47' 45"	-119° 38' 12"
3536	3536	38° 56' 28"	-120° 25' 10"	38° 56' 28"	-120° 25' 10"
3617	3617	37° 46' 28"	-122° 23' 38"	37° 46' 28"	-122° 23' 38"
3632	3632-1	34° 17' 57"	-118° 54' 50"	34° 17' 57"	-118° 54' 50"
3632	3632-3	34° 18' 16"	-118° 54' 2"	34° 18' 16"	-118° 54' 2"
3632	3632-2	34° 18' 18"	-118° 53' 58"	34° 18' 18"	-118° 53' 58"
3677	3677	32° 50' 50"	-117° 9' 50"	32° 50' 50"	-117° 9' 50"
3710	3710	37° 29' 23"	-121° 57' 32"	37° 30' 50"	-122° 3' 8"
4206	4206	34° 37' 24"	-118° 44' 40"	34° 37' 24"	-118° 44' 40"
4231	4231-1	38° 44' 7"	-121° 13' 58"	38° 59' 18"	-121° 24' 13"
4231	4231-2	38° 44' 7"	-121° 13' 58"	38° 59' 24"	-121° 24' 38"
4580	4580	33° 50' 5"	-117° 28' 31"	33° 50' 5"	-117° 28' 31"
4858 & 5371	4858-T	34° 23' 58"	-118° 45' 23"	34° 23' 58"	-118° 45' 23"
5136	5136-T	37° 2' 8"	-122° 1' 30"	37° 2' 8"	-122° 1' 30"
5217	5217-T	34° 26' 21"	-119° 44' 40"	34° 26' 21"	-119° 44' 40"
5401	5401	33° 59' 17"	-117° 43' 50"	33° 59' 17"	-117° 43' 50"
5425	5425	38° 14' 41"	-122° 35' 37"	38° 14' 41"	-122° 35' 37"
5619	5619-T	33° 15' 4"	-114° 41' 27"	33° 15' 4"	-114° 41' 27"
5625	5625-1	34° 10' 49"	-118° 54' 43"	34° 10' 39"	-118° 54' 42"
5625	5625-2	34° 10' 49"	-118° 54' 43"	34° 10' 43"	-118° 54' 41"
5625	5625-3	34° 10' 49"	-118° 54' 43"	34° 10' 51"	-118° 54' 41"
5747	5747-1	33° 52' 43"	-117° 17' 20"	33° 52' 43"	-117° 17' 20"
5747	5747-2	33° 52' 44"	-117° 17' 16"	33° 52' 44"	-117° 17' 16"
5815	5815-1	38° 0' 51"	-122° 15' 21"	38° 0' 51"	-122° 15' 21"
5815	5815-2	38° 0' 51"	-122° 15' 21"	38° 0' 54"	-122° 15' 21"
6002	6002	33° 41' 33"	-118° 0' 15"	33° 41' 33"	-118° 0' 15"
6159	6159-1	34° 3' 49"	-118° 27' 57"	34° 3' 36"	-118° 28' 1"
6159	6159-2	34° 3' 49"	-118° 27' 57"	34° 3' 36"	-118° 27' 58"
6280	6280	34° 27' 25"	-119° 16' 33"	34° 27' 25"	-119° 16' 33"
6367	6367-T	38° 24' 5"	-122° 43' 26"	38° 22' 57"	-122° 46' 21"
6369	6369-2A	33° 37' 31"	-117° 49' 39"	33° 36' 58"	-117° 48' 4"
6369	6369-2B	33° 37' 31"	-117° 49' 39"	33° 37' 24"	-117° 48' 13"
6369	6369-2C	33° 37' 31"	-117° 49' 39"	33° 37' 40"	-117° 48' 16"
6369	6369-1	33° 37' 31"	-117° 49' 39"	33° 37' 31"	-117° 49' 39"
6389	6389	34° 16' 9"	-118° 55' 52"	34° 16' 9"	-118° 55' 52"
6451	6451	38° 7' 9"	-122° 17' 1"	38° 7' 9"	-122° 17' 1"
6489	6489	38° 27' 45"	-121° 21' 40"	38° 25' 30"	-121° 22' 51"
6668	6668-E	38° 0' 57"	-122° 16' 38"	38° 0' 57"	-122° 16' 27"

File #	Mitigation Site	Impact Latitude	Impact Longitude	Mitigation Latitude	Mitigation Longitude
6668	6668-W	38° 0' 57"	-122° 16' 38"	38° 1' 5"	-122° 16' 53"
6668	6668-R	38° 0' 57"	-122° 16' 38"	38° 1' 5"	-122° 16' 38"
6709	6709	37° 57' 13"	-121° 53' 41"	37° 57' 13"	-122° 6' 19"
6789	6789-T	37° 52' 47"	-121° 11' 41"	37° 53' 2"	-121° 11' 36"
6845	6845	34° 16' 43"	-118° 48' 13"	34° 16' 43"	-118° 48' 13"
6855	6855	41° 47' 16"	-123° 46' 44"	41° 47' 16"	-124° 13' 16"
6949	6949	39° 12' 23"	-120° 12' 28"	39° 12' 23"	-120° 12' 28"
6970	6970-1	36° 52' 41"	-119° 47' 27"	36° 52' 41"	-119° 47' 27"
6970	6970-3	36° 52' 42"	-119° 47' 28"	36° 52' 42"	-119° 47' 28"
6970	6970-2	36° 52' 40"	-119° 47' 26"	36° 52' 40"	-119° 47' 26"
7059	7059	35° 5' 40"	-120° 30' 10"	35° 5' 40"	-120° 30' 10"
7117	7117	41° 28' 15"	-119° 27' 8"	41° 28' 15"	-120° 32' 52"
7154	7154-5	36° 26' 27"	-121° 47' 49"	36° 26' 25"	-121° 47' 42"
7154	7154-T	36° 26' 27"	-121° 47' 49"	36° 27' 24"	-121° 47' 53"
7154	7154-6	36° 26' 27"	-121° 47' 49"	36° 27' 24"	-121° 47' 59"
7270	7270	38° 30' 42"	-122° 49' 37"	38° 30' 56"	-122° 48' 26"
7371	7371	34° 14' 25"	-118° 46' 53"	34° 14' 25"	-118° 46' 53"
7385	7385-2	39° 47' 8"	-121° 52' 27"	39° 47' 5"	-121° 52' 30"
7385	7385-1	39° 47' 8"	-121° 52' 27"	39° 47' 8"	-121° 52' 27"
7404	7404-T	38° 32' 58"	-122° 48' 51"	38° 31' 4"	-122° 46' 37"
7456	7456-5	38° 31' 47"	-122° 47' 32"	38° 24' 8"	-122° 45' 56"
7456	7456-T	38° 31' 47"	-122° 47' 32"	38° 24' 1"	-122° 45' 52"
7497	7497	33° 39' 39"	-117° 50' 45"	33° 39' 39"	-117° 50' 45"
7521	7521-2	32° 39' 31"	-117° 2' 34"	32° 39' 31"	-117° 2' 39"
7521	7521-1	32° 39' 32"	-117° 2' 35"	32° 39' 32"	-117° 2' 35"
7528	7528	38° 32' 39"	-122° 48' 22"	38° 30' 55"	-122° 48' 19"
7640	7640	32° 50' 16"	-116° 43' 1"	32° 50' 16"	-116° 43' 1"
7646	7646-1	37° 31' 49"	-121° 43' 57"	37° 31' 59"	-122° 15' 56"
7646	7646-2	37° 31' 49"	-121° 43' 57"	37° 31' 53"	-122° 15' 60"
7678	7678-SW	37° 18' 49"	-120° 49' 20"	37° 18' 51"	-120° 49' 32"
7678	7678-nE	37° 18' 49"	-120° 49' 20"	37° 19' 2"	-120° 48' 59"
7827	7827-2	38° 13' 40"	-121° 58' 43"	38° 13' 26"	-121° 58' 44"
7827	7827-1	38° 13' 40"	-121° 58' 43"	38° 13' 25"	-121° 58' 44"
7883	7883-1	38° 0' 17"	-121° 54' 8"	38° 0' 18"	-122° 5' 50"
7883	7883-2	38° 0' 17"	-121° 54' 8"	38° 0' 17"	-122° 5' 53"
7932	7932-3	41° 19' 9"	-121° 40' 45"	41° 19' 19"	-122° 19' 18"
7932	7932-1	41° 19' 9"	-121° 40' 45"	41° 19' 9"	-122° 19' 15"
7932	7932-2	41° 19' 9"	-121° 40' 45"	41° 19' 9"	-122° 19' 15"
7936	7936	34° 24' 35"	-118° 34' 24"	34° 27' 35"	-118° 33' 10"
7942	7942-OFS	32° 33' 16"	-117° 5' 3"	32° 33' 5"	-117° 5' 44"
7942	7942-3	32° 33' 16"	-117° 5' 3"	32° 33' 16"	-117° 5' 3"
8044	8044-D	38° 44' 21"	-121° 18' 15"	38° 59' 18"	-121° 24' 13"
8044	8044-6	38° 44' 21"	-121° 18' 15"	38° 58' 58"	-121° 24' 39"
8044	8044-VP	38° 44' 21"	-121° 18' 15"	38° 59' 24"	-121° 24' 38"
8061	8061	32° 44' 15"	-116° 56' 14"	32° 44' 15"	-116° 56' 14"
8125	8125-T	38° 43' 46"	-120° 45' 4"	38° 43' 46"	-121° 14' 56"
8156 & 8159	8156-1	33° 8' 49"	-117° 18' 1"	33° 8' 45"	-117° 18' 41"
8156 & 8159	8156-3	33° 8' 49"	-117° 18' 1"	33° 8' 59"	-117° 18' 1"
8156 & 8159	8156-5	33° 8' 49"	-117° 18' 1"	33° 8' 3"	-117° 18' 15"
8156 & 8159	8156-T	33° 8' 49"	-117° 18' 1"	33° 8' 14"	-117° 18' 25"
8156 & 8159	8156-2	33° 8' 49"	-117° 18' 1"	33° 8' 45"	-117° 18' 41"
8156 & 8159	8156-4	33° 8' 49"	-117° 18' 1"	33° 8' 57"	-117° 17' 60"

File #	Mitigation Site	Impact Latitude	Impact Longitude	Mitigation Latitude	Mitigation Longitude
8156 & 8159	8156-10	33° 8' 14"	-117° 18' 27"	33° 8' 14"	-117° 18' 27"
8156 & 8159	8156-9	33° 8' 16"	-117° 18' 30"	33° 8' 16"	-117° 18' 30"
8177	8177-1	38° 19' 44"	-121° 42' 20"	38° 19' 44"	-122° 17' 40"
8177	8177-2	38° 19' 44"	-121° 42' 20"	38° 19' 43"	-122° 17' 41"
8185	8185-1	32° 58' 13"	-117° 9' 20"	32° 58' 22"	-117° 9' 8"
8185	8185-2	32° 58' 13"	-117° 9' 20"	32° 58' 24"	-117° 9' 10"
8202	8202	37° 21' 42"	-118° 24' 28"	37° 21' 42"	-118° 24' 28"
8215	8215-T	37° 22' 54"	-120° 33' 4"	37° 22' 54"	-120° 33' 4"
8248	8248-T	38° 42' 35"	-121° 5' 32"	38° 59' 18"	-121° 24' 13"
8337	8337	32° 41' 17"	-117° 7' 41"	32° 41' 17"	-117° 7' 41"
8390	8390-T	38° 32' 6"	-122° 47' 28"	38° 31' 4"	-122° 46' 37"
8525	8525	33° 37' 15"	-117° 55' 45"	33° 37' 43"	-117° 52' 45"
8529	8529	33° 45' 53"	-116° 27' 36"	33° 45' 10"	-116° 28' 48"
8558	8558-T	38° 14' 8"	-119° 7' 27"	38° 14' 8"	-120° 52' 33"
8587	8587	33° 54' 18"	-117° 52' 32"	33° 54' 18"	-117° 52' 32"
8677	8677	33° 47' 6"	-117° 49' 49"	33° 47' 6"	-117° 49' 49"
8704	8704	37° 25' 57"	-120° 6' 38"	37° 25' 57"	-121° 53' 22"
8793	8793	34° 28' 1"	-118° 39' 45"	34° 33' 24"	-118° 29' 37"
8800	8800	37° 46' 2"	-120° 0' 7"	37° 46' 2"	-121° 59' 53"
8924	8924-T	38° 42' 38"	-121° 5' 23"	38° 59' 24"	-121° 24' 38"
8947	8947-T	38° 16' 22"	-121° 19' 30"	38° 16' 22"	-122° 40' 30"
8980	8980-D	38° 49' 32"	-121° 18' 1"	38° 59' 18"	-121° 24' 13"
8980	8980-VP	38° 49' 32"	-121° 18' 1"	38° 59' 24"	-121° 24' 38"
9193	9193-3	34° 24' 39"	-118° 40' 10"	34° 23' 36"	-118° 52' 55"
9193	9193-2	34° 24' 39"	-118° 40' 10"	34° 24' 39"	-118° 40' 10"
9193	9193-1	34° 25' 42"	-118° 37' 44"	34° 25' 42"	-118° 37' 44"
9211	9211	33° 55' 7"	-117° 19' 17"	34° 17' 30"	-118° 14' 7"
9392	9392	34° 30' 21"	-119° 16' 49"	34° 30' 49"	-119° 16' 19"
9404	9404-1	33° 53' 51"	-117° 36' 30"	33° 54' 5"	-117° 35' 41"
9404	9404-T	33° 53' 51"	-117° 36' 30"	33° 54' 16"	-117° 35' 57"
9404	9404-4	33° 53' 51"	-117° 36' 30"	33° 53' 56"	-117° 35' 59"
9430	9430	35° 8' 13"	-120° 37' 15"	35° 8' 1"	-120° 37' 25"
9432	9432-2	32° 55' 54"	-117° 13' 27"	32° 55' 54"	-117° 13' 27"
9432	9432-1	32° 56' 2"	-117° 13' 32"	32° 56' 2"	-117° 13' 32"
9510	9510-T	38° 30' 19"	-122° 47' 46"	38° 31' 4"	-122° 46' 37"
9597	9597-1	32° 37' 26"	-117° 4' 6"	32° 35' 23"	-117° 2' 23"
9597	9597-2	32° 37' 26"	-117° 4' 6"	32° 35' 24"	-117° 2' 29"
9597	9597-3	32° 37' 26"	-117° 4' 6"	32° 36' 42"	-117° 0' 39"
9671	9671-T	38° 33' 26"	-121° 18' 33"	38° 59' 18"	-121° 24' 13"
9691	9691	34° 41' 13"	-120° 9' 23"	34° 41' 13"	-120° 9' 23"
9857	9857	37° 13' 51"	-120° 8' 21"	37° 13' 51"	-121° 51' 39"
10274	10274-T	38° 8' 2"	-121° 35' 27"	38° 1' 54"	-121° 49' 2"
10304	10304-T	38° 16' 41"	-122° 27' 0"	38° 8' 57"	-122° 32' 36"
10347	10347-1	34° 7' 34"	-117° 9' 49"	34° 7' 27"	-117° 9' 36"
10347	10347-3	34° 7' 33"	-117° 9' 50"	34° 7' 33"	-117° 9' 50"
10347	10347-2	34° 7' 36"	-117° 9' 48"	34° 7' 36"	-117° 9' 48"
10399	10399	37° 45' 49"	-119° 6' 31"	37° 45' 49"	-119° 6' 31"
10409	10409-1	38° 23' 12"	-121° 17' 1"	38° 23' 12"	-122° 42' 54"
10409	10409-2	38° 23' 12"	-121° 17' 1"	38° 23' 12"	-122° 42' 3"
10453	10453-D	38° 48' 3"	-121° 19' 32"	38° 59' 18"	-121° 24' 13"
10453	10453-VP	38° 48' 3"	-121° 19' 32"	38° 59' 24"	-121° 24' 38"
10495	10495-2	36° 51' 13"	-121° 33' 59"	36° 50' 22"	-121° 34' 8"

File #	Mitigation Site	Impact Latitude	Impact Longitude	Mitigation Latitude	Mitigation Longitude
10495	10495-1	36° 51' 13"	-121° 33' 59"	36° 50' 24"	-121° 34' 14"
10530	10530-D	38° 47' 40"	-121° 22' 35"	38° 25' 13"	-121° 3' 11"
10530	10530-VP	38° 47' 40"	-121° 22' 35"	38° 24' 54"	-121° 3' 24"
10843	10843	33° 35' 50"	-117° 13' 39"	33° 35' 50"	-117° 13' 39"
10938	10938-T	38° 54' 4"	-121° 16' 54"	38° 59' 24"	-121° 24' 38"
11208	11208-T	38° 41' 35"	-120° 54' 18"	38° 59' 18"	-121° 24' 13"
11224	11224	37° 13' 12"	-120° 15' 10"	37° 13' 12"	-121° 44' 50"

5. Distribution of Sites within Regions

Included in this appendix are twelve figures displaying the distribution of assessed sites within the 12 Regions or sub-Regions of the State Board. Some information regarding the relative proximity of corresponding impact sites is also included, and the mitigation sites are coded according to their respective Total-CRAM scores.

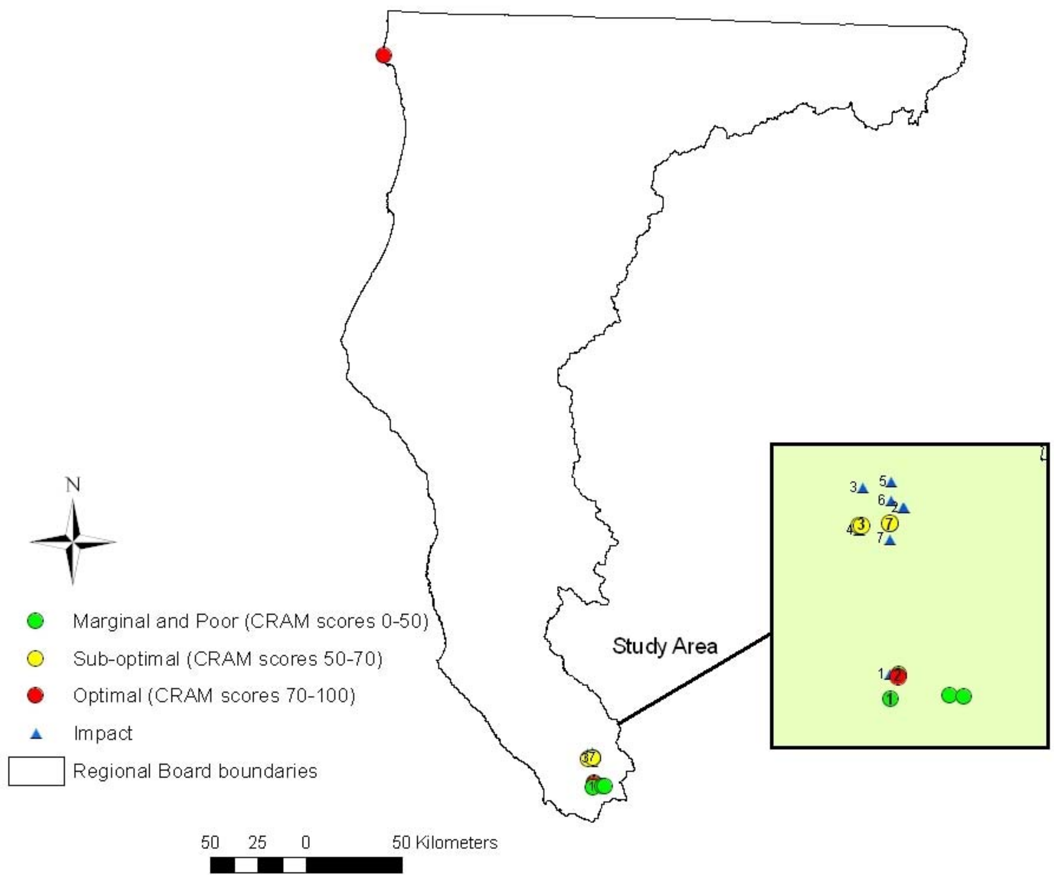


Figure 5-1. Distribution of overall CRAM scores for mitigation projects assessed across Region 1 and associated impact locations for off-site mitigation projects. Circles indicate individual mitigation actions; multiple points may be indicated for individual projects with multiple mitigation actions, and some points may represent multiple projects, e.g., mitigation banks. Numbers indicate paired impact and mitigation locations. Inset provides more detailed location of sites in the southern part of Region 1.

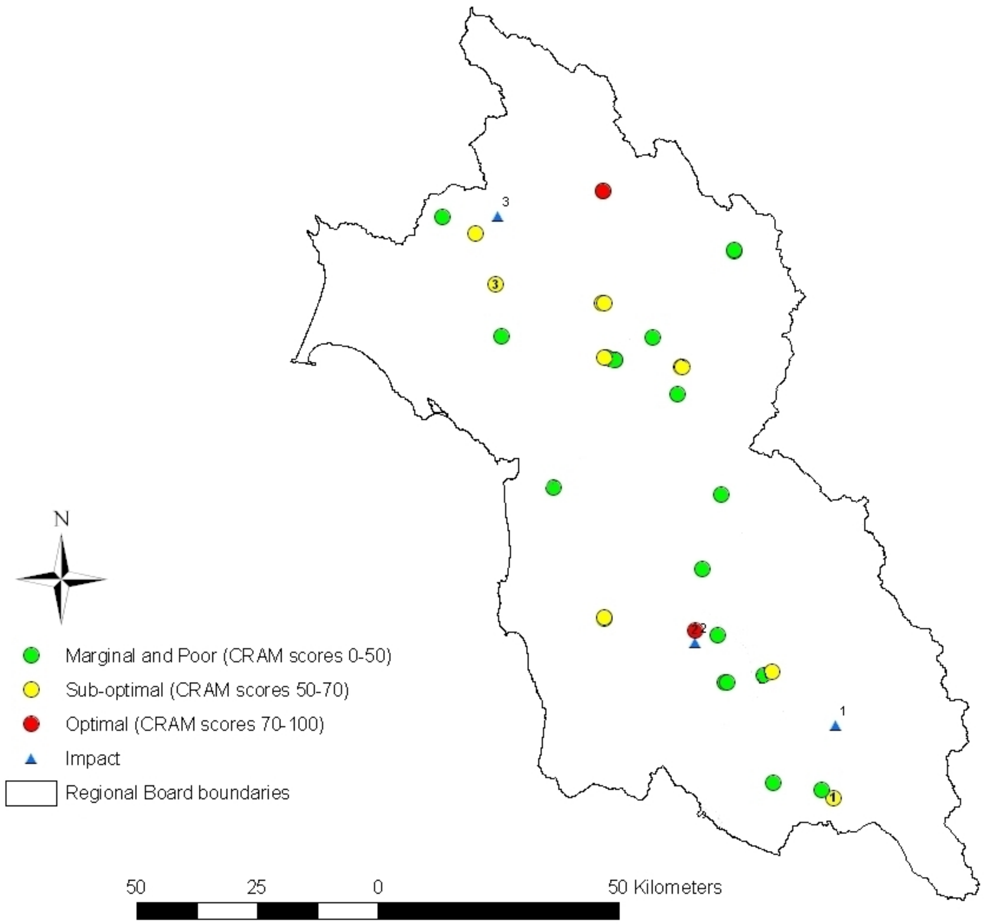


Figure 5-2. Distribution of overall CRAM scores for mitigation projects assessed across Region 2 and associated impact locations for off-site mitigation projects. Circles indicate individual mitigation actions; multiple points may be indicated for individual projects with multiple mitigation actions, and some points may represent multiple projects, e.g., mitigation banks. Numbers indicate paired impact and mitigation locations.

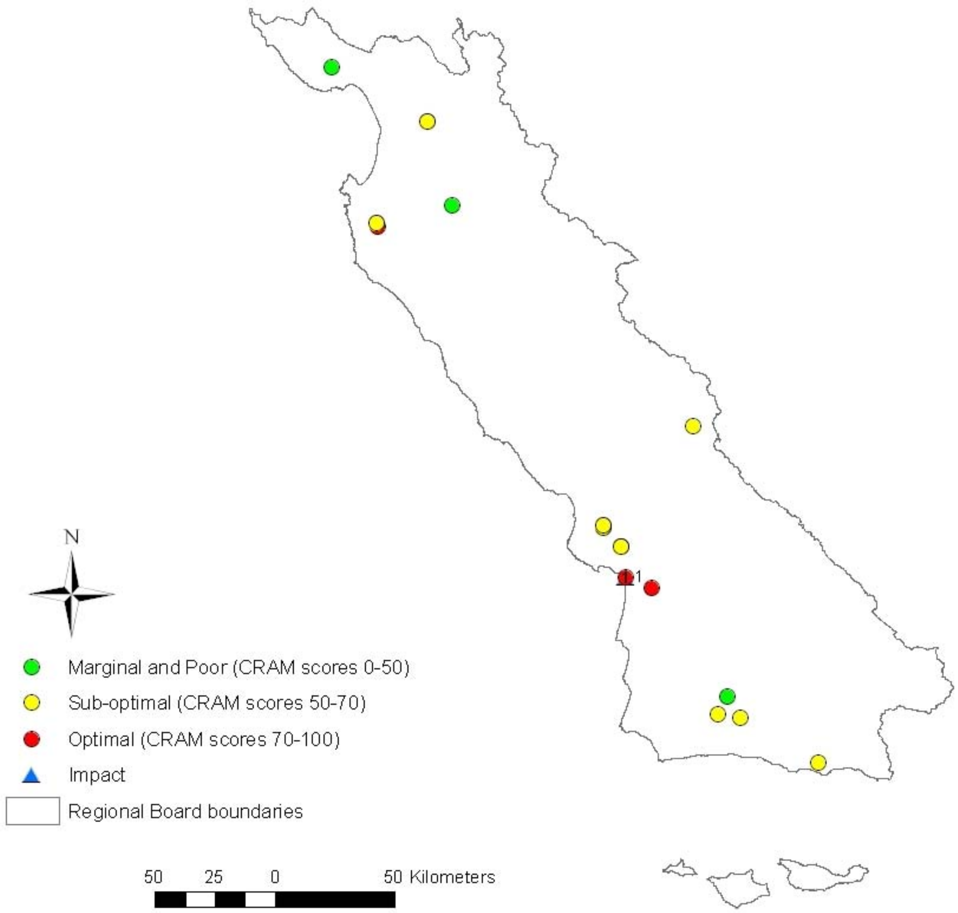


Figure 5-3. Distribution of overall CRAM scores for mitigation projects assessed across Region 3 and associated impact locations for off-site mitigation projects. Circles indicate individual mitigation actions; multiple points may be indicated for individual projects with multiple mitigation actions, and some points may represent multiple projects, e.g., mitigation banks. Numbers indicate paired impact and mitigation locations.

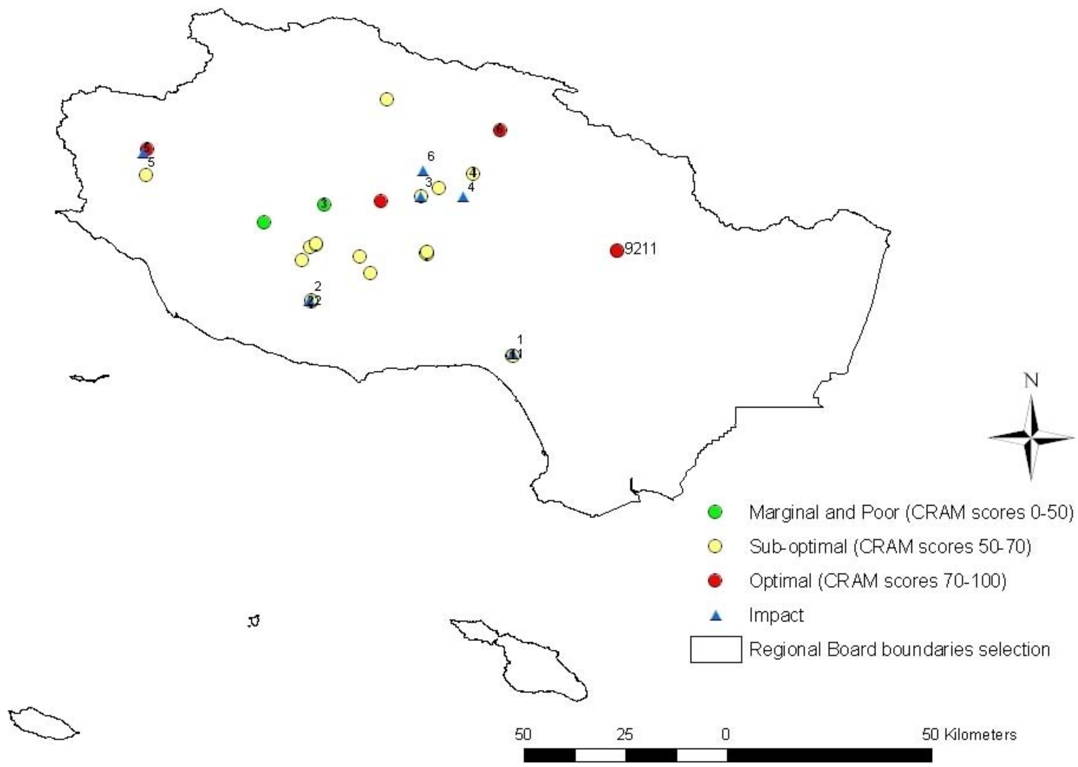


Figure 5-4. Distribution of overall CRAM scores for mitigation projects assessed across Region 4 and associated impact locations for off-site mitigation projects. Circles indicate individual mitigation actions; multiple points may be indicated for individual projects with multiple mitigation actions, and some points may represent multiple projects, e.g., mitigation banks. Numbers indicate paired impact and mitigation locations. The mitigation location for project #9211 is indicated separately because the impact occurred in Region 8 while the mitigation occurred in Region 4.

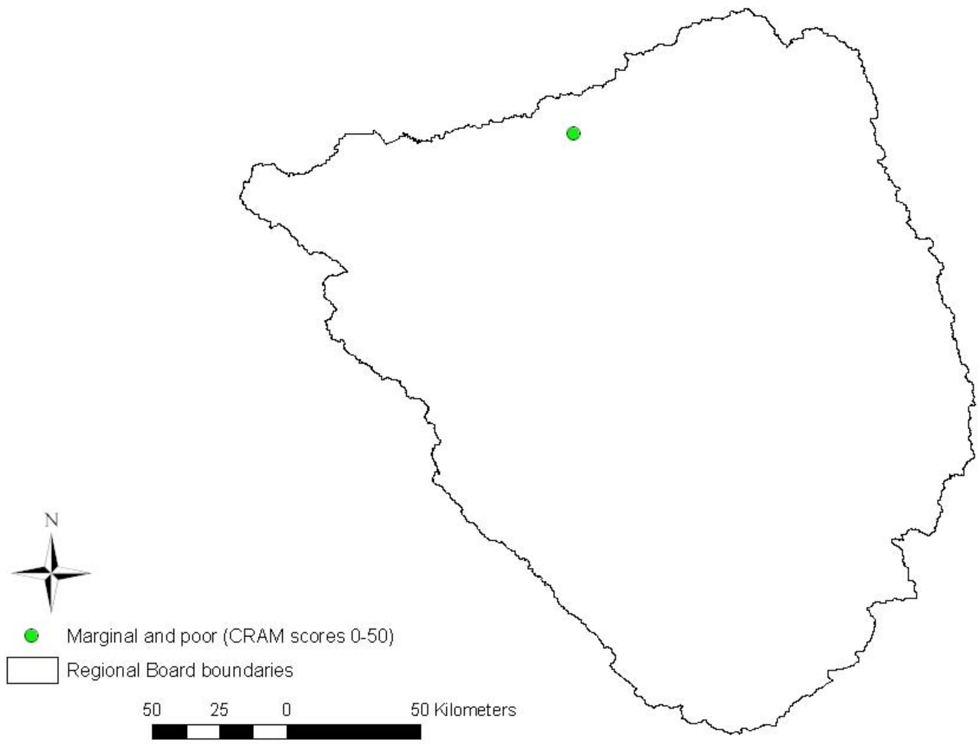


Figure 5-5. Distribution of overall CRAM scores for mitigation projects assessed across Sub-Region 5F. Circles indicate individual mitigation actions; multiple points may be indicated for individual projects with multiple mitigation actions, and some points may represent multiple projects, e.g., mitigation banks.

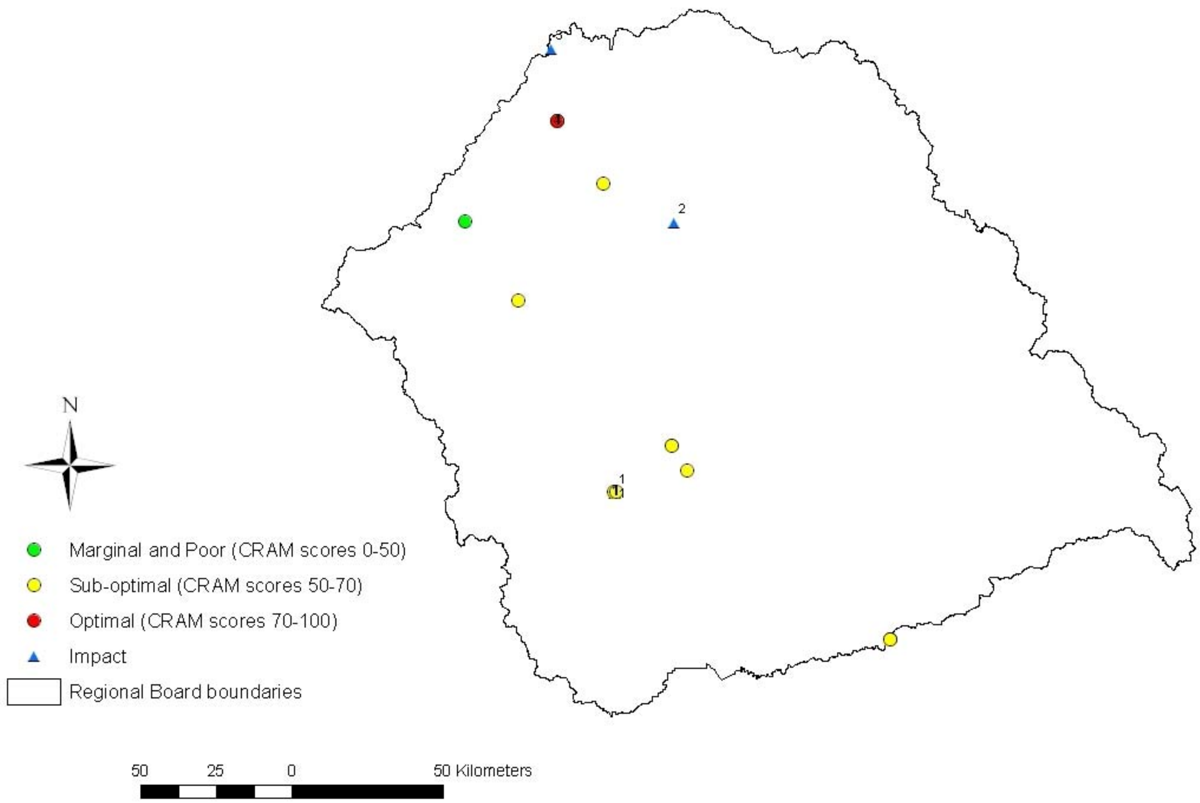


Figure 5-6. Distribution of overall CRAM scores for mitigation projects assessed across Sub-Region 5S and associated impact locations for off-site mitigation projects. Circles indicate individual mitigation actions; multiple points may be indicated for individual projects with multiple mitigation actions, and some points may represent multiple projects, e.g., mitigation banks. Numbers indicate paired impact and mitigation locations.

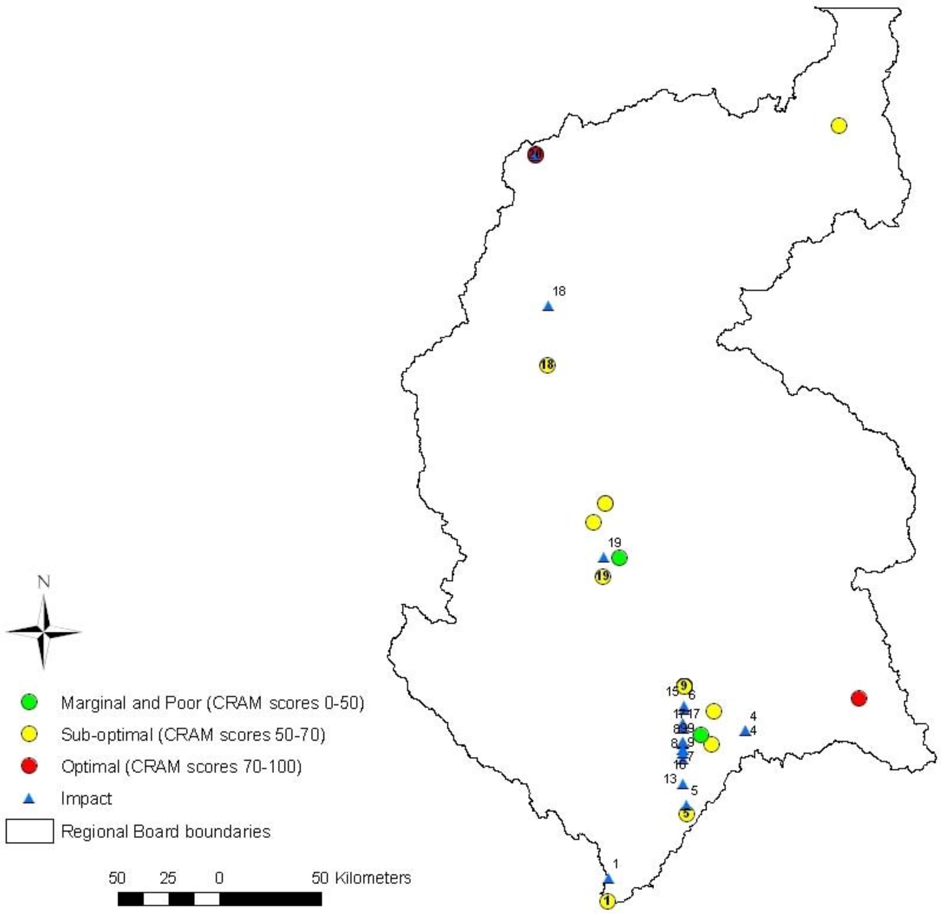


Figure 5-7. Distribution of overall CRAM scores for mitigation projects assessed across Sub-Region 5R and associated impact locations for off-site mitigation projects. Circles indicate individual mitigation actions; multiple points may be indicated for individual projects with multiple mitigation actions, and some points may represent multiple projects, e.g., mitigation banks. Numbers indicate paired impact and mitigation locations.

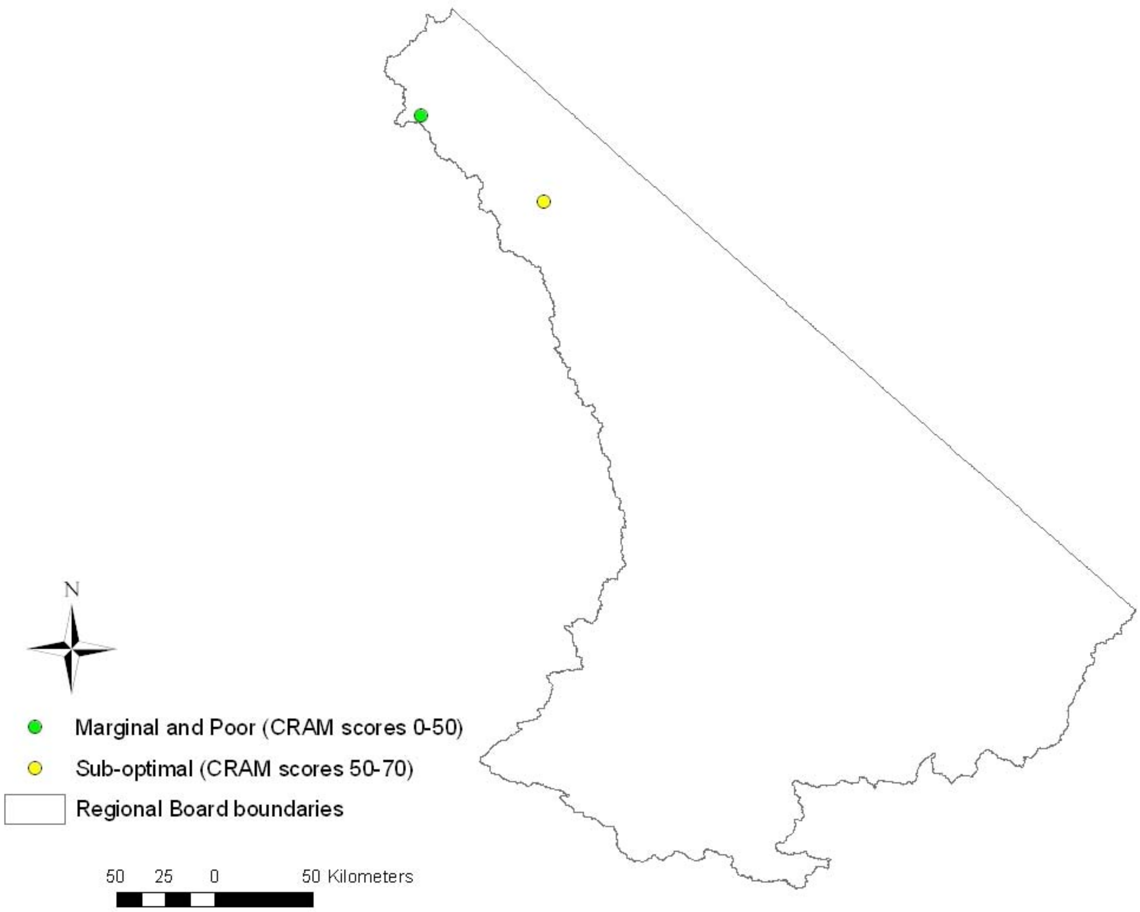
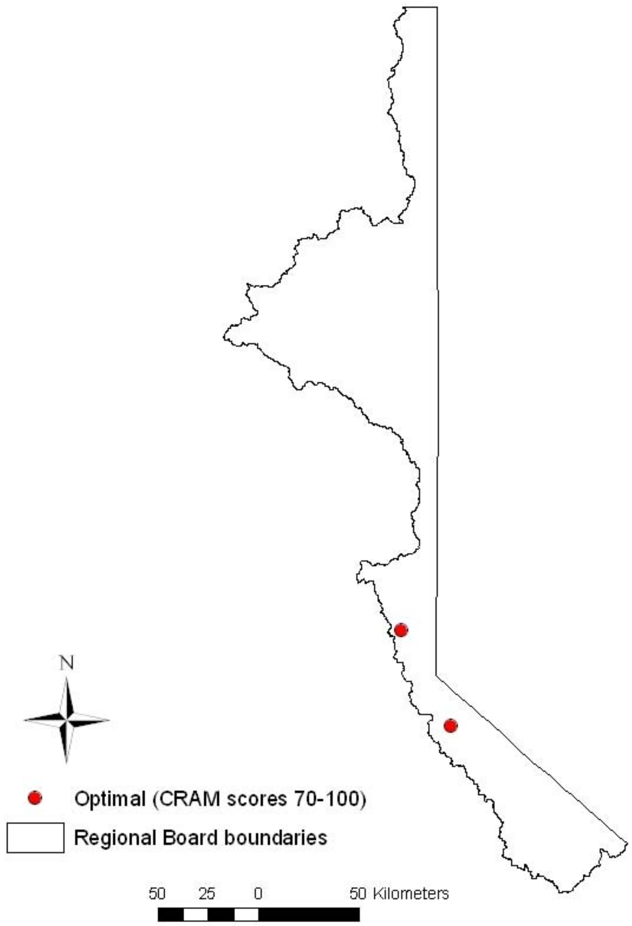


Figure 5-8. Distribution of overall CRAM scores for mitigation projects assessed across Sub-Region 6V. Circles indicate individual mitigation actions; multiple points may be indicated for individual projects with multiple mitigation actions, and some points may represent multiple projects, e.g., mitigation banks.



494 **Figure 5-9.** Distribution of overall CRAM scores for mitigation projects assessed across Sub-Region 6SLT. Circles indicate individual mitigation actions; multiple points may be indicated for individual projects with multiple mitigation actions, and some points may represent multiple projects, e.g., mitigation banks.

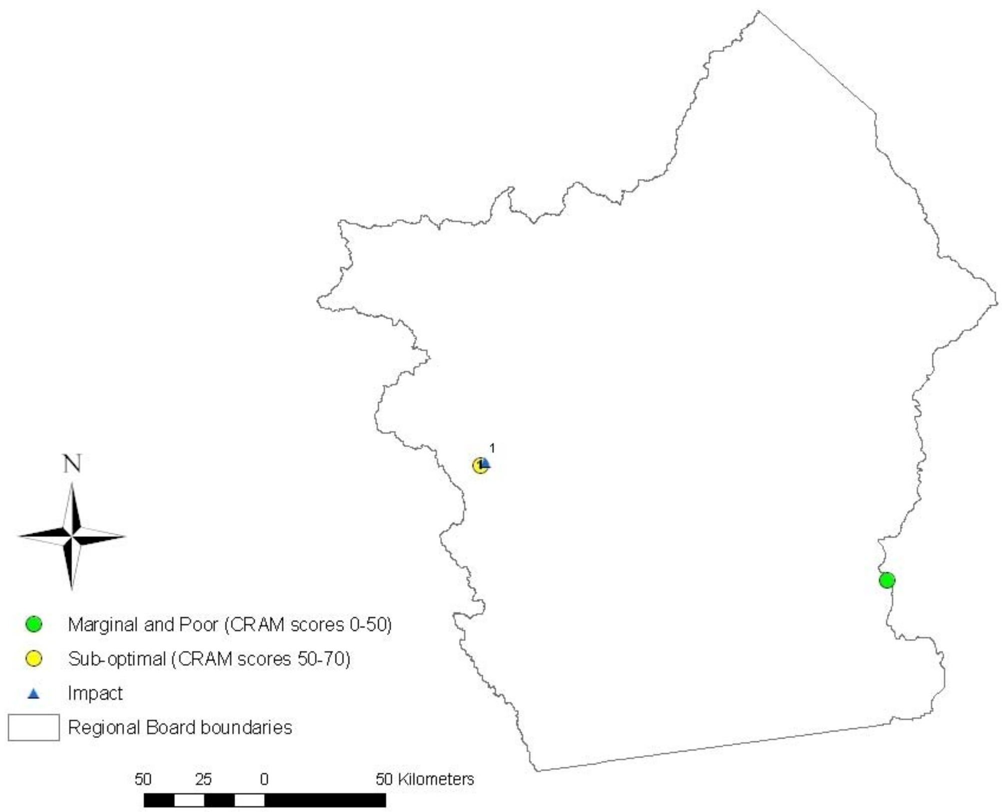


Figure 5-10. Distribution of overall CRAM scores for mitigation projects assessed across Region 7 and associated impact locations for off-site mitigation projects. Circles indicate individual mitigation actions; multiple points may be indicated for individual projects with multiple mitigation actions, and some points may represent multiple projects, e.g., mitigation banks. Numbers indicate paired impact and mitigation locations.

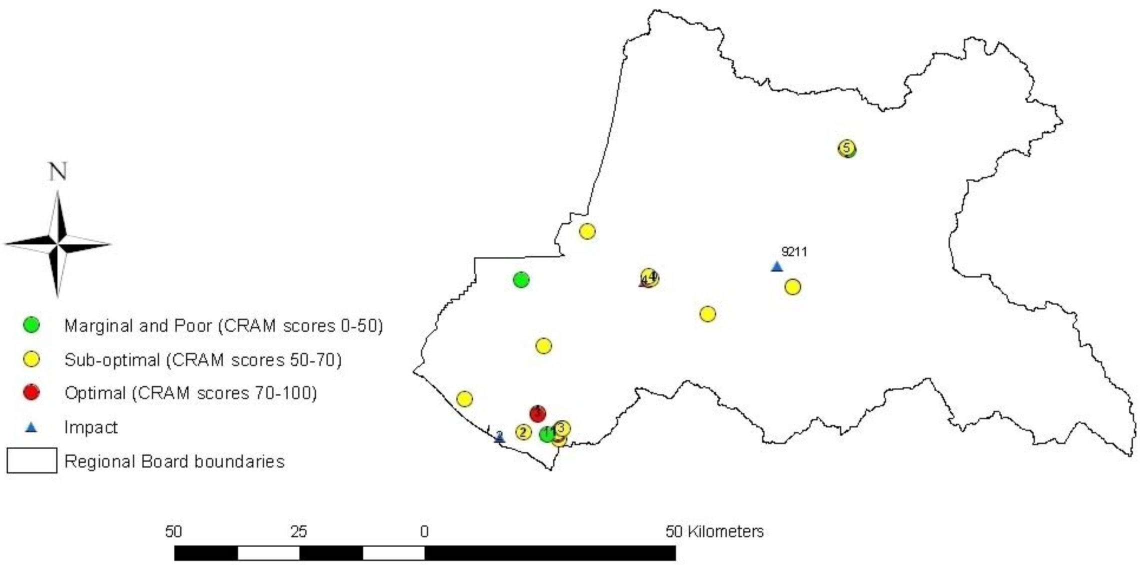


Figure 5-11. Distribution of overall CRAM scores for mitigation projects assessed across Region 8 and associated impact locations for off-site mitigation projects. Circles indicate individual mitigation actions; multiple points may be indicated for individual projects with multiple mitigation actions, and some points may represent multiple projects, e.g., mitigation banks. Numbers indicate paired impact and mitigation locations. The impact location for project #9211 is indicated separately because the impact occurred in Region 8 while the mitigation occurred in Region 4.

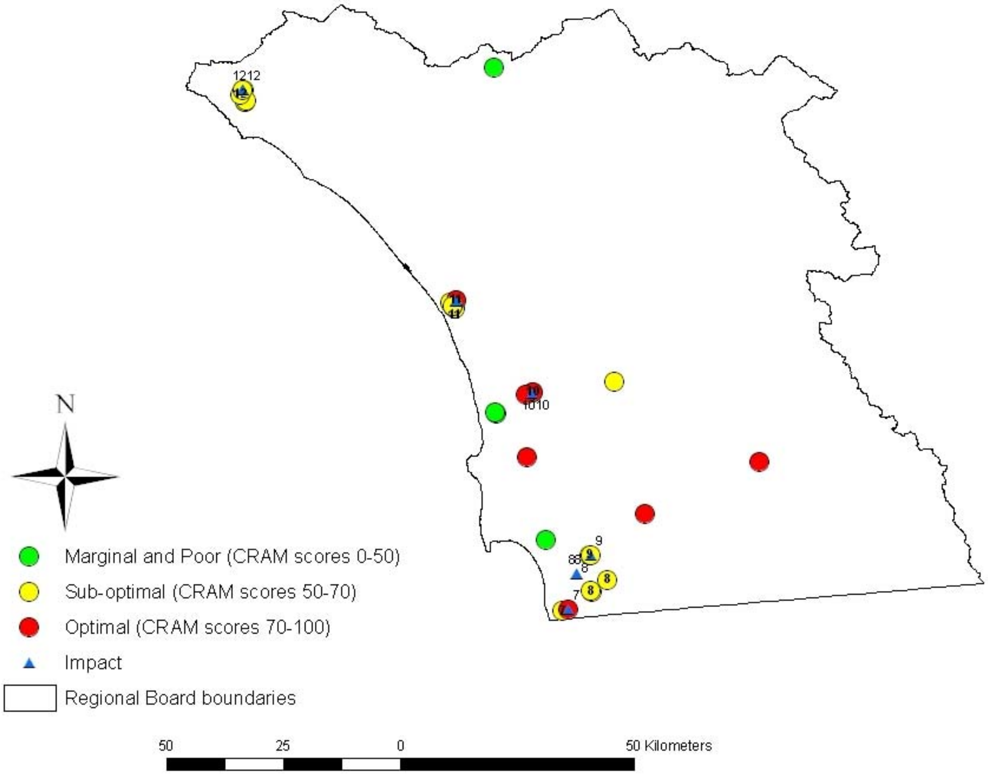


Figure 5-12. Distribution of overall CRAM scores for mitigation projects assessed across Region 9 and associated impact locations for off-site mitigation projects. Circles indicate individual mitigation actions; multiple points may be indicated for individual projects with multiple mitigation actions, and some points may represent multiple projects, e.g., mitigation banks. Numbers indicate paired impact and mitigation locations.

6. Detailed Permit Compliance Assessment Methodology

This appendix is divided into four sections that describe the selection, organization, scoring, and categorization of conditions.

6.1. Selection of permit conditions for inclusion in compliance assessments

In our compliance assessment, we checked for compliance with all relevant permit conditions issued by the three key agencies (RWQCB, ACOE, DFG), plus any additional conditions or performance criteria specified in the mitigation plan. We took this inclusive approach because it is implicit in the 401 certification or waiver that the permittee needs to comply with all other agency conditions as well as those specifically assigned by the Regional Board. In general, there were four categories of permit conditions found in these documents: procedural conditions (Table 6-1), avoidance and minimization conditions relating to the impact project and mitigation installation (Table 6-2), conditions focusing on the success of the mitigation site (Table 6-3), and mitigation plan, performance bond, and post-mitigation submission requirements (Table 6-4). In our compliance assessment, we focused only on those conditions falling within the latter two categories (Table 6-3 and Table 6-4) as only these are relevant to the objectives of this project. We searched the permit file paperwork for all relevant conditions in the latter two categories (conditions relating to mitigation success and conditions related to submission requirements) and entered each of these conditions into a form corresponding to the permit from which the condition was taken.

Table 6-1. Examples of procedural conditions were not assessed in this study. (The examples may be excerpts from the more complete text of the condition.)

Agency	Condition
RWQCB	The project construction shall be completed by [date].
Corps	Prior to project grading, the permittee shall contract with a qualified biologist/restoration specialist who shall oversee implementation of all features of the mitigation plan...
Corps	If any change of ownership occurs, the Corps must be notified of the new owner.
DFG	The Operator shall request an extension of this agreement prior to its termination if work is not completed by (date). The Operator may request a maximum of three extensions of this agreement of the purpose of construction.
DFG	The Operator shall submit a delineation according to Department jurisdiction prior to construction to the Department for review and approval.
DFG	The Operator shall have a qualified biologist survey the restoration site to monitor the recovery of wildlife and aquatic resources in the area following construction.
DFG	The Operator shall notify the Department in writing, at least 5 days prior to initiation of construction activities and at least 5 days prior to completion of construction activities.

Table 6-2. Examples of avoidance and minimization conditions that were not assessed in this study. (The examples may be excerpts from the more complete text of the condition.)

Agency	Condition
RWQCB	The project proponent shall adhere to the list of standard conditions.
Corps	Prior to any grading near sensitive biological resources, fencing shall be placed showing the limits of grading. The permittee shall assure that contractors are made aware of the sensitive areas.
DFG	Disturbance or removal of vegetation shall not exceed the limits approved by the Department.
DFG	The Operator shall flag the limits of the impact area to alert construction staff to the boundaries of the work areas so that impacts to riparian and upland habitat can be minimized.
DFG	Trees with active nests/roosts shall not be removed. Construction generated noise shall be less than 65 dbA within 500 feet of any active nest or roost.
DFG	No living native vegetation shall be removed from the channel, bed, or banks of the stream, except as otherwise provided for in this agreement.
DFG	In areas of temporary disturbance where vegetation must be removed, native trees and shrubs with DBMs of 3 inches or less shall be cut to ground level with hand operated power tools rather than by grading.
DFG	The operator must install X wildlife guzzlers [watering stations] within the designated open space [during project installation] to mitigate for impacts to wildlife associated with removing access to surface water.
DFG	No herbicides shall be used on native vegetation unless specifically authorized in writing
DFG	When possible, invasive species shall be removed by hand rather than by chemical means. Where the use of herbicides is necessary... only those… approved for aquatic use.
DFG	The Operator shall construct an effective water velocity dissipation devise at all outlet structures to minimize erosion.
DFG	The Operator shall have a qualified biologist monitor the site for [threatened or endangered species] prior to construction activities
DFG	Fill length, width, and height dimensions shall not exceed those of the original installation or the original naturally occurring topography, contour and elevation. Fill shall be limited to the minimal amount necessary to accomplish the agreed activities.
DFG	Unless specifically authorized by this agreement, all hard bank protection and energy dissipation structures shall consist of un-concreted boulder rip-rap, no [grouting or] concreted materials shall be used.

Table 6-3. Examples of mitigation success conditions that were assessed in this study. (The examples may be excerpts from the more complete text of the condition.)

Agency	Condition
RWQCB	The project proponent shall implement the mitigation measures as described in [title of mitigation plan]
RWQCB	The project proponent shall adhere to the more stringent conditions indicated in the CDFG's Streambed Alteration Agreement, and/or the Corps' [404] permit.
RWQCB	Impacted wetland and riparian habitats shall be mitigated at a minimum 2:1 replacement ratio.
RWQCB	Restore/Create X acres of [wetland] habitat
Corps	The permittee shall create the following habitats: X acres wetland...X acres riparian
Corps	The restoration site should include construction of a minimum of 6 check dams along the drainages to be restored. The area behind each check dam will be backfilled with appropriate soil and revegetated in accordance with the mitigation plan…
DFG	Restoration shall include the revegetation of stripped or exposed work and mitigation areas with vegetation native to the area.
DFG	A buffer of native vegetation averaging at least 100 feet in width shall extend along the mitigation area and all riparian and wetland drainages. The buffer shall serve to minimize the amount of light and noise and other human generated intrusions impacting wildlife in the corridor.
DFG	*Mitigation for areas of temporary disturbance*. A total of [X] acres of riparian habitat will be temporarily disturbed… Restoration shall include…
DFG	*Mitigation for areas of permanent disturbance*. A total of [X] acres of riparian habitat will be permanently lost…Restoration shall include…
DFG	Any oaks, sycamores [etc.] which must be damaged/removed shall be replaced in kind. Such conditions typically include dbh specifications, and mitigation ratios for the replacement of trees
DFG	Planting palette specifications…
DFG	All plants shall be planted in randomly spaced, naturally clumped patterns. The density shall… [criteria specified].
DFG	All planting shall have a minimum of 80% survival by species for the first year… [etc.].
DFG	The Operator shall provide irrigation when natural moisture conditions are inadequate to ensure survival of plants. Irrigation shall be provided for a period of at least two years from planting. Irrigation shall be phased out [afterwards]…all plants must survive and grow for at least three years without supplemental water for [the remainder of] the restoration phase…
DFG	The Operator shall remove any non-native vegetation [examples of species] from the work area and shall dispose of it in a manner and a location which prevents its reestablishment. Removal shall be done at least twice annually…
DFG	*Arundo*, if present, shall be cut to a height of 6 inches or less and the stumps painted with [Rodeo]…
DFG	All planting should be done between [date] and [date] to take advantage of the rainy season. Any planting done outside this time should be done at [higher planting density] to account for the likely mortality…
DFG	Plant material for revegetation shall be derived from cuttings, materials salvaged from disturbed areas, and/or seeds obtained from randomly selected native trees and shrubs occurring locally within the same drainage.
DFG	Any replacement tree/shrub stock which cannot be grown from cuttings or seeds shall be obtained from a native plant nursery, and shall not be inoculated to prevent heart rot.

Table 6-4. Examples of mitigation plan, performance bond, and post-mitigation submission requirement conditions that were assessed in this study. (The examples may be excerpts from the more complete text of the condition.)

Agency	Condition
RWQCB	All mitigation plans, monitoring and progress reports for the mitigation areas and/or compliance reports for the proposed activities shall be submitted to this regional board at the time each is due.
RWQCB	The proposed mitigation areas shall be preserved in perpetuity unless acceptable alternatives for mitigation and preservation are identified
Corps	The permittee must draft and submit a mitigation plan.
Corps	A deed restriction shall be recorded on the open space mitigation areas to protect fish and wildlife resources in perpetuity. The restriction should specifically prohibit…copy submitted to the Corps.
Corps	Prior to the recordation of the final tract map or issuance of the first grading permit, an agreement shall be entered into and financial security posted in the amount of ($$) guaranteeing the implementation, monitoring provisions and performance standards described herein…
DFG	An irrevocable letter of credit for the amount of restoration/mitigation [] and land costs for the project shall be submitted to the Department prior to the initiation of construction activities.
DFG	To protect fish and wildlife resources in perpetuity, the Department shall be named as a third party beneficiary over lands proposed for mitigation as part of the final mitigation plan and [over] the land to be dedicated as open space.
DFG	An annual report shall be submitted to the department by [date] of each year for 5 years after planting. This report shall include survival, percent cover, and height of both tree and shrub species. The number by species replaced, and overview of the revegetation effort, and the method used to assess these parameters shall also be included. Photos from pre-designated photo stations shall be included.

6.2. Conventions for the Organization and Standardization of Permit Conditions

In general, if a condition had lots of details that relate closely, we included all the details in that one condition. For example, Arundo-removal instructions that were a paragraph long were included in a single condition with the general exotic-plant removal instructions found in the permit, if these general instructions were present (see Exotic-plant-removal requirements below for more information). The following conventions were used for specific conditions and types of conditions:

Restore/Enhance/Create/Preserve a specified acreage of habitat, e.g.,:

• “*restore 0.06ac of temporary impacts to waters of the US and all other areas of temp disturbance*”
• “*create 0.71ac, restore 0.04ac, and enhance 0.18ac of Federal jurisdictional wetland habitat (0.93ac)*”
• “*create 3.99ac onsite for impacts to oak rip habitat*”
• “*create 2.24ac onsite for impacts to oak rip habitat willow/mulefat riparian habitat*”

We included type of mitigation action required and acreage over which it was required ((e.g., *create 5ac wetland habitat*) in one condition. Then, we listed details of the mitigation actions required as separate conditions when they were distinct requirements, even if they were listed in a single sentence or paragraph, e.g., the following three conditions were listed in a single sentence in the permit and they were listed as three separate conditions on the datasheet because the requirements were different (i.e., one was a mitigation action over a specified acreage, the next was a description of a specific restoration action, and the last one was a type of plant palette):

• “*restore 0.06ac of temporary impacts to waters of the US and all other areas of temp disturbance*”
• “*restoration to include revegetation of stripped or exposed areas*”
• “*revegetation to use species native to the area*”

Coverage and Survivorship Performance standards for multiple years, e.g.,:

• “*all plantings shall have 60% cover after year 1, 80% cover after year 2, 100% cover after year 3*”
• “*all plantings should have survivorship of 70% after year 1 and 100% survivorship thereafter*”
• “*all planting min 80% survival, by species, 1st yr and 100% survival thereafter and/or shall attain 75% cover after 3yrs and 90% cover after 5yrs for life of project; replacement plantings, if requirements not met, and monitoring of replacements*”
• “*density perf stand p11*”
• “*diversity perf stand p11*”

We included standards for all years and plant species in one condition, except in the following case: if cover and survivorship criteria were listed separately in the permits for mitigation areas or habitat types, we listed them as separate conditions for each mitigation area or habitat type. In addition, we listed coverage and survivorship requirements as two conditions for each mitigation area and/or habitat type.

Mitigation Plan and Annual Monitoring Report submission requirements, e.g.,:
• “*submit annual monitoring reports by Jan 1st for 5 yrs after planting documenting success of all restoration and mitigation efforts, including % survival by plant species and % cover, discussion of any monitoring activities and exotic plant control efforts, photos:*”
• “*prior to starting project, submit mitigation and monitoring plan which needs to be approved by the SWRCB*”

We included all details related to each plan/report in one condition.

As-Built Report submission requirements, e.g.,:
• “*w/i 6 wks of completion of plant installatn, submit as-built report to FG and COE describing installed condition of rest sites and including drawings of rest sites*”
• “*submit as-built report w/i 90d of site prep and planting*”

We included this condition only if the As-Built Report refered to the <u>mitigation</u> project. Usually, if this condition was listed in the Mitigation Plan, then it refered to the mitigation project which means it was included. If the condition refered to as As-Built Report of the <u>impact</u> project or if the aspect of the project to which the report applied is not specified, we did not include this condition, for example:

• “*as-blt plan to be included in 1st annual report*” (We did not include this condition because it was not specified whether the plan refered to impact or mitigation construction and this condition was not listed in the Mitigation Plan)
• “*submit w/in 60d of completion of waters/wetlands as-blt construction drawings w/ an overlay of waters/wetlands impacted and areas to be preserved and summary of project activities which documents authorized impacts not exceed and condns complied w/*” (We did not include this condition because it refered to the impact project and avoidance/minimization measures)

Plant palette, e.g.,:
• “*Plants: western ragweed (Ambrosia psilostachya), mugwort (Artemisia douglasiana), CA brome (Bromus carinatus), Coast goldenbush (Isocoma menzisii), Purple needlegrass (Nassella pulchra), White sage (Salvia apiana), Coyote bush, Laurel sumac, CA walnut:*”

We listed all species in one condition, except in the following cases:
1) If plant palettes were listed separately in the permits for different types of planting (e.g., hydroseeding, container plantings, and plant cuttings), we also listed plant palettes in separate conditions, e.g.,:

• “*rest area plant palette: canopy: western syc, arroyo willow, mulefat, fremont's cottonwood; understory: mugwort, grape, morning glory, Douglas' nightshade*”
• “*creat area plant palette: western syc, arroyo willow, mexican elderberry, fremont's cottonwood in canopy, mulefat, common fiddleneck, douglas' nightshade, sticky monkey flower, wild rose*”

2) If mitigation types/areas were listed separately in permits (e.g., enhance 1ac riparian habitat, create 1ac wetland habitat) and plant palettes were listed separately in permits (e.g., riparian planting palette, wetland planting palette), we listed plant palettes in separate conditions for each mitigation type/area.

Contingency conditions (mitigation requirements for unanticipated impacts, in case they happen), e.g.,:
• *"if impacts exceed marked boundaries, impacts shall be mitigation at a 5:1 ratio"*
• *"if oak trees are removed, replace them at a 10:1 ratio"*
• *"if pesticides/herbicides need to be used, permittee shall use only those pesticides/herbicides approved for aquatic use"*
• *"Integrated Pest Management is preferred for dealing with pest problems, if they arise"*
• *"if coverage and survival performance standards have not been met, replacement planting must be done and monitoring continued for five years after these replantings."*
• *"no supplemental irrig after planting anticipated to be needed; but hand watering of transplants may occur depending on weather patterns"*
• *"if stream's low-flow channel, bed, or banks altered w/i areas of temp disturbance, return as nearly as possible to original configuration and width, w/o creating future erosion problems"*

We did not include these conditions, unless there was evidence in the file that the condition applied (i.e., the impacts did exceed the marked boundaries, the oak trees were removed, or pesticides/herbicides did need to be used). If there was evidence in the file to confirm that these conditions did apply (a rare circumstance), then we included the conditions and scored them like all the other conditions.

Maintenance and Monitoring conditions, e.g.,:
• *"maintenance and monitoring for 5yrs, including data gather for determining reveg success, recommendations for remedial actions, and reporting"*
• *"survey plants monthly for 1yr after installatn, then quarterly for next 2yrs"*
• *"replace dead or diseased plants during 1st suitable growing season"*
• *"maint over 5-yr period to include operation and maint of drip irrig system, weed and exotic plant control, plant replacement to guarantee successful rest efforts, and incidental maintenance as necessary to ensure proper hydrologic conditions are achieved"*
• *"submit project completion report, that includes postproject photos properly identified, w/in 30d of construction completion"*

We included all details for maintenance or monitoring in one condition, unless maintenance conditions had specific performance criteria, e.g., these two conditions were listed separately:

• *"maintain mit area free of exotic plant species for the entire 5yr maintenance and monitoring period"*
• *"remove non-native vegetation, including castor bean and arundo, 2x annually"*

We listed maintenance conditions separately from monitoring conditions, unless maintenance and monitoring overlapped mostly, in which case, we included all details for both in one condition (as in the first example above). Some of these conditions were contingency conditions and were treated as all the other contingency conditions (i.e., we included only if there was evidence to confirm that the condition did apply).

Specific planting instructions, e.g.,:
• *"apply coarse, organic, weed- and disease-free mulch at least 1" deep, topdressing around the exposed collar and inside entire basin area"*
• *"use random hand seeding method rather than hydroseeding"*
• *"willow cuttings to be minimum of 12" in length and have two side branches or buds"*

We list all closely related details describing one requirement as a single condition (as in first example above wherein all details related to the mulch and its application). If planting instructions were highly specific and dealt with installation and not with the source of the plant material, they were not included, e.g.,:

• *"plants should be planted at 6" deep"*
• *"plants should be watered before planting"*

Planting material source requirements, e.g.,:

• *"willow woodland plant materials: cuttings, salvaged plants, salvaged mature trees, bare-root nursery stock; willow and cottonwood cuttings to be taken from areas of abandoned channel to be filled"*
• *"all plants to be native to site or to northern San Diego Cty; materials other than seed salvaged from site or purchased from native plant nursery located w/i 50 mi of site in coastal So CA; seed collected from coastal locations w/i 50mi of project site"*
• *"any replacement tree/stock unavailable as cuttings to be obtained from native plant nursery and not inoculated to prevent heart rot"*

We included all these details as one condition. Contingency measures having to do with material sources were treated like all other contingency measures (i.e., we included them only if there was evidence to confirm that the condition did apply), e.g.,:

• *"if plant material cannot be derived from cuttings, then use locally collected seed material and contract with a local nursery to grow the plants."*

Planting density conditions, e.g.,:
• *"plants to be planted in naturally clumped randomly distributed patterns"*
• Planting density requirements specified for each plant (often presented in tables with each species and its required spacing is listed)
• *"plant plants in natural looking patterns so that each species is distributed throughout planting area as appropriate; may arrange by microclimates, as determined appropriate"*

We listed different density requirements separately. For example, "planting in naturally clumped patterns" and "planting at 10' on-center" were listed as two conditions. We listed density requirements for different species in one condition, except in the following case: if planting density requirements were listed separately for various planting areas/mitigation sites, we listed them as separate conditions.

Exotic-plant-removal requirements, e.g.,:
• *"weed control to continue throughout the 5yr monitoring period, including for the following anticipated species: giant reed, acacia, mustard, selloa pampas grass, filaree/storksbill, eucalyptus, sweet fennel, tree tobacco, castor bean, peruvian pepper"*
• *"all weed species to be controlled for a min of 2yrs, or to extent necessary to prevent detrimental competition w/ desirable plants"*
• *"use herbicides approved for aquatic use when needed in stream bed, banks or channel of stream"*
• *"where possible, use mechanical rather than chemical means to remove non-native veg"*
• *"remove any non-native veg in work area and dispose of it in manner which prevents reestablishment; removal at least 2x annually during spring/summer season, as needed, through term of rest; special instructions for giant cane removal (details condn #48 ["Arundo should be cut to 6" by hand, then sprayed with an herbicide...])"*

We included all species to be removed in one condition along with the frequency of exotic plant removal. We included special instructions for Arundo (giant cane) removal in the same condition as instructions for all other non-native-plant removal. We listed details for different removal types (i.e., mechanical and chemical) as separate conditions.

Irrigation requirements, e.g.,:
• *"temporary irrigation system should be installed for first two years of planting"*
• *"irrig when natural moisture condns inadequate to ensure survival of plants and for at least 2yrs from planting, then phased out during fall/winter of 2nd yr unless unusually severe condns threaten survival of plantings"*
• *"install temp irrig system in PA 34 as determined appropriate by Rest Specialist; decrease irrig at 2yrs and discontinue at 3yrs following plant installation; use drip irrig; deep water plants 2-3x/ wk through 1st 3-5, unless rainfall frequent"*
• *"temp drip irrig system constructed; irrig 100% phased out by 4 yrs"*

We included details of irrigation (e.g., frequency, depth, duration) in one condition. Some parts of these requirements were contingency conditions and were treated as such (i.e., we included them only if there is evidence to confirm that the condition did apply).

Protection measures for mitigation sites, e.g.,:
• *“6' high vinyl-coated chain link fence to be constructed along outer edge of channel top plantings”*
• *“predator fencing adjacent to natural open spaces”*

We included these conditions, if they had to do specifically with the mitigation project and success thereof.

Timing of mitigation installation, e.g.,:
• *“implement rest program concurrently w/, or immediately after site, site grading”*
• *“any rest/planting done by 2.1.1996”*

We included these conditions, if they had to do with the mitigation project and its success specifically. We included only the end-point timing requirements and did not include specifics of mitigation installation scheduling which are displayed often in tables, e.g.,:

• *“offsite weed removal to begin fall 2000 and planting winter 2000…”*

Miscellaneous conditions required as part of mitigation project:
• *“installation of 42-" culvert under Street "A" to facilitate wildlife movement btw open space areas”*

We included these conditions, if they dealt specifically with the mitigation project and the success thereof.

Erosion-control measures, e.g.,:
• *"areas of disturbed soils w/ slopes towards the stream to be stabilized to reduce erosion potential"*
• *"stablize slopes toward stream from erosion via veg or non-erodible material"*
• *"rock, riprap, or other erosion protection to be placed in areas where veg cannot reasonably be expected to become reestablished"*
• *"mix of native grasses to be used to reveg banks of drain to prevent erosion and provide habitat for wildlife"*
• *"all areas disturbed by project activities shall be protected from washout or erosion"*
• *"erosion control and soil stabilization; all erosion control structures maintained and soil stabilization measures performed until reveg results in adequate protective cover; landslides, gullying, blowouts prevented; topsoil maintained in stable condition"*

We included these conditions when they refered to the mitigation site or mitigation activities, such as restoration of temporary impacts.

6.3. Scoring Conventions used in the Compliance Assessments

Compliance was assessed using one of two approaches, depending on the nature of the permit conditions. The first approach was for permit conditions with outcomes that can be measured as continuous variables. For determinations of compliance with conditions concerning acreage, survivorship, or percent cover (or any other situation in which the variable is continuous in nature), the score was calculated percentage relative to the desired outcome. For example, if the targeted cover was 80% and cover on the site was assessed as 60%, then the compliance score would be 60/80=75%. Percentages greater than 100% were scored as 100%. The second approach was for permit conditions with outcomes measured categorically (Table 6-5). A description of these scoring categories is provided in Table 6-6.

We employed some additional conventions in scoring conditions. Firstly, if evidence could not be found on the site (or by review of monitoring reports or other sources of information) that actions were undertaken to comply with a permit condition, then that condition must be scored as “cannot be determined.” However, there may be situations where there is some evidence that an attempt was made to comply with the permit condition, but the extent of the attempt is not obvious. Every effort should be made to investigate the extent of the effort, and best professional judgment formed about the extent of the effort. However, if significant uncertainty remains, then the condition must be scored as “cannot be determined.” Permit compliance should not be downgraded because evidence of compliance has not persisted until our assessment.

Secondly, although in theory survivorship or percent cover can be measured and a precise estimate of %compliance determined, there may be situations where it is difficult to make an accurate estimate of cover or survivorship with a high degree of certainty. In these cases, the scoring categories could be used, since they represent a wider range of values (and hence it is easier to incorporate uncertainty into them).

Thirdly, for scoring, we wrote the actual percentage score. If there were multiple mitigation sites or actions that apply to a particular condition, record separate compliance assessments for each unless a single score can unambiguously be applied to both. In the analysis, the average will be used (e.g., if scores of 100% and 25% for two sites, the score to be analyzed will be 65.5%).

Table 6-5. Scoring table and criterion for permit conditions with outcomes measured categorically.

Compliance Rating	Met	Mostly Met	Partially Met	Mostly Not Met	Not Met	Can Not Be Determined
	A	B	C	D	E	
Condition # 1	100%	75%	50%	25%	0%	ND

Table 6-6. Description of compliance ratings used in evaluating conditions.

Rating	Description
Condition Met	Condition has been met or exceeded. For conditions concerning actions to be taken, the actions were completed as specified. For conditions concerning biological performance, the desired outcome has been achieved; for example, the desired vegetation community has developed fully and completely. Note: compliance with the condition must evaluate only aspects of biological performance that were actually included in the condition, not general ecological condition or function. This category is reserved for situations where the permit condition has been clearly and unambiguously achieved. Any signs of diminished compliance success would need to be inconsequential to score in this category (e.g., < 1% deviation).
Condition Mostly Met	Clear evidence that relevant actions were undertaken, but with some limitations or shortfalls in the expected level of effort or outcome. For conditions concerning actions to be taken, the actions were undertaken but were less than required by the permit. For conditions concerning biological performance, the outcome was mostly but not quite completely achieved; for example, survivorship or cover nearly achieved the levels prescribed in the permit, or the desired vegetation community developed, but not quite as fully as prescribed in the permit. Compliance with the condition must evaluate only aspects of biological performance that were actually included in the condition, not general ecological condition or function.
Condition Partially Met	Evidence that relevant actions were undertaken, but the level of effort or outcome falling notably short of expectations. For conditions concerning actions to be taken, the actions were undertaken but were substantially less than required by the permit. For conditions concerning biological performance, the outcome was substantially less than desired; for example, the number of trees planted fell somewhat short of expectations, or the desired vegetation community developed, but was in poorer condition than prescribed in the permit. Compliance with the condition must evaluate only aspects of biological performance that were actually included in the condition, not general ecological condition or function.
Condition Somewhat Met	Evidence that relevant actions were undertaken, but with a level of effort or outcome falling substantially short of expectations. For conditions concerning actions to be taken, there is some evidence that the actions were undertaken but at a small fraction of the effort required by the permit. For conditions concerning biological performance, the outcome was much less than desired; for example, the desired vegetation community was barely present. Compliance with the condition must evaluate only aspects of biological performance that were actually included in the condition, not general ecological condition or function.
Condition Not Met	Clear evidence of non-compliance. For conditions concerning actions to be taken, it is clear that essentially no attempt was make to comply with the permit condition. For conditions concerning biological performance, there may be evidence that efforts were made to comply with the condition, but these efforts completely failed to achieve the desired outcome; for example, the desired vegetation community was absent or the site was completely dominated by exotic species. This category is reserved for situations where the permit condition has clearly and unambiguously **not** been achieved.
Cannot Be Determined	No evidence to confirm or deny that relevant actions were undertaken. Because the "cannot be determined" category is likely to be used frequently, and because there are a number of different reasons why a condition might not be assessable, this category will have a number of checkboxes to refine it. The checkboxes will include: (1) Cannot be assessed because prescribed action would not have left evidence of its completion (e.g., mulching, old hydroseeding); (2) cannot be assessed because condition is time-dependent (e.g., 50% cover by year 3 when the assessment occurs in year 10); (3) there is evidence of some attempt to comply with the condition, but full compliance cannot be determined.

6.4. Categorization of Permit Conditions

For this analysis, the various permit conditions were organized into 9 categories. In Excel, each permit condition was assigned a categorization code according to the conventions given in Table 6-7:

Table 6-7. Descriptions, codes, and examples for categories into which permit conditions were placed.

Code	Category	Description	Examples
1	3rd Party Mitigation Requirements	This code was assigned any time there was a mitigation bank payment, in lieu fee payment or, occasionally, a 3rd party issue that didn't involve clear $ or credits. This code does not apply to payments to educational funds (those go into Code 9 – other).	Compensate for the filling of wetlands by purchasing 3.7 shares (equal to .37 acre) of recently created seasonal wetlands at the Wikiup Mitigation Bank; $25,000 to the Wright Preservation Bank
2	Acreage	This code was assigned for any non -3rd party mitigation acreage including preservation areas, but we were careful to avoid acreage requirements for buffer areas…they went into Code 5-protection. Occasionally the information was in square feet or involved some *area* of habitat without a specific acreage.	Create 3 acre of wetlands at the south borrow area within the landfill property; Create 0.34 acres of vernal swale by excavating uplands in the northern boundary of the property
3	Project Implementation	This was for any of the conditions having to do with the main mitigation tasks, including mitigation site preparation and implementation of the mitigation actions. Examples of site preparation are: installation of irrigation, grading the site, removing invasives prior to planting, removing trash, etc, and aspects of project design. Examples of implementation are: follow the plant palette, use only locally grown/ obtained/ native plants or seeds, hydroseed the banks with natives, planting densities, statements that "restoration" will be done, irrigation of plants during their establishment phase, plus any timing requirements clearly having to do with planting during optimal conditions. Other timing conditions that are more administrative in nature (e.g. must complete all mitigation activities by [date]) did not go in this category and were assigned Code 7 instead. Condtions requiring removal of invasives or non-natives concurrent with plantings were included here. Requirements for follow-up invasive control or remedial plantings would not be included here, but would be placed	A clay liner will be placed or the submaterial compacted to 95% to reduce infiltration; Wetland plants will be brought in from local nurseries, native trees planted in setback area (150' wide along Windsor Ck); installatn of efficient irrig systems that minimize runoff; application of mulch in landscaped areas to improve water holding capacity of soils; remove invasive weeds, including giant reed, salt cedar, tree tobacco, castor bean, Russian thistle, star thistle, artichoke thistle, pampas grass, fountain grass, or cocklebur, as required by FG

Code	Category	Description	Examples
		in the site maintenance category instead.	
4	Site Maintenance	This category included all ongoing maintenance conditions that dictated maintenance actions to be taken at the mitigation site after the initial project implementation.	dead saplings shall be replaced after 1yr; remove accumulated sediment/debris in designated clean-out areas to ensure continued health of oak trees
5	Site Protection	This is used for conditions meant to protect the site from humans, livestock, erosion, overflow/runoff or harmful chemicals. Examples are installing fences, educational signage, reseeding for slope protection or erosion control, any other erosion control measures, keeping runoff from entering the site restricting use of herbicides. Conditions mandating that buffers be established also go into this category.	~5ac to remain as natural open space: ~3.3ac oak woodland along East Windsor Ck and 1.7ac of creek setback averaging 150' in width along Windsor Ck, Construct a 1000 foot long earthen berm, Punch in straw, native seed/mulch/fertilizer mix, soil stabilizing emulsion on the upslope buffer area for erosion control
6	Success and Performance Standards	Anything having to do with vegetative or hydrological success.	There should be a slow, gradual organic matter increase in restored pools and swales, Erosion along the swale / pool sides slopes during the wet season shall not exceed 1/10 inch per month, Existing special status plant populations (Sebastopol Meadowfoam) should increase over time so that they are more widely distributed within probable habitat locations, created wetlands to represent 3 wetland classes
7	Monitoring and Submission	This category includes all monitoring and submission conditions that are administrative in nature and don't involve specific actions that will occur at the mitigation site. Examples: monitor site for X years, project overseen by professional, annual reports submitted, mitigation plan submitted, proof of deeds, payments, or easements submitted, deeds developed, or preserved in perpetuity, etc. In addition any timing requirements that do not clearly relate to planting during optimal conditions are placed in this category.	provide proof of purchase documents for required creation and pres mit credits purchased from an approved Wetland Mit Bank, Monitoring will begin in November, 1997 and continue for 5 years (details p15), A report summarizing the vegetation sampling and all data sheets and labeled photos is to be filed by the end of each year, beginning in 1997, identify location of mit clearly on a map of suitable quality and defined by latitude and longitude; this info to be submitted to RB prior to any disturbance w/i waters of the US
8	Invocation		Follow the mitigation plan; Follow F&G SAA
9	Other		restore disturbed areas to pre-project conditions to max extent possible (including revegetation of stripped or exposed areas with native species)

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7. Supplemental CRAM Results

Contained in this appendix are all the miscellaneous CRAM methods, and results that were too detailed to be included in the main report.

Table 7-1. Breakdown of + / - categories for overall CRAM metrics scores by wetland class.

COASTAL LAGOON							
Physical Patch Richness		**Biotic Patch Richness**		**% Non-Native Plant Species**		**Native Plant Species Richness**	
A+	96 - 100	A+	88 - 100	A+	0 - 3	A+	9 and up
A	90 - 65	A	75 - 87	A	4 - 6	A	7 - 8
A-	85 - 89	A-	61 - 74	A-	7 - 9	B	5 - 6
B+	73 - 84	B+	58 - 60	B+	10 - 11	C	3 - 4
B	59 - 72	B	54 - 57	B	12 - 13	D	1 - 2
B-	45 - 58	B-	51 - 53	B-	14 - 15	D-	0
C+	41 - 44	C+	47 - 50	C+	16 - 18		
C	37 - 40	C	42 - 46	C	19 - 22		
C-	33 - 36	C-	37 - 41	C-	23 - 25		
D+	23 - 32	D+	25 - 36	D+	26 - 50		
D	12 - 22	D	13 - 24	D	51 - 75		
D-	0 - 11	D-	0 - 12	D-	76 - 100		
DEPRESSIONAL							
Physical Patch Richness		**Biotic Patch Richness**		**% Non-Native Plant Species**		**Native Plant Species Richness**	
A+	96 - 100	A+	87 - 100	A+	0 - 3	A+	9 and up
A	90 - 65	A	71 - 86	A	4 - 6	A	7 - 8
A-	85 - 89	A-	57 - 70	A-	7 - 9	B	5 - 6
B+	73 - 84	B+	54 - 56	B+	10 - 11	C	3 - 4
B	59 - 72	B	51 - 53	B	12 - 13	D	1 - 2
B-	45 - 58	B-	48 - 50	B-	14 - 15	D-	0
C+	41 - 44	C+	40 - 47	C+	16 - 18		
C	37 - 40	C	31 - 39	C	19 - 22		
C-	33 - 36	C-	22 - 30	C-	23 - 25		
D+	23 - 32	D+	15 - 21	D+	26 - 50		
D	12 - 22	D	8 - 14	D	51 - 75		
D-	0 - 11	D-	0 - 7	D-	76 - 100		
ESTUARINE							
Physical Patch Richness		**Biotic Patch Richness**		**% Non-Native Plant Species**		**Native Plant Species Richness**	
A+	96 - 100	A+	88 - 100	A+	0 - 1	A+	6 and up
A	91 - 95	A	75 - 87	A	2 - 3	A	5
A-	86 - 90	A-	61 - 74	A-	4 - 6	B	4
B+	79 - 85	B+	58 - 60	B+	7 - 8	C	3
B	71 - 78	B	54 - 57	B	9 - 10	D	2
B-	63 - 70	B-	51 - 53	B-	11 - 13	D-	0 - 1
C+	58 - 62	C+	47 - 50	C+	14 - 15		
C	52 - 57	C	42 - 46	C	16 - 17		
C-	46 - 51	C-	37 - 41	C-	18 - 19		

D+	31 - 45	D+	25 - 36	D+	20 - 46		
D	16 - 30	D	13 - 24	D	47 - 73		
D-	0 - 15	D-	0 - 12	D-	74 - 100		

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LACUSTRINE							
Physical Patch Richness		**Biotic Patch Richness**		**% Non-Native Plant Species**		**Native Plant Species Richness**	
A+	89 - 100	A+	88 - 100	A+	0 - 3	A+	9 and up
A	77 - 88	A	75 - 87	A	4 - 6	A	7 - 8
A-	65 - 76	A-	61 - 74	A-	7 - 9	B	5 - 6
B+	60 - 64	B+	58 - 60	B+	10 - 11	C	3 - 4
B	54 - 59	B	54 - 57	B	12 - 13	D	1 - 2
B-	48 - 53	B-	51 - 53	B-	14 - 15	D-	0
C+	42 - 47	C+	47 - 50	C+	16 - 18		
C	37 - 41	C	42 - 46	C	19 - 22		
C-	32 - 36	C-	37 - 41	C-	23 - 25		
D+	22 - 31	D+	25 - 36	D+	26 - 50		
D	11 - 21	D	13 - 24	D	51 - 75		
D-	0 - 10	D-	0 - 12	D-	76 - 100		
RIVERINE HIGH							
Physical Patch Richness		**Biotic Patch Richness**		**% Non-Native Plant Species**		**Native Plant Species Richness**	
A+	96 - 100	A+	93 - 100	A+	0 - 3	A+	9 and up
A	91 - 95	A	85 - 92	A	4 - 6	A	7 - 8
A-	86 - 90	A-	76 - 84	A-	7 - 9	B	5 - 6
B+	79 - 85	B+	73 - 75	B+	10 - 11	C	3 - 4
B	71 - 78	B	70 - 72	B	12 - 13	D	1 - 2
B-	63 - 70	B-	67 - 69	B-	14 - 15	D-	0
C+	58 - 62	C+	64 - 66	C+	16 - 18		
C	52 - 57	C	61 - 63	C	19 - 22		
C-	46 - 51	C-	57 - 60	C-	23 - 25		
D+	31 - 45	D+	38 - 56	D+	26 - 50		
D	16 - 30	D	19 - 37	D	51 - 75		
D-	0 - 15	D-	0 - 18	D-	76 - 100		
RIVERINE LOW							
Physical Patch Richness		**Biotic Patch Richness**		**% Non-Native Plant Species**		**Native Plant Species Richness**	
A+	89 - 100	A+	88 - 100	A+	0 - 3	A+	9 and up
A	77 - 88	A	75 - 87	A	4 - 6	A	7 - 8
A-	65 - 76	A-	61 - 74	A-	7 - 9	B	5 - 6
B+	60 - 64	B+	58 - 60	B+	10 - 11	C	3 - 4
B	54 - 59	B	54 - 57	B	12 - 13	D	1 - 2
B-	48 - 53	B-	51 - 53	B-	14 - 15	D-	0
C+	42 - 47	C+	47 - 50	C+	16 - 18		
C	37 - 41	C	42 - 46	C	19 - 22		
C-	32 - 36	C-	37 - 41	C-	23 - 25		
D+	22 - 31	D+	25 - 36	D+	26 - 50		
D	11 - 21	D	13 - 24	D	51 - 75		
D-	0 - 10	D-	0 - 12	D-	76 - 100		

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SEEP / SPRING							
Physical Patch Richness		**Biotic Patch Richness**		**% Non-Native Plant Species**		**Native Plant Species Richness**	
A+	73 - 100	A+	88 - 100	A+	0 - 3	A+	9 and up
A	45 - 72	A	75 - 87	A	4 - 6	A	7 - 8
A-	16 - 44	A-	61 - 74	A-	7 - 9	B	5 - 6
B+	15	B+	60	B+	10 - 11	C	3 - 4
B	13 - 14	B	59	B	12 - 13	D	1 - 2
B-	11 - 12	B-	58	B-	14 - 15	D-	0
C+	10	C+	57	C+	16 - 18		
C	8 - 9	C	56	C	19 - 22		
C-	6 - 7	C-	54 - 55	C-	23 - 25		
D+	4 - 5	D+	36 - 53	D+	26 - 50		
D	2 - 3	D	18 - 35	D	51 - 75		
D-	0 - 1	D-	0 - 17	D-	76 - 100		

VERNAL POOL							
Physical Patch Richness		**Biotic Patch Richness**		**% Non-Native Plant Species**		**Native Plant Species Richness**	
A+	93 - 100	A+	92 - 100	A	0	A+	5 and up
A	84 - 92	A	81 - 91	B+	1 - 6	A	4
A-	76 - 83	A-	72 - 80	B	7 - 14	B	3
B+	68 - 75	B+	63 - 71	B-	15 - 20	C	2
B	59 - 67	B	53 - 62	C+	21 - 26	D	1
B-	51 - 58	B-	44 - 52	C	27 - 34	D-	0
C+	43 - 50	C+	35 - 43	C-	35 - 40		
C	34 - 42	C	24 - 34	D+	41 - 60		
C-	26 - 33	C-	15 - 23	D	61 - 80		
D+	18 - 25	D+	10 - 14	D-	81 - 100		
D	8 - 17	D	5 - 9				
D-	0 - 7	D-	0 - 4				

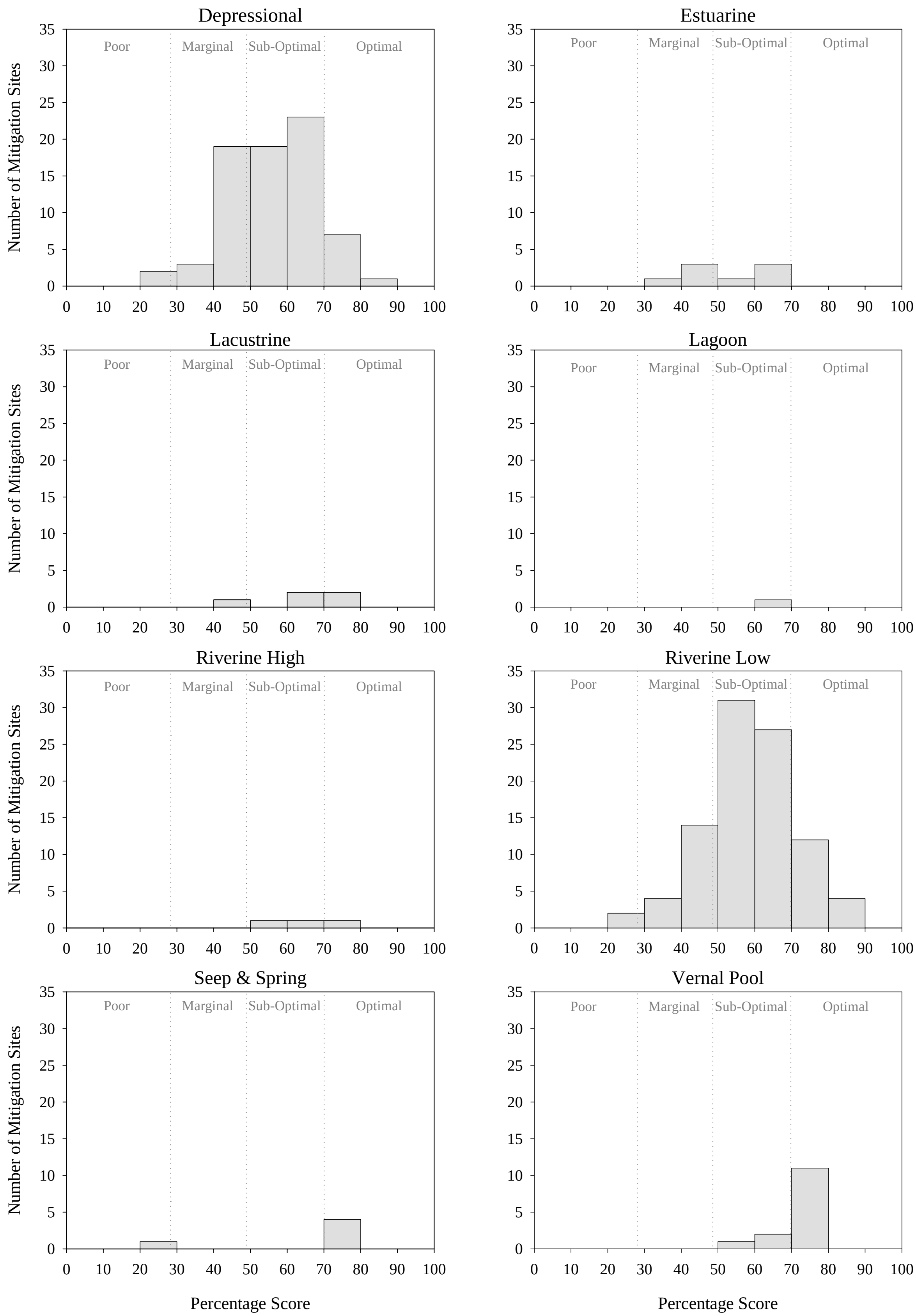


Figure 7-1. All data combined into a single functional success score by wetland class for each of the 204 mitigation sites representing 129 files evaluated using CRAM.

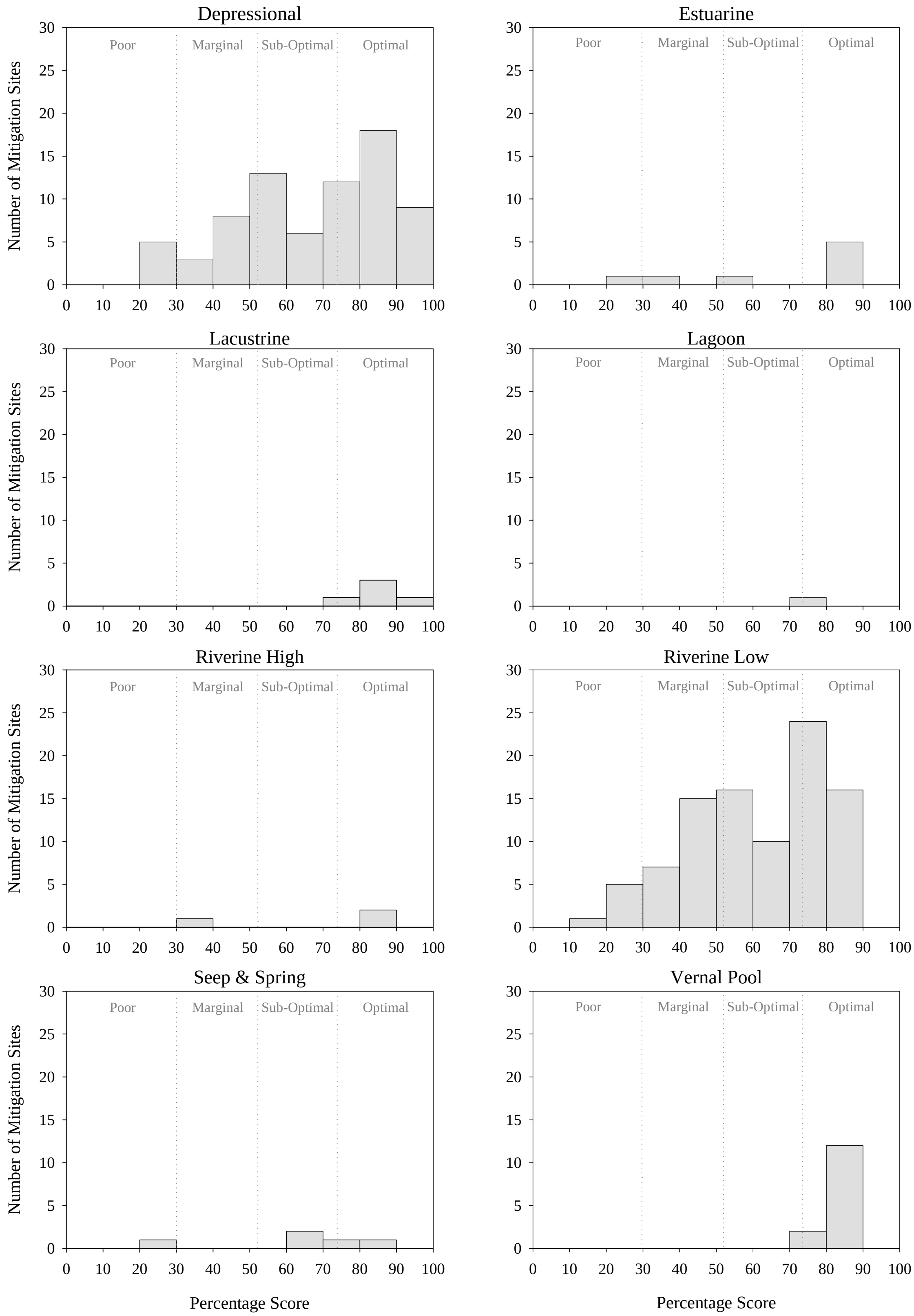


Figure 7-2. All connectivity, percent of assessment area with buffer, average buffer width, and buffer condition data combined into a single landscape context score by wetland class for each of the 204 mitigation sites representing 129 files.

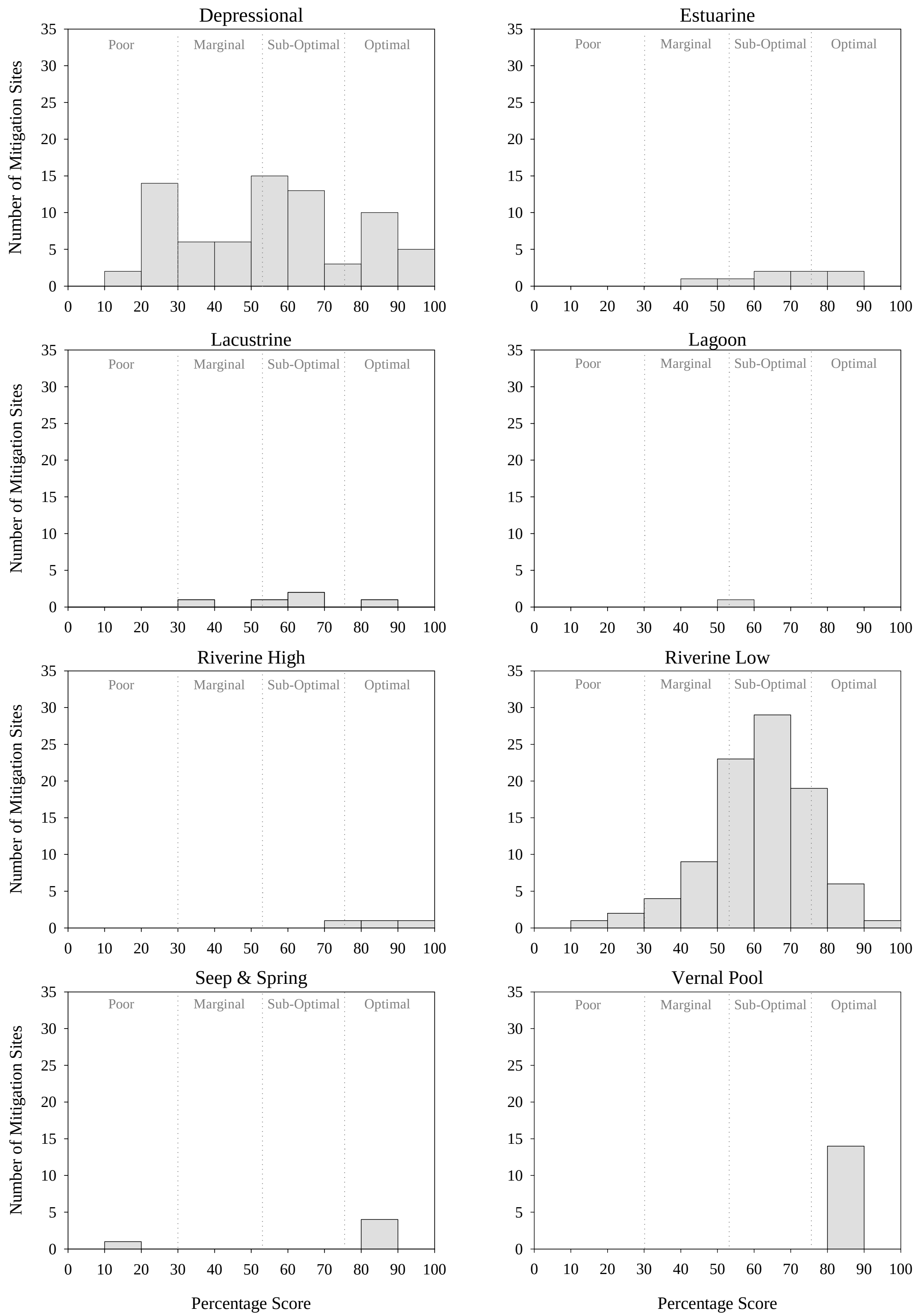


Figure 7-3. All water source, hydroperiod, and hydrologic connectivity data combined into a single hydrology score by wetland class for each of the 204 mitigation sites representing 129 files evaluated using CRAM.

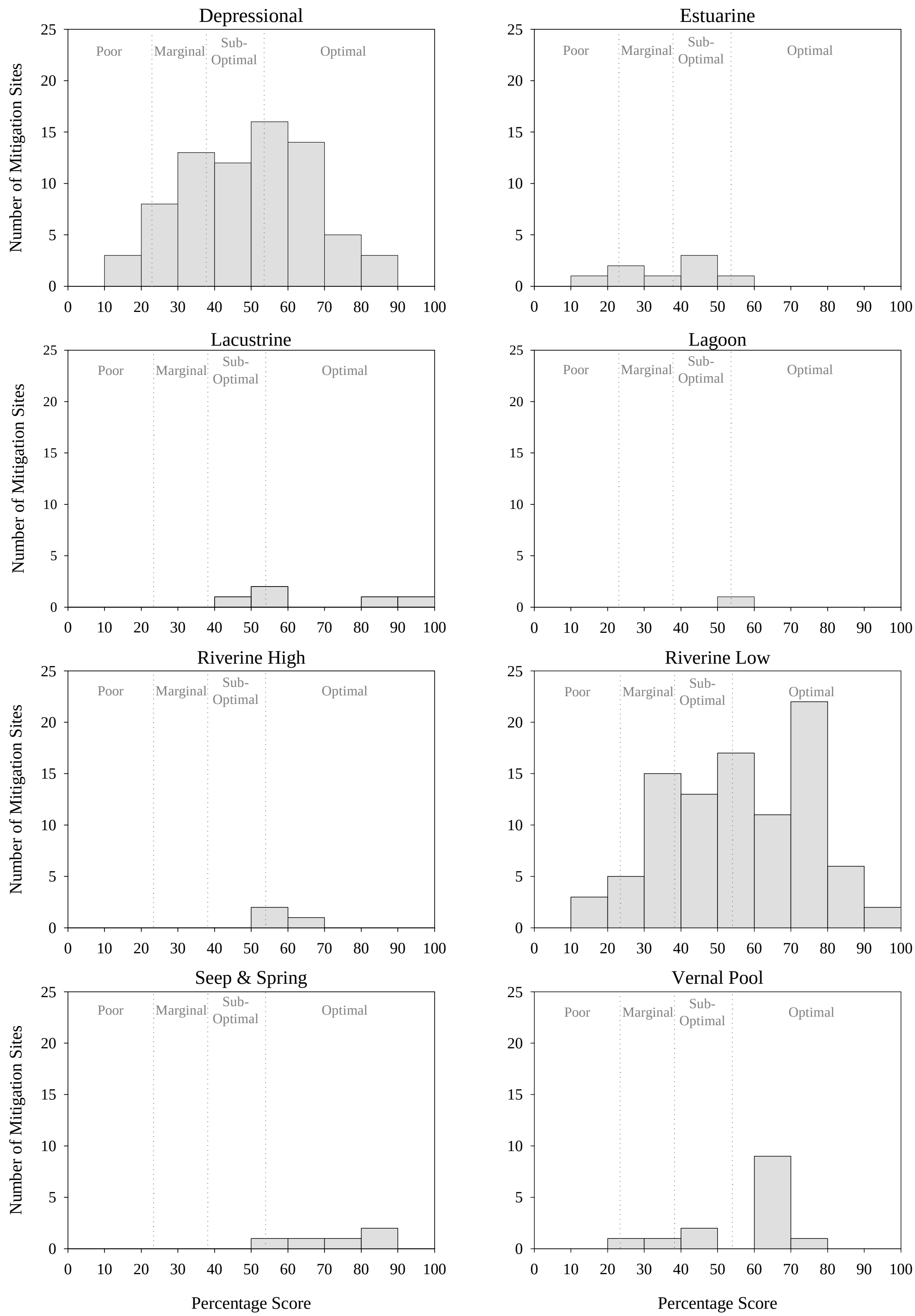


Figure 7-4. All physical patch richness and topographic complexity data combined into a single physical structure score by wetland class for each of the 204 mitigation sites representing 129 files evaluated using CRAM.

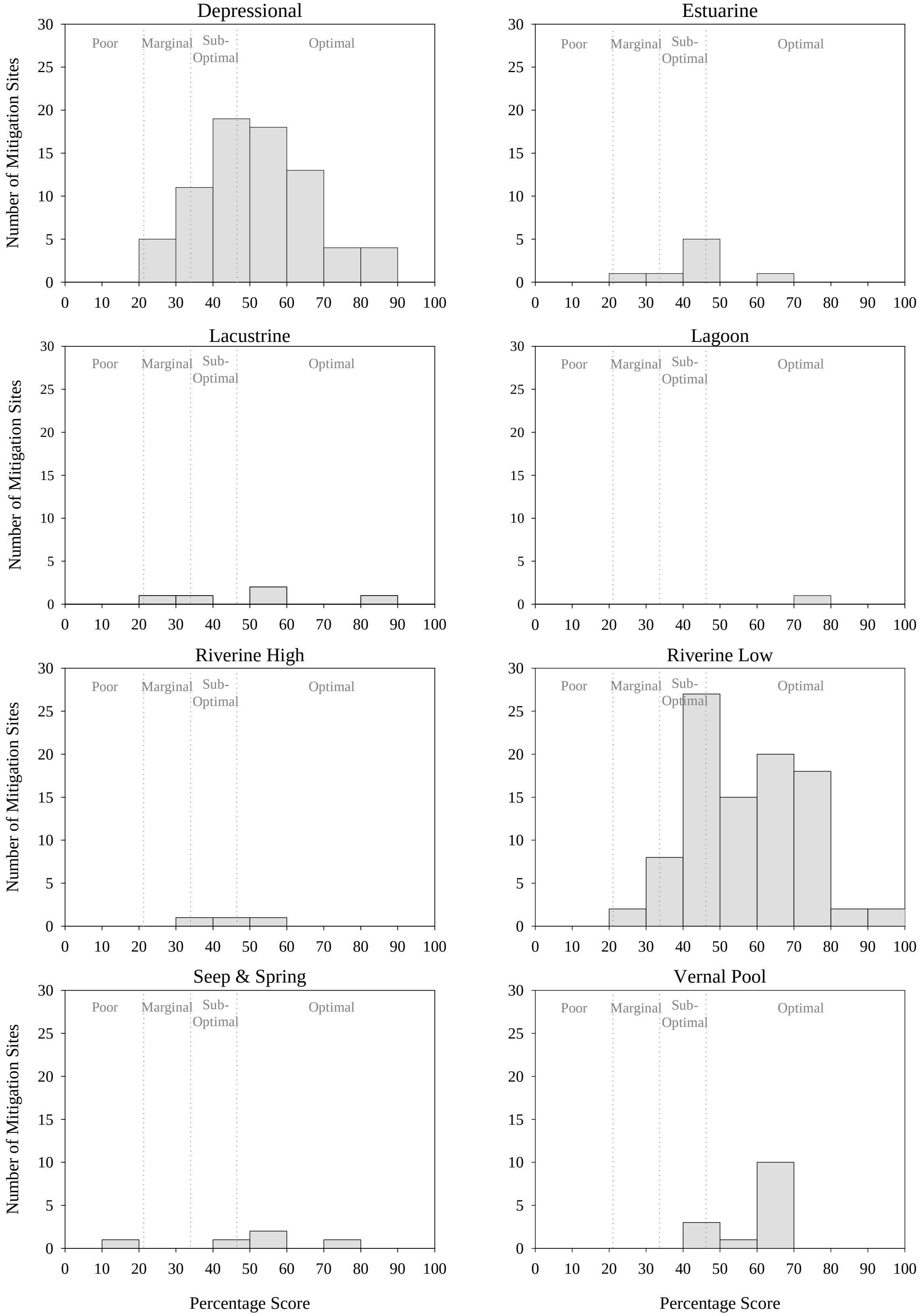
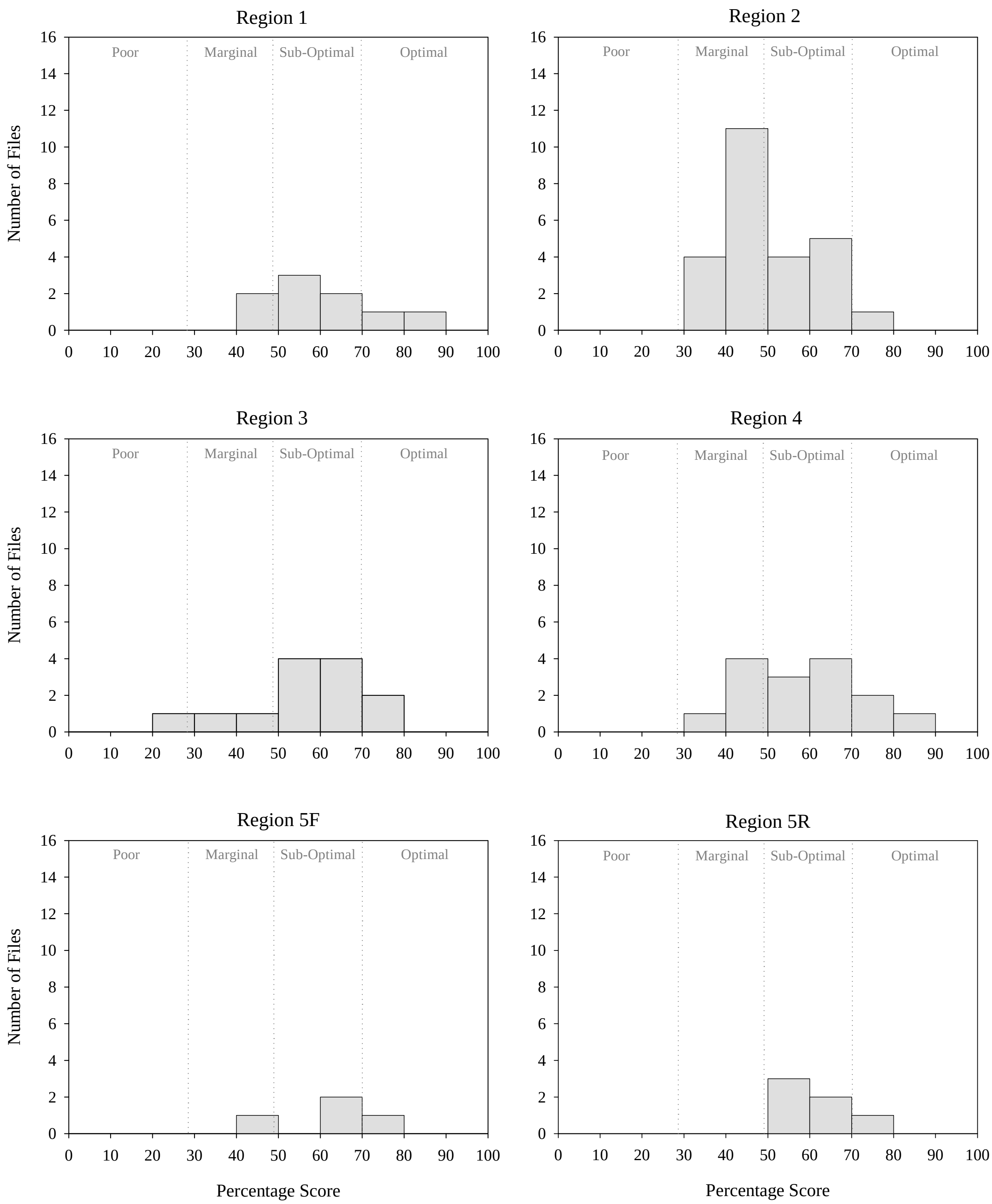


Figure 7-5. Organic matter accumulation, biotic patch richness, vertical structure, interspersion/zonation, % non-native plant species, and native plant species richness data combined into one biotic structure score by wetland class (N=204 mitigation sites).


Region 1
Region 2
Region 3
Region 4
Region 5F
Region 5R
Poor
Marginal
Sub-Optimal
Optimal
Number of Files
Percentage Score
0
10
20
30
40
50
60
70
80
90
100
0
2
4
6
8
10
12
14
16

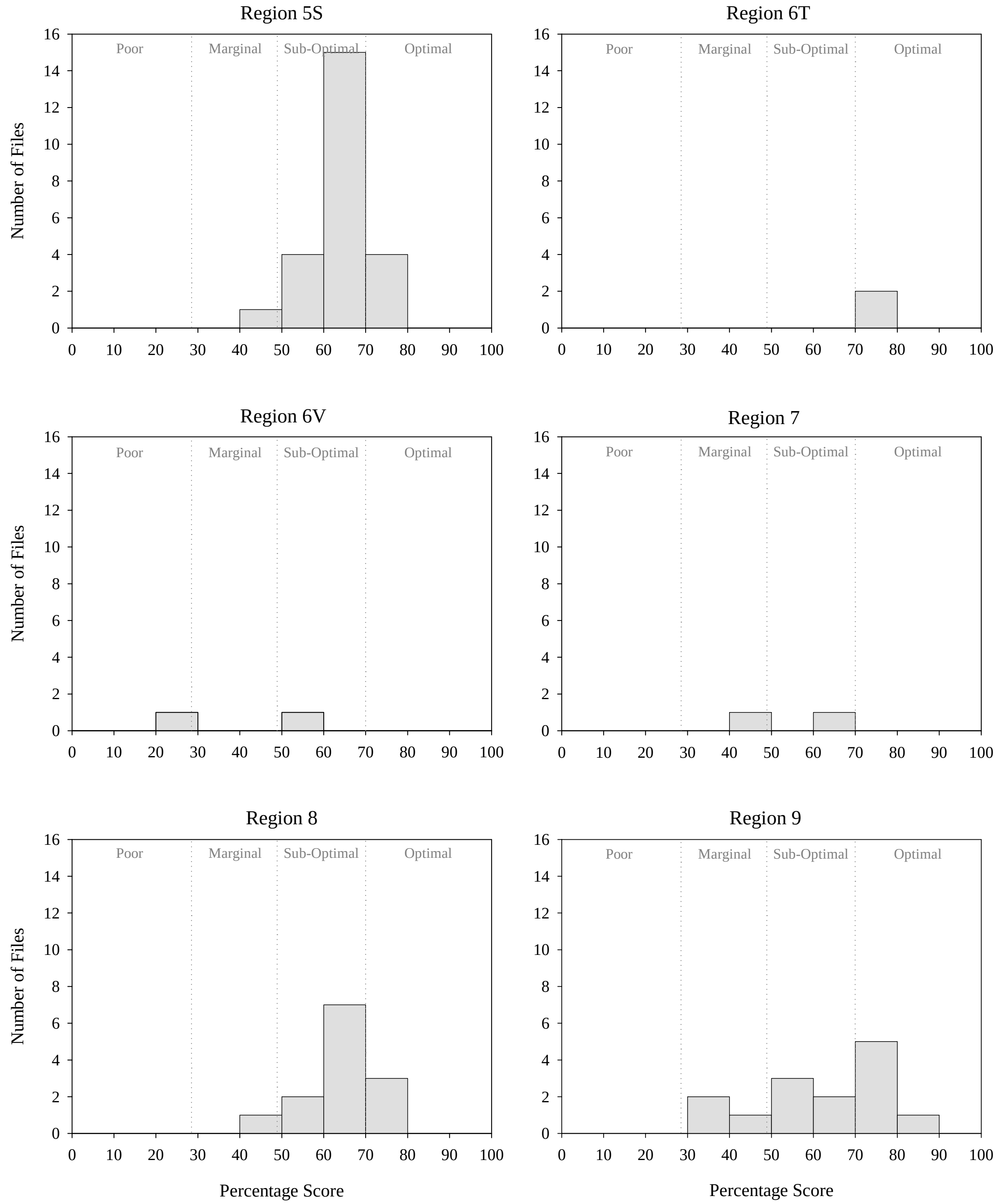
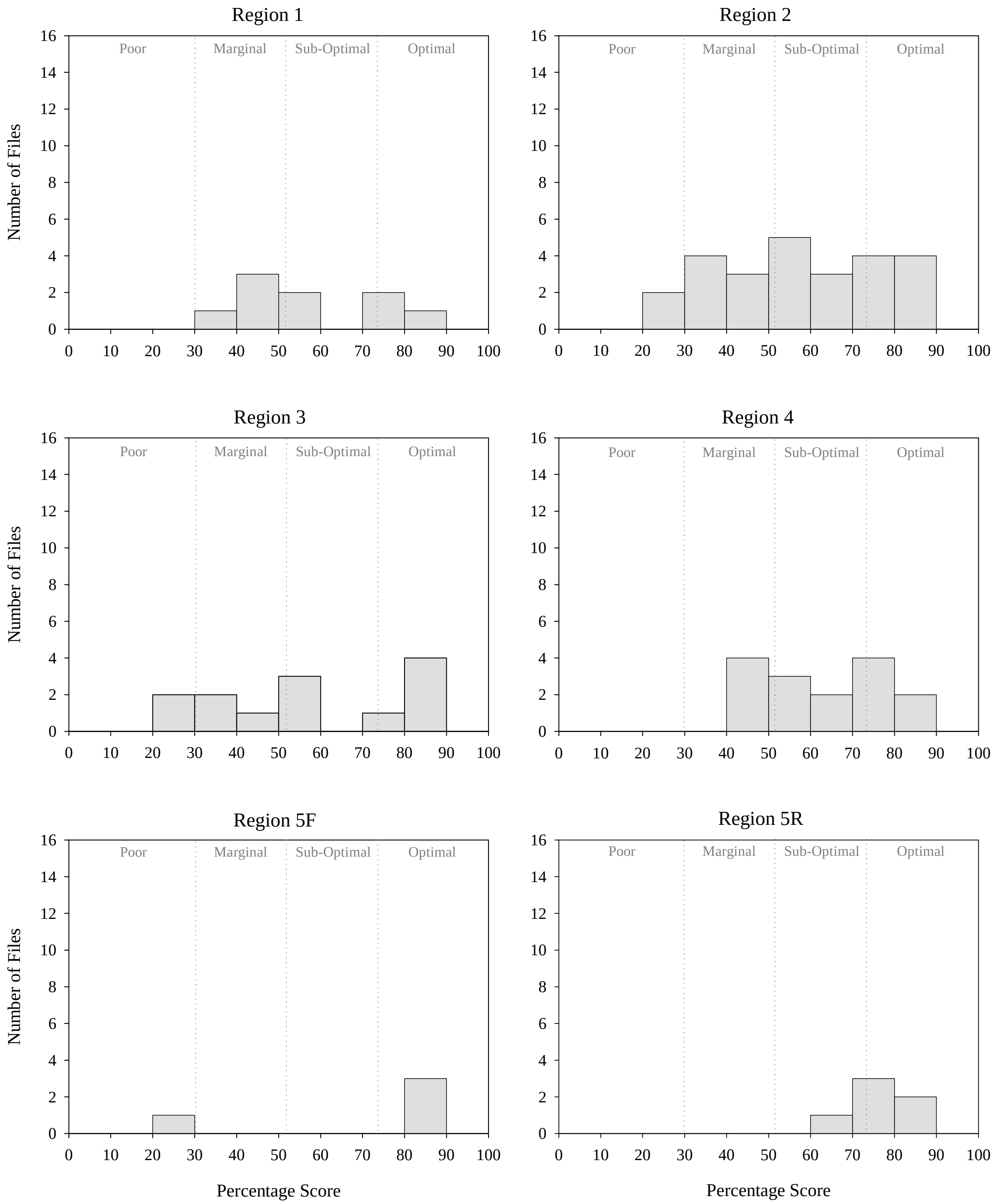


Figure 7-6. All data combined into a single functional success score by state board regions for each of the 129 files evaluated using CRAM.


Region 1
Region 2
Region 3
Region 4
Region 5F
Region 5R
Poor
Marginal
Sub-Optimal
Optimal
Number of Files
Percentage Score
0
2
4
6
8
10
12
14
16
0
10
20
30
40
50
60
70
80
90
100

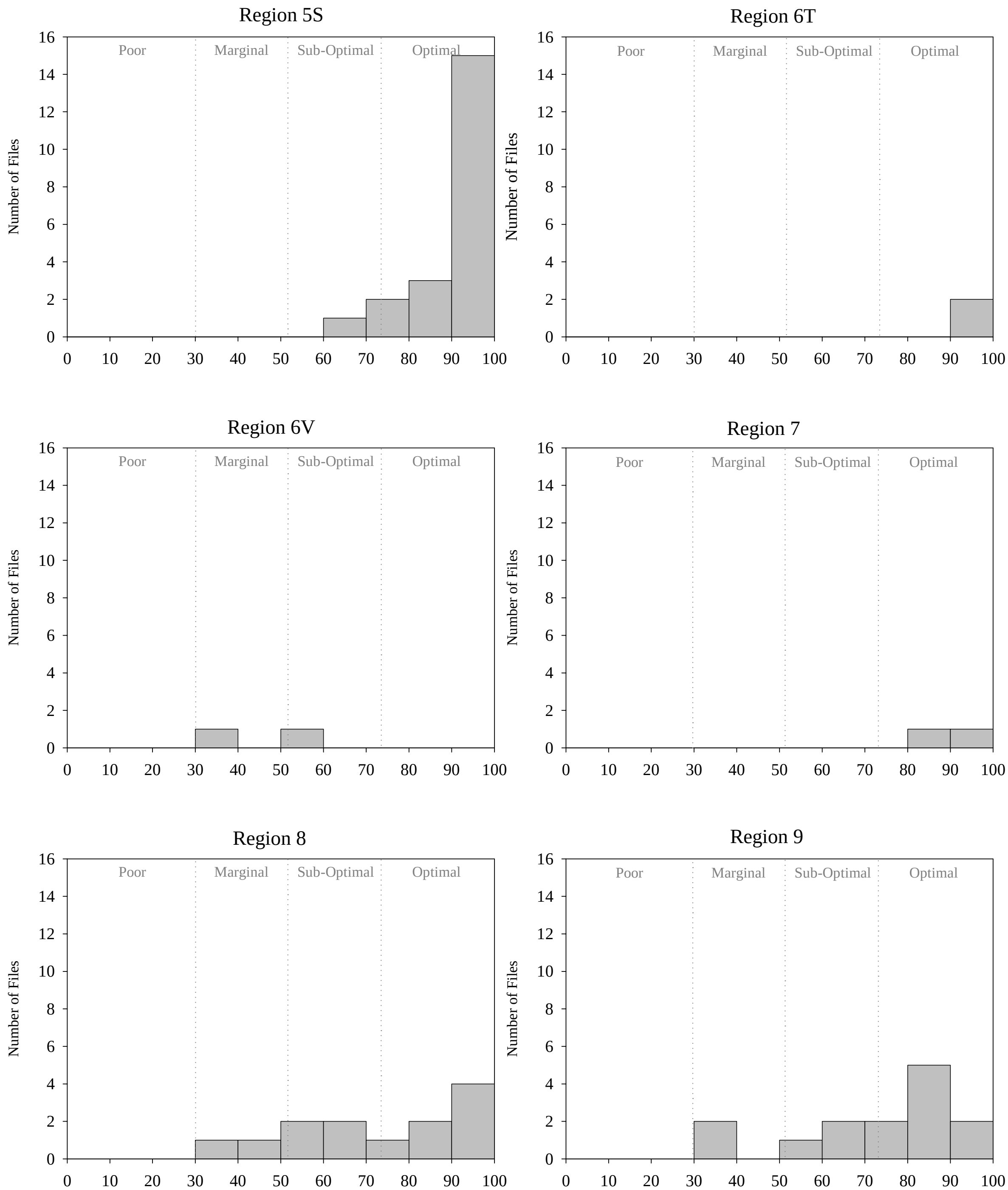
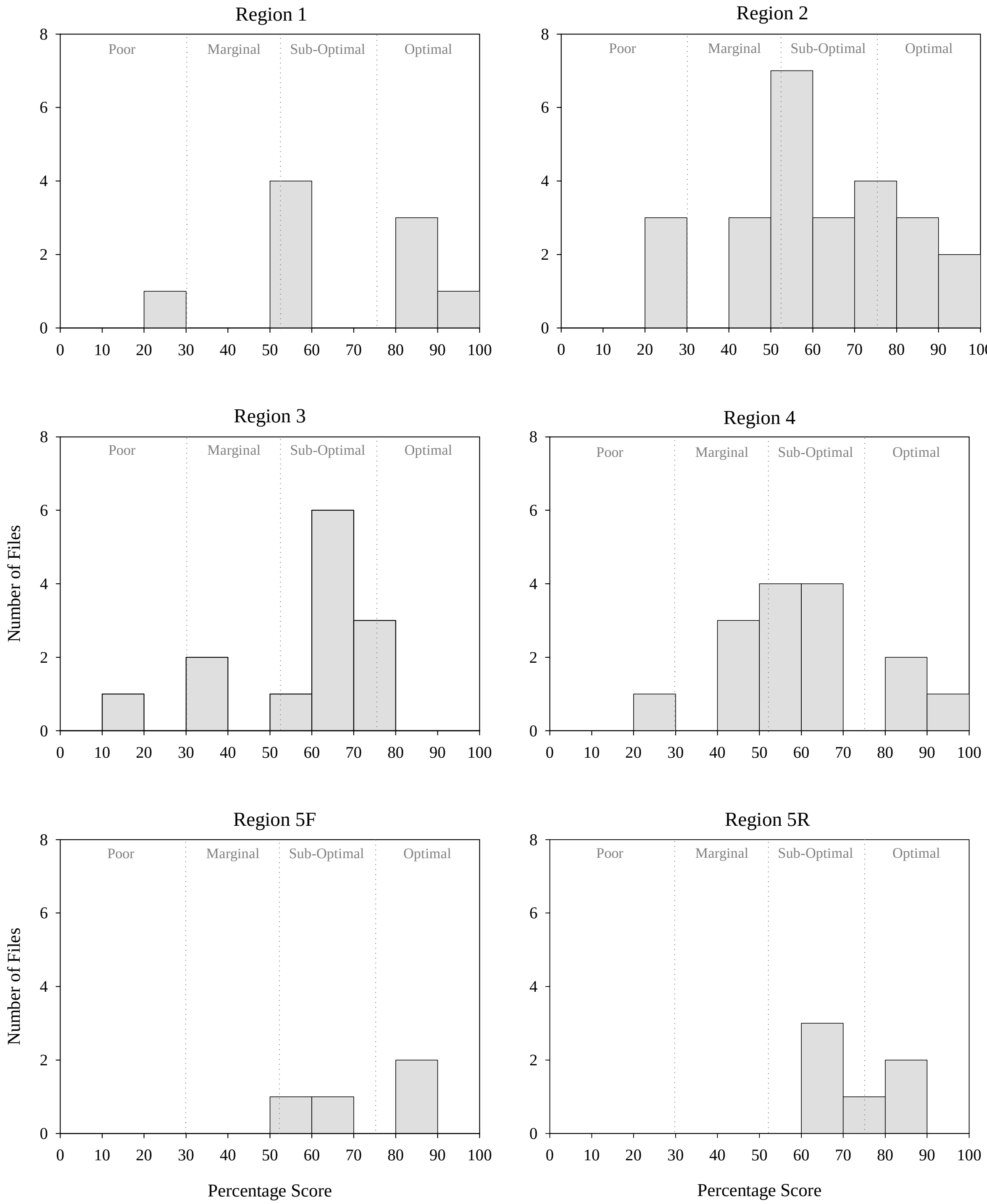


Figure 7-7. All connectivity, percent of assessment area with buffer, average width of buffer, and buffer condition data combined into a single landscape context score by state board regions for each of the 129 files evaluated using CRAM.


Region 1
Region 2
Region 3
Region 4
Region 5F
Region 5R
Poor
Marginal
Sub-Optimal
Optimal
Number of Files
Percentage Score
0
2
4
6
8
0
10
20
30
40
50
60
70
80
90
100

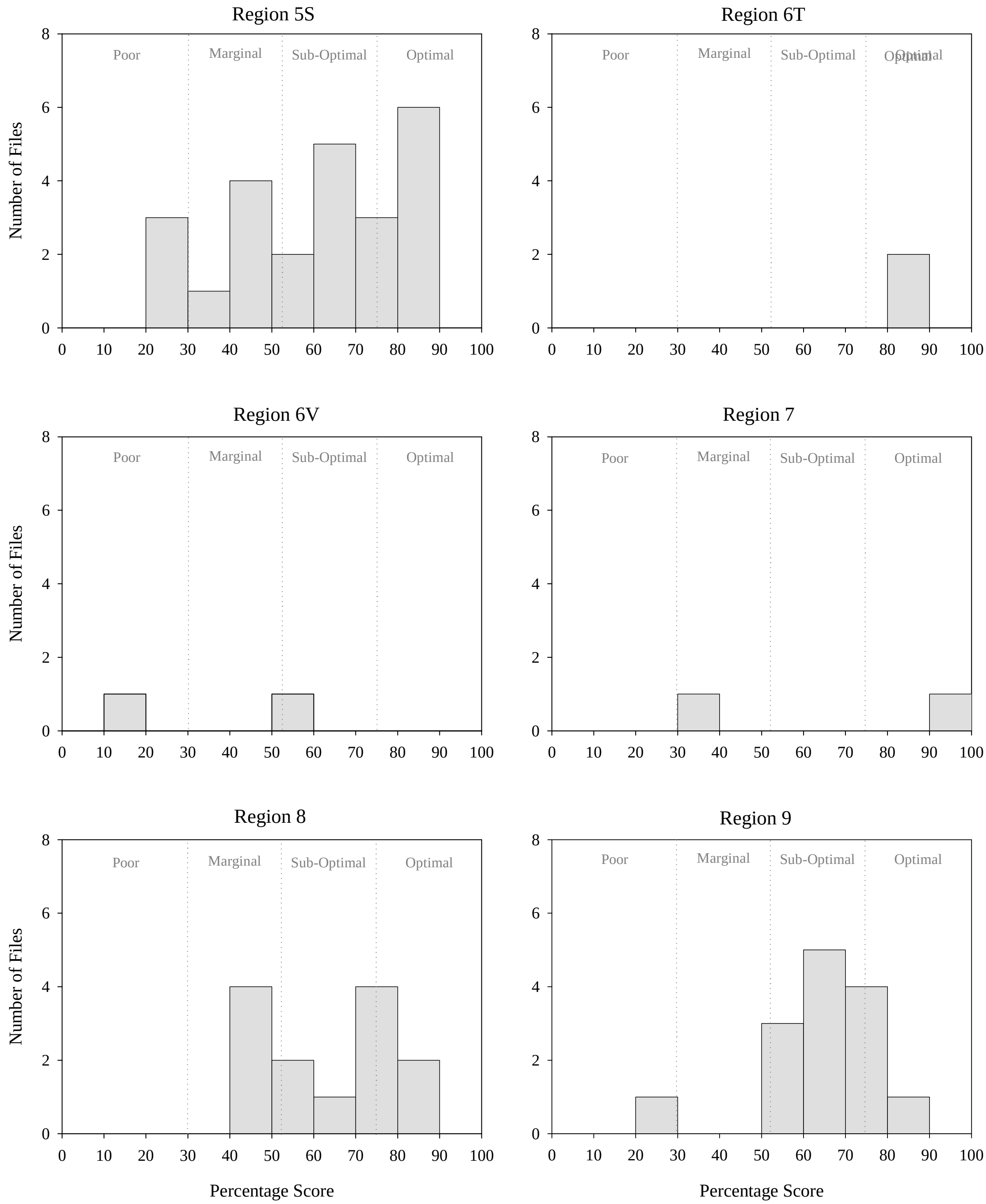
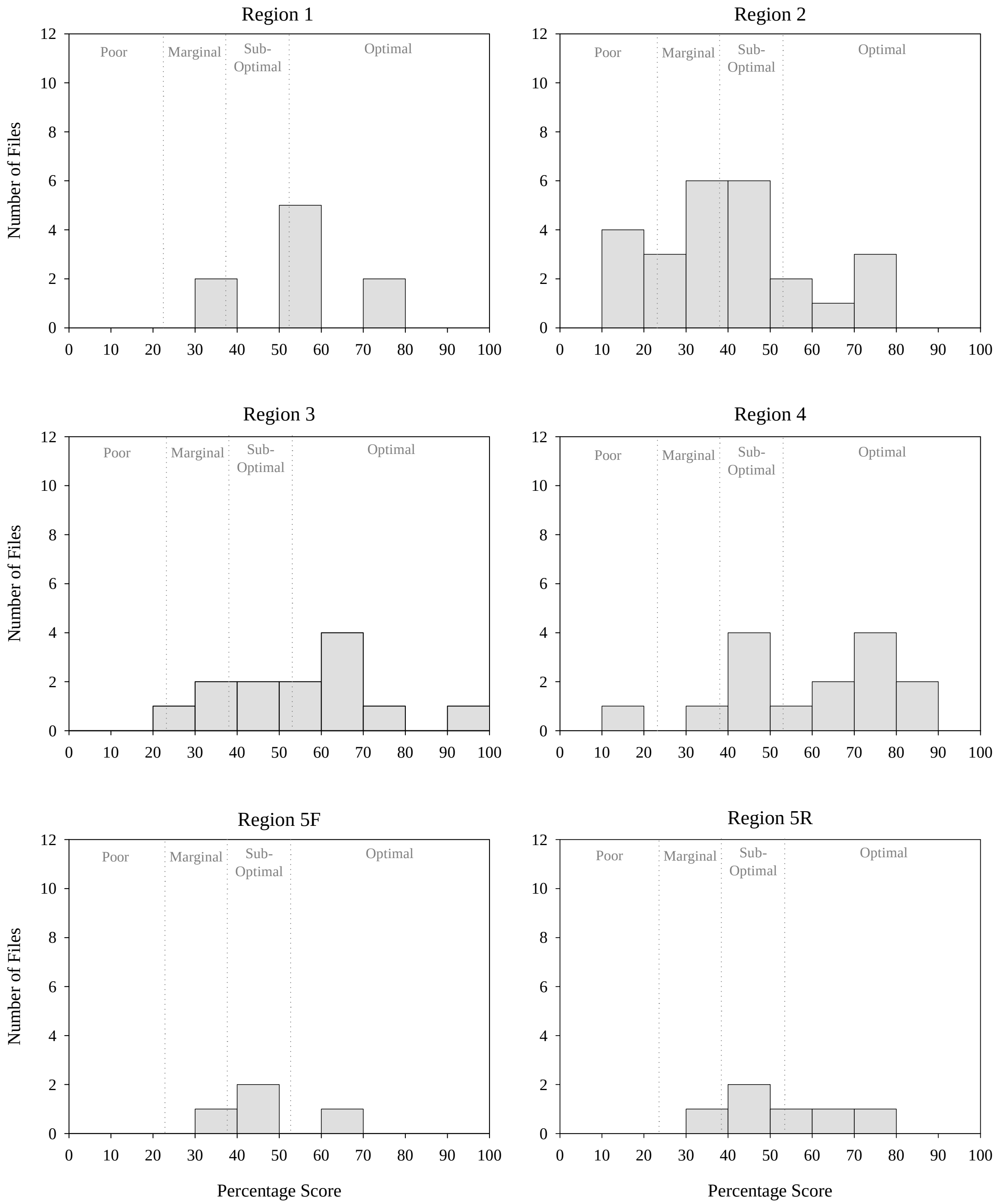


Figure 7-8. All water source, hydroperiod, and hydrologic connectivity data combined into a single hydrology score by state board regions for each of the 129 files evaluated fully.


Region 1
Region 2
Region 3
Region 4
Region 5F
Region 5R
Poor
Marginal
Sub-Optimal
Optimal
Number of Files
Percentage Score
0
2
4
6
8
10
12
0 10 20 30 40 50 60 70 80 90 100

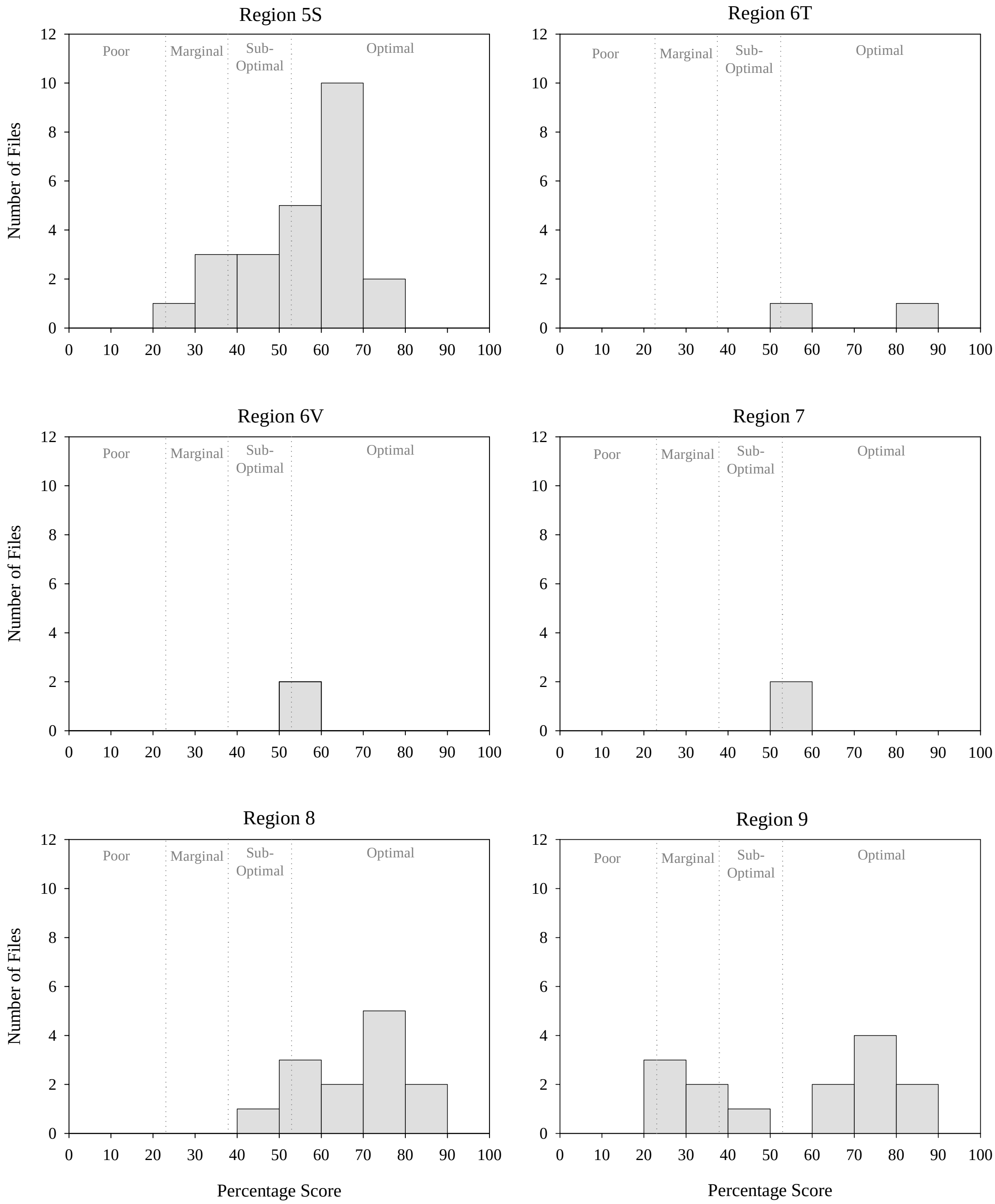
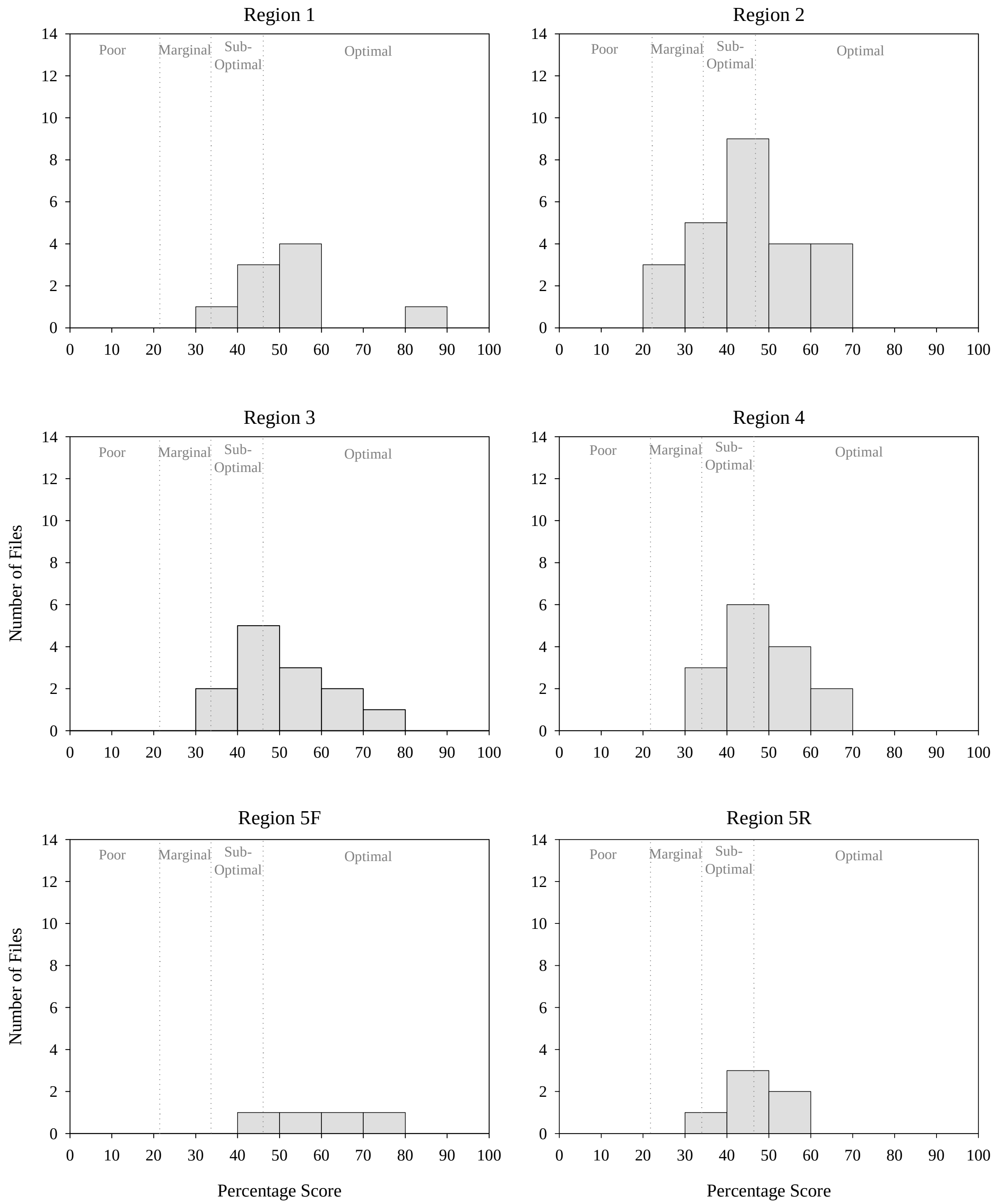


Figure 7-9. All physical patch richness and topographic complexity data combined into a single physical structure score by state board regions for each of the 129 files evaluated using CRAM.


Region 1
Region 2
Region 3
Region 4
Region 5F
Region 5R
Poor
Marginal
Sub-
Optimal
Optimal
Number of Files
Percentage Score
0
2
4
6
8
10
12
14
0
10
20
30
40
50
60
70
80
90
100

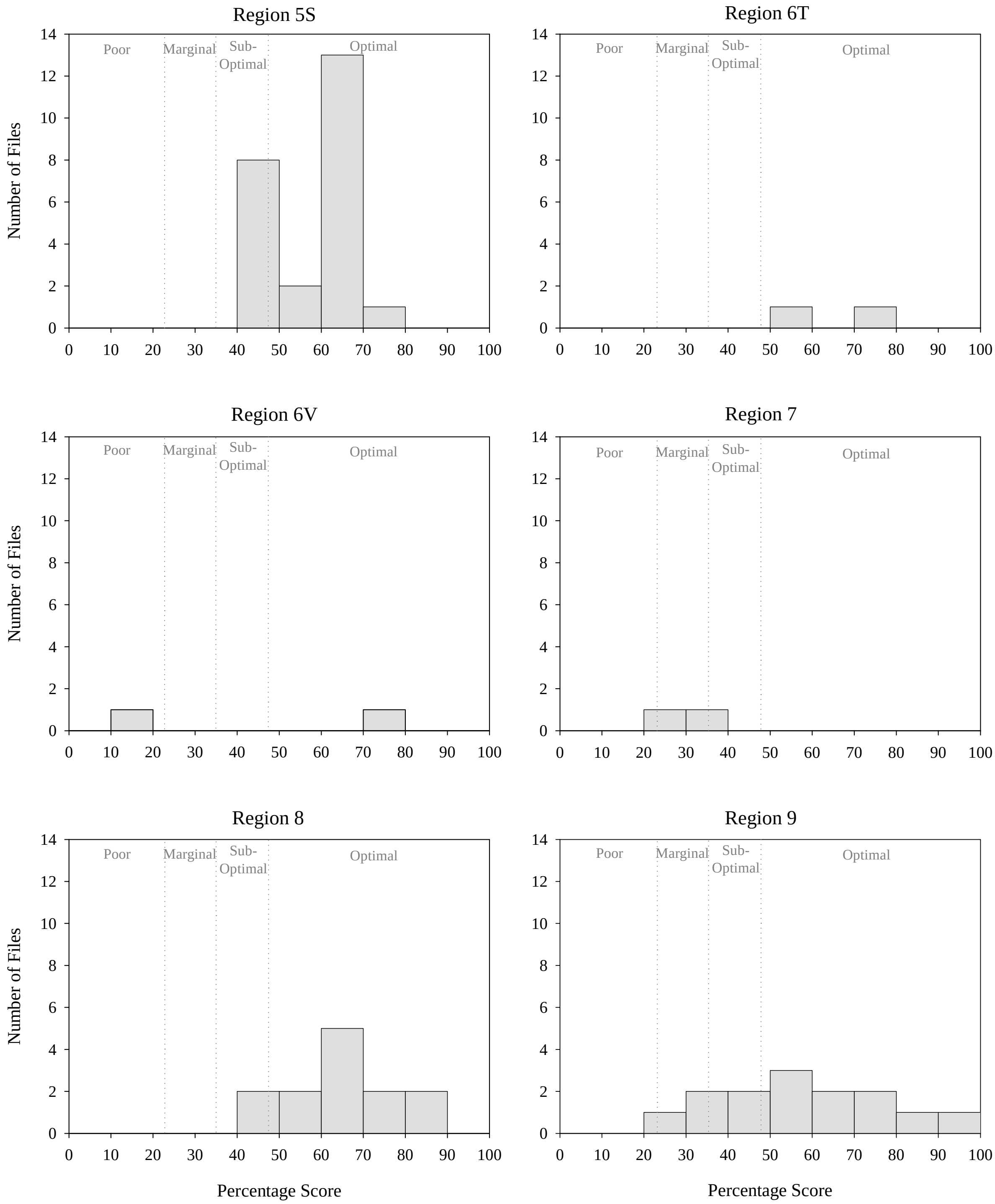


Figure 7-10. All organic material accumulation, biotic patch richness, vertical biotic structure, interspersion and zonation, percent invasive plant species, and native plant species richness data combined into a single biotic structure by state board regions for all 129 files evaluated using CRAM.

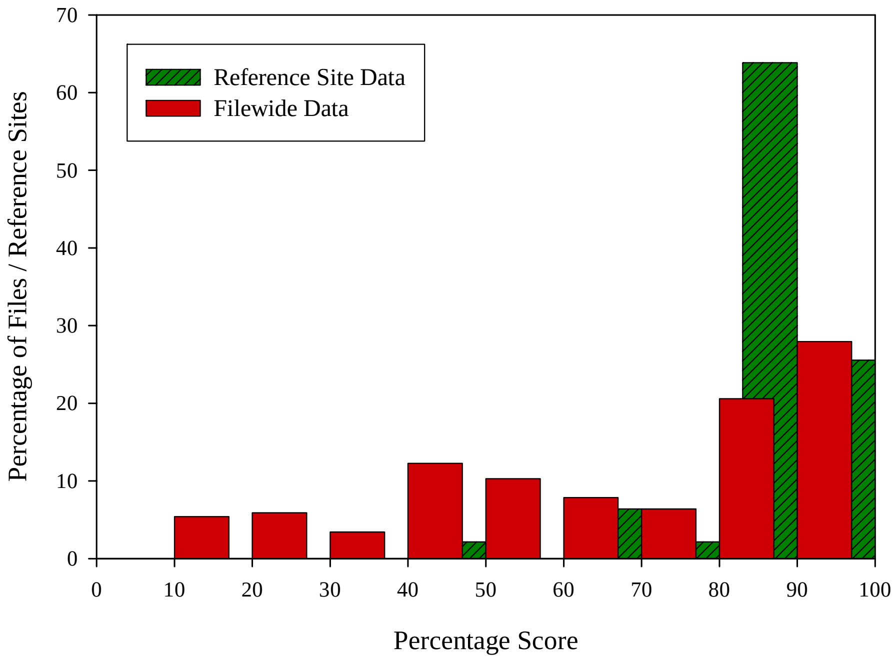


Figure 7-11. Connectivity scores for each of the 47 reference sites and each of the 204 mitigation sites (representing 129 files) evaluated using CRAM.

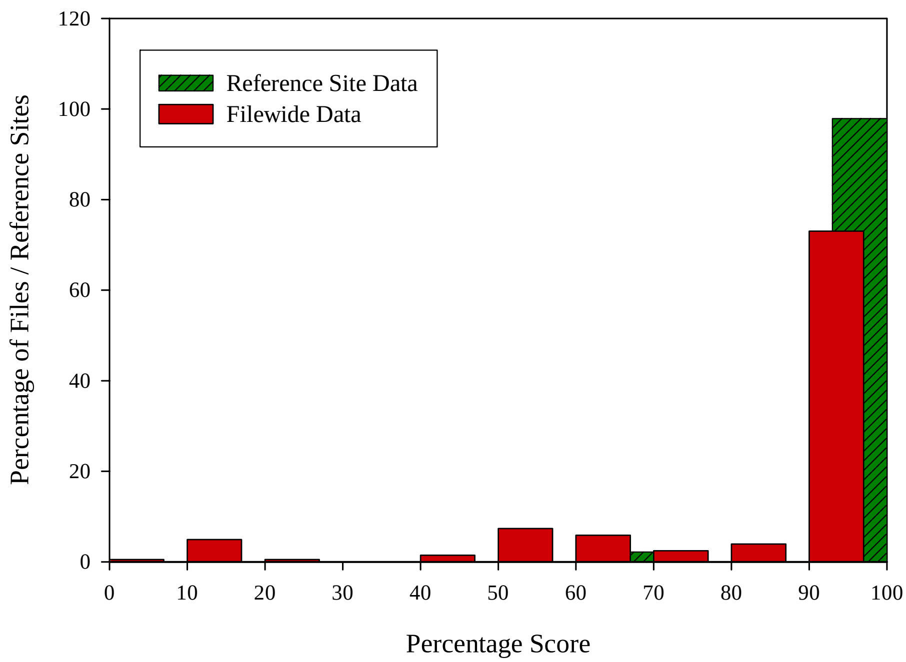


Figure 7-12. Percent of Assessment Area with Buffer scores for each of the 47 reference sites and for each of the 204 mitigation sites (representing 129 files) evaluated using CRAM.

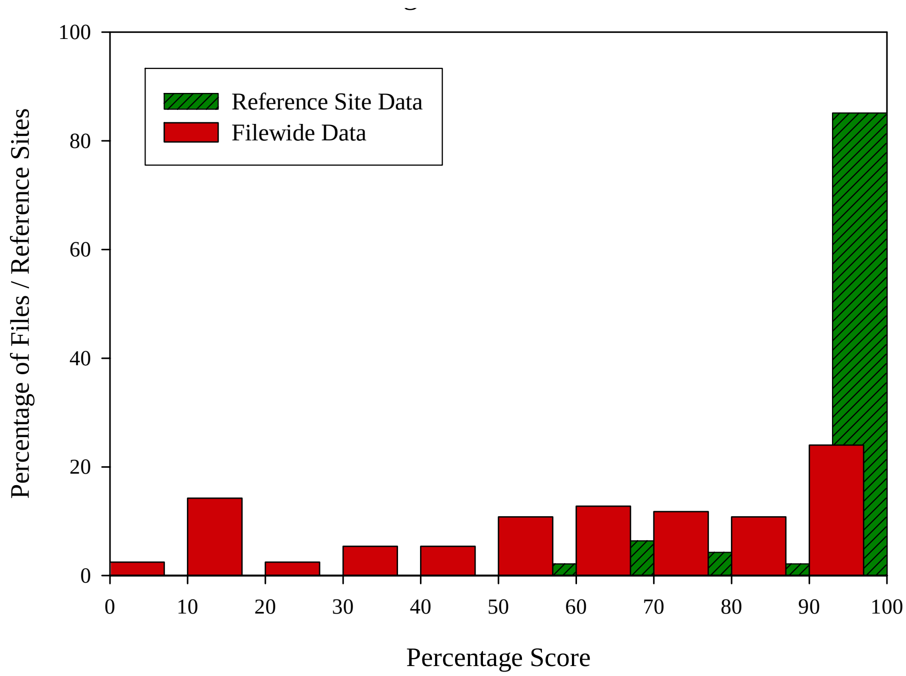


Figure 7-13. Average Width of Buffer scores for each of the 47 reference sites and for each of the 204 mitigation sites (representing 129 files) evaluated using CRAM.

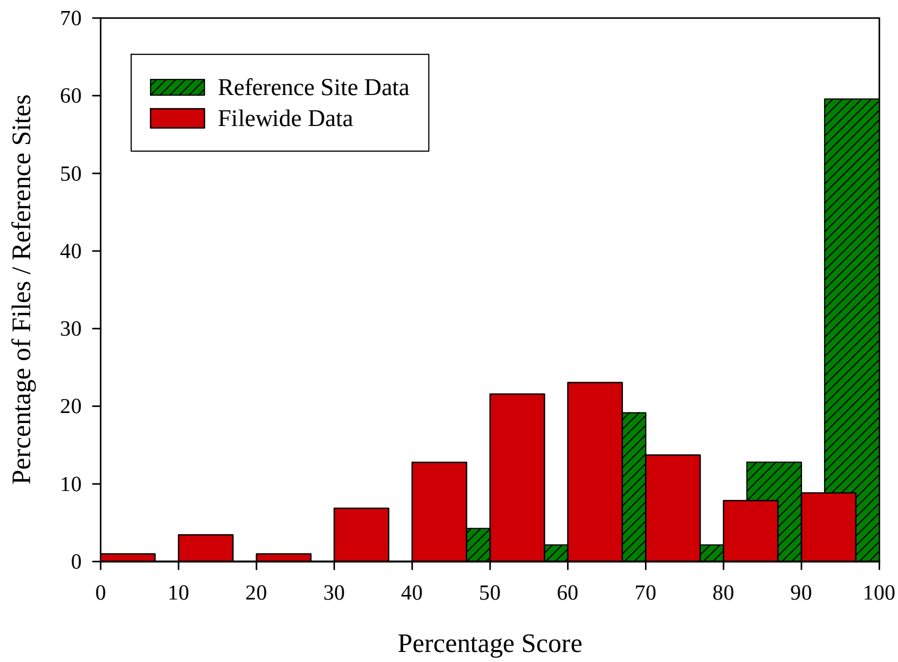


Figure 7-14. Buffer Condition scores for each of the 47 reference sites and for each of the 204 mitigation sites (representing 129 files) evaluated using CRAM.

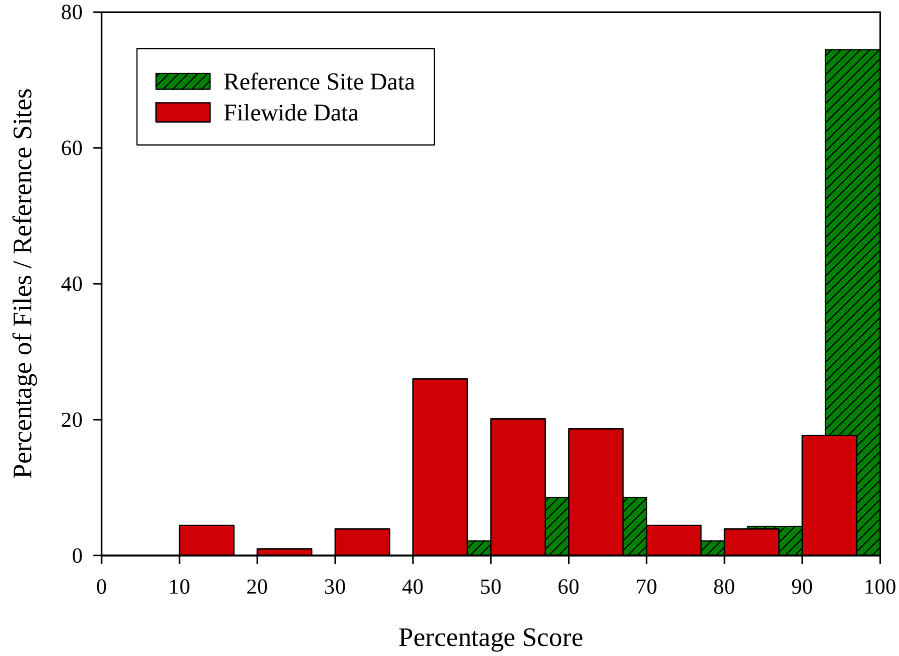


Figure 7-15. Water source scores for each of the 47 reference sites and for each of the 204 mitigation sites (representing 129 files) evaluated using CRAM.

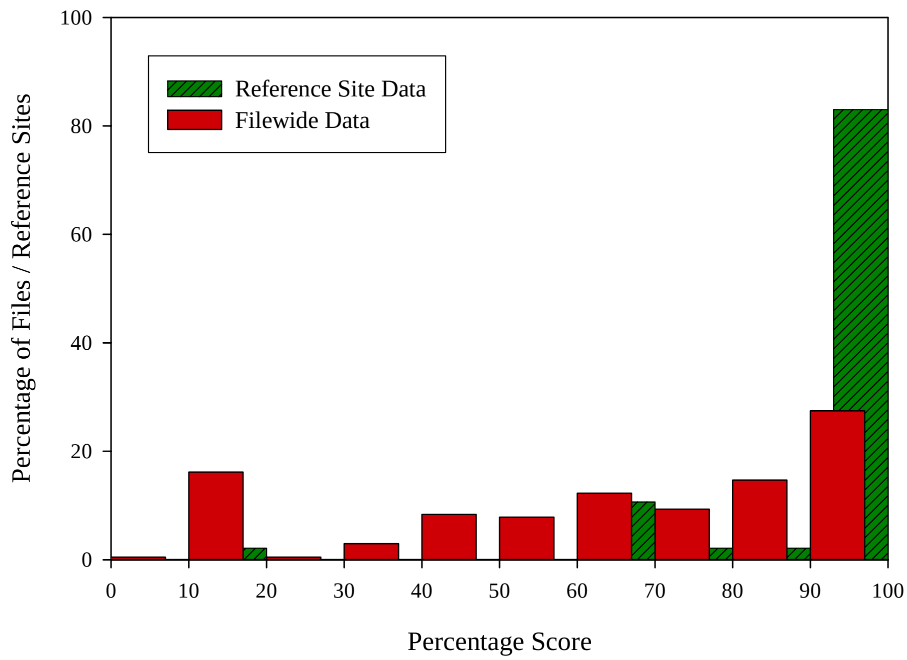


Figure 7-16. Hydroperiod scores for each of the 47 reference sites and for each of the 204 mitigation sites (representing 129 files) evaluated using CRAM.

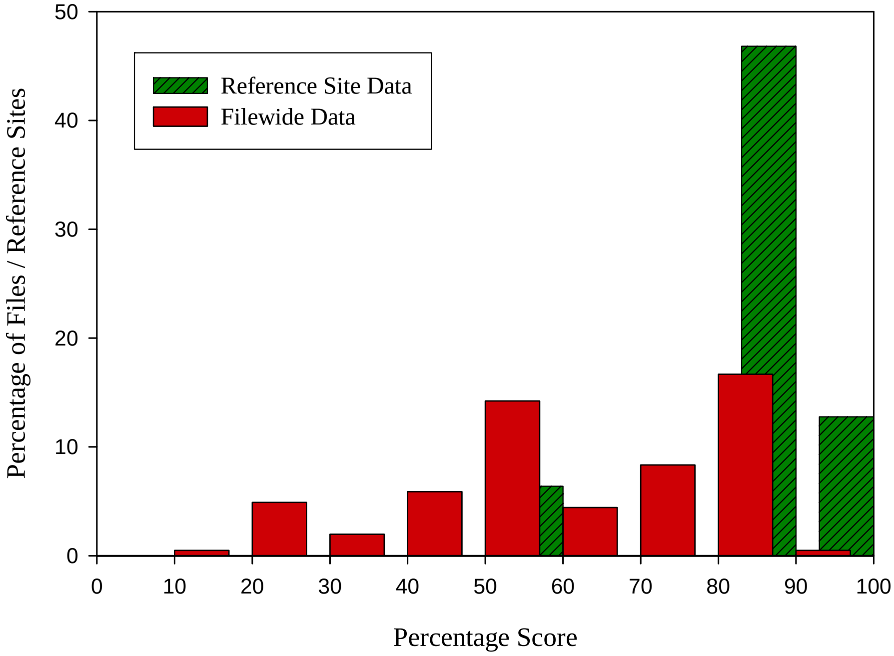


Figure 7-17. Hydrologic Connectivity scores for each of the 47 reference sites and for 117 mitigation sites evaluated using CRAM.

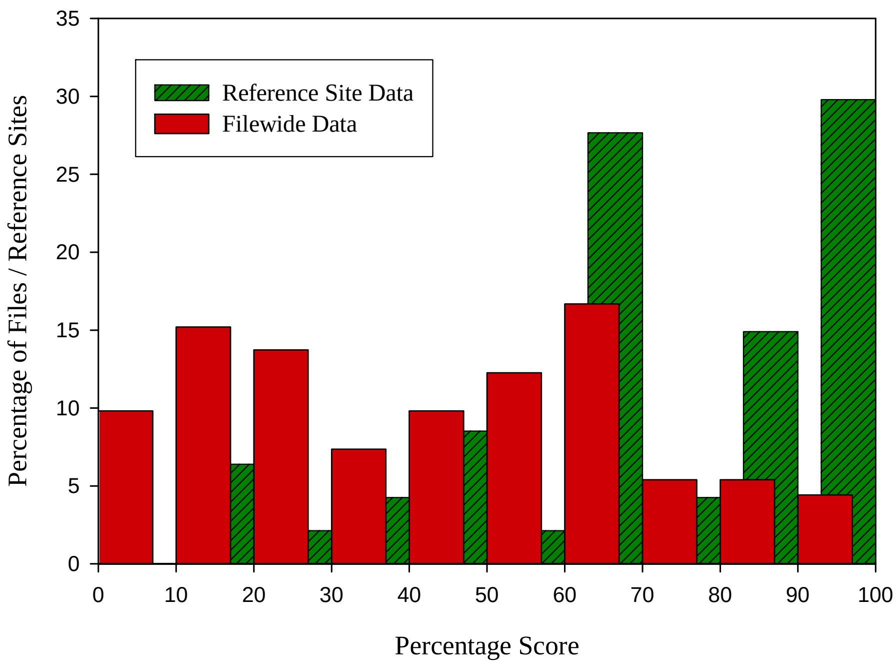


Figure 7-18. Physical Patch Richness scores for each of the 47 reference sites and for each of the 204 mitigation sites (representing 129 files) evaluated using CRAM.

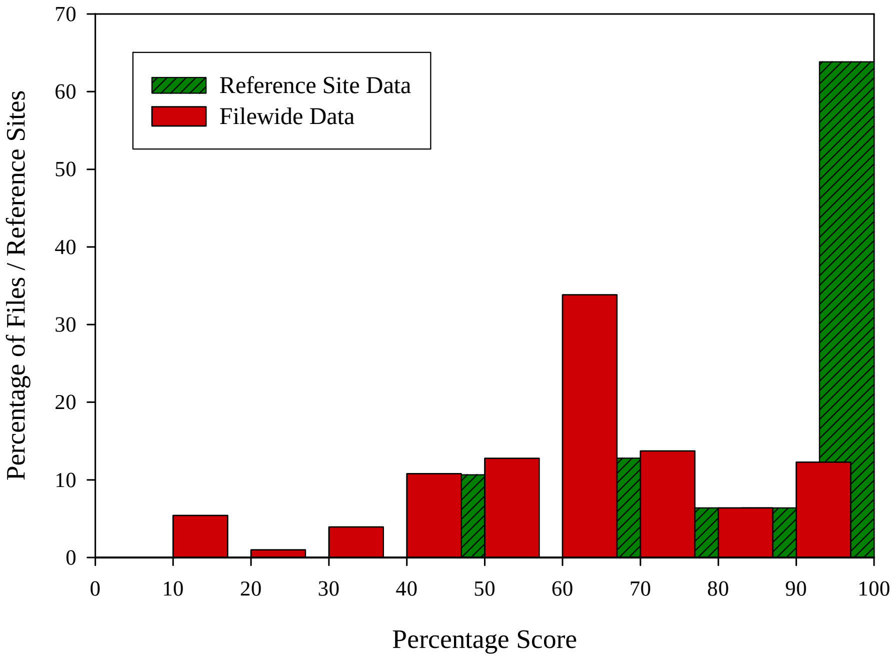


Figure 7-19. Topographic Complexity scores for each of the 47 reference sites and for each of the 204 mitigation sites (representing 129 files) evaluated using CRAM.

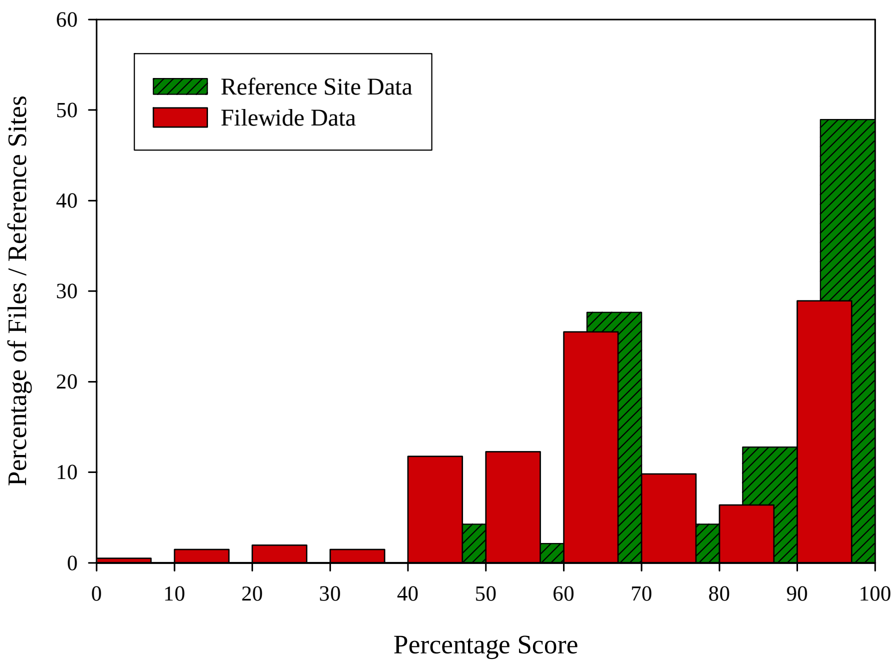


Figure 7-20. Organic Matter Accumulation scores for each of the 47 reference sites and for each of the 204 mitigation sites (representing 129 files) evaluated using CRAM.

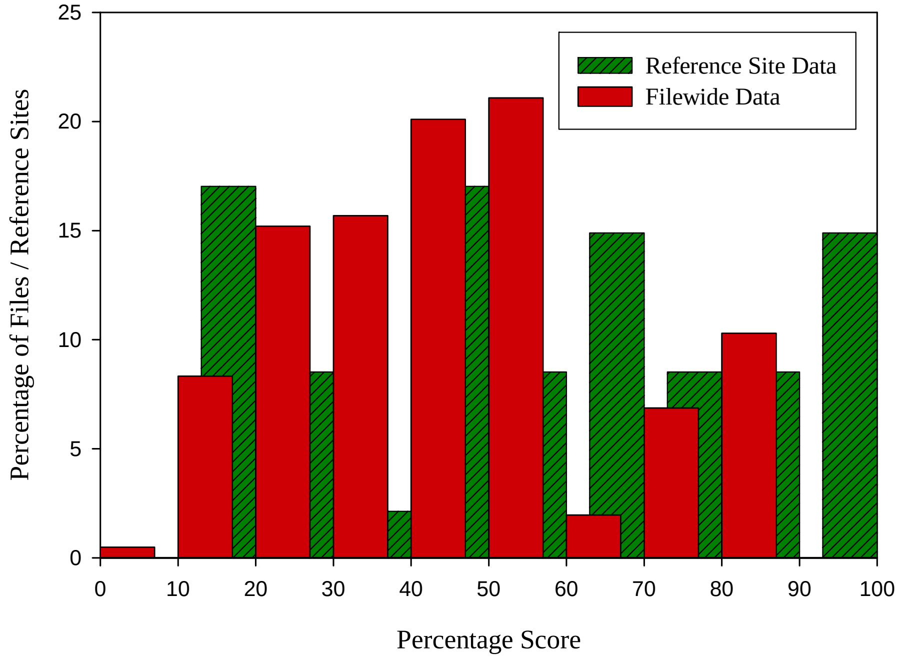


Figure 7-21. Biotic Patch Richness scores for each of the 47 reference sites and for each of the 204 mitigation sites (representing 129 files) evaluated using CRAM.

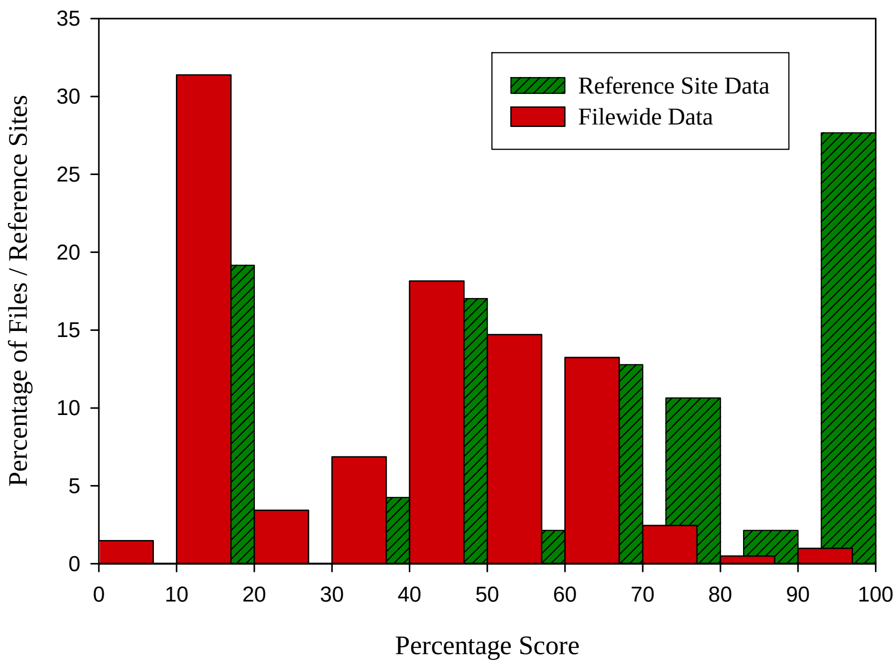


Figure 7-22. Vertical Biotic Structure scores for each of the 47 reference sites and for 190 mitigation sites evaluated using CRAM.

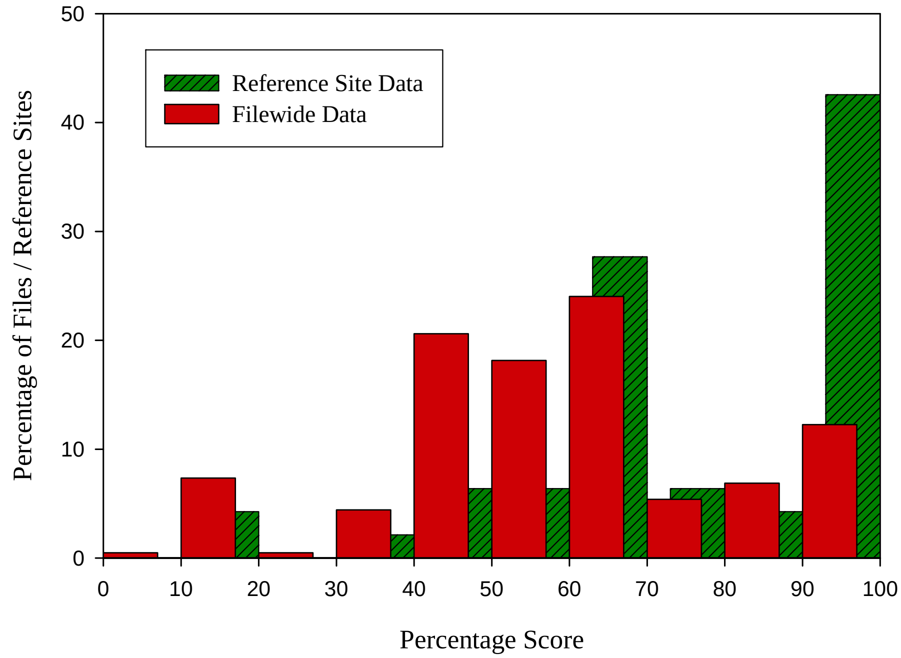


Figure 7-23. Interspersion and Zonation scores for each of the 47 reference sites and for each of the 204 mitigation sites (representing 129 files) evaluated using CRAM.

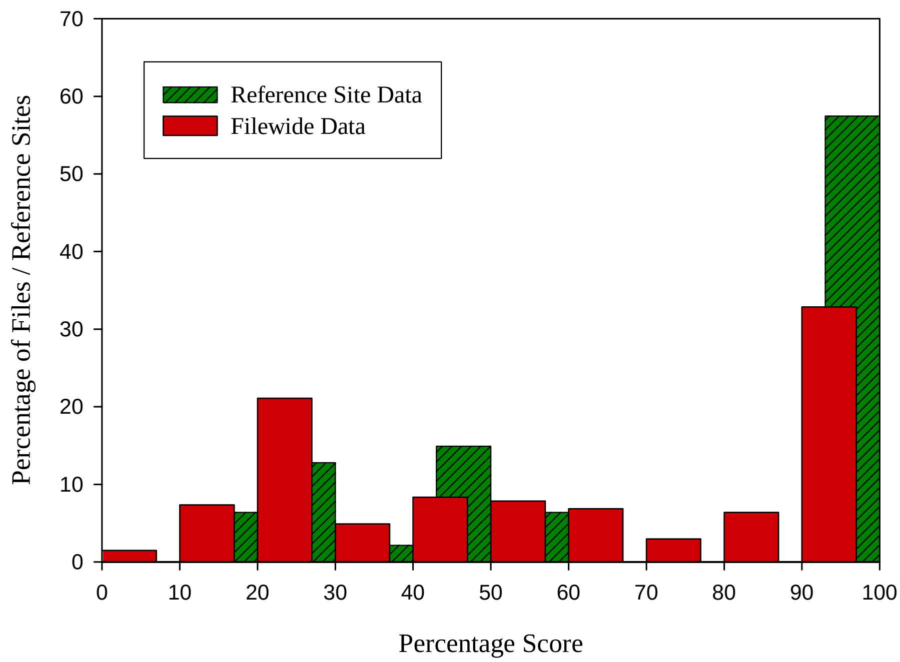


Figure 7-24. Percent Non-Native Plant Species scores for each of the 47 reference sites and for each of the 204 mitigation sites (representing 129 files) evaluated using CRAM.

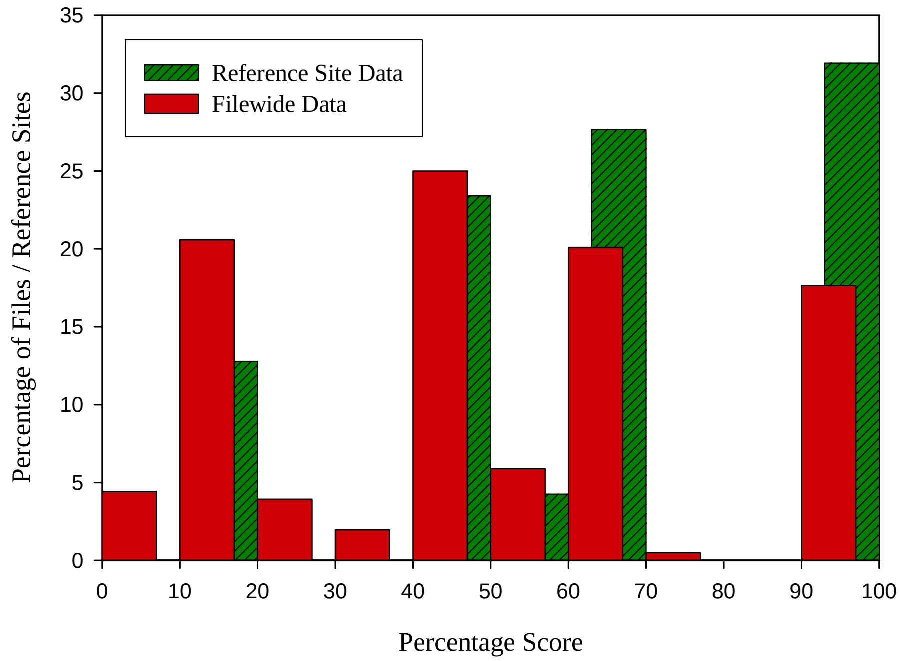


Figure 7-25. Native Plant Species Richness scores for each of the 47 reference sites and for each of the 204 mitigation sites (representing 129 files) evaluated using CRAM.

8. CRAM by Wetland Class Results and Discussion

The overall CRAM scores varied widely within most wetland classes (Figure 8-1). The scores for vernal pool mitigation sites varied the least and had the highest overall median score (75%). The majority (79%) of vernal pool mitigation sites scored optimally, 21% were sub-optimal, and no sites were considered marginal to poor (Table 8-1). Estuarine and depressional sites scored lower than other classes. The majority of estuarine mitigation sites scored in the sub-optimal category, while 38 percent were in the marginal to poor scoring categories, with an overall median of 55%. The overall median for depressional sites was 57%, with 11% of the files scoring optimally, 61% sub-optimally, and 28% considered marginal to poor. These results are surprising given that our assessments were not done during the optimal growing season, and vernal pools are highly variable across seasons. However, aspects of the plant community affect only a portion of the overall CRAM evaluation. Alternatively, CRAM may not be properly calibrated with respect to the evaluation of vernal pools. In fact, the CRAM development team has already recognized the unresolved nature of this section. The lack of vernal pool reference sites makes further interpretation of these results difficult.

For the buffer and landscape context attribute, the majority of files had optimal mean scores for six of the eight wetland classes (Table 8-2). In particular, lacustrine and vernal pool sites scored well for this attribute with median scores greater than 85%. Alternatively, low gradient riverine and seep and spring sites had lower median scores (62% and 64% respectively) and had less than 50% optimally scoring files. The results for low gradient riverine sites is likely due to the prevalence of development pressure in more low lying areas, and the fact that many of these sites were situated in relatively densely populated areas in southern California.

For hydrology, vernal pool and high gradient riverine mitigation sites scored remarkably well, with medians of 90% and 88% respectively (Table 8-3). In fact, all vernal pool sites were assigned optimal scores for hydrology. Similarly, seep and spring mitigation sites had a median score of 85% with 80% of sites having optimal scores. Depressional mitigation sites scored notably lower with a median score of 57% and less than a quarter of its files scoring optimally.

For physical structure, seep and spring mitigation sites scored well, with a median score of 75% and the majority of files considered optimal (Table 8-4). In contrast, estuarine sites scored remarkably low with a median score of only 38%, and half of its sites in the marginal to poor category.

Estuarine sites had low scores for the biotic structure as well (Table 8-5). For this class of wetlands, only 25% of files scored optimally with a median score of 43%. With a median score of 49%, high gradient riverine sites did not do well for biotic structure either. Vernal pool sites had relatively high biotic structure scores, with 86% of these sites scoring optimally.

Considering individual metrics, many patterns can be seen among wetland types (Figure 8-2). It should be noted that comparisons are made to an overall reference standard that was averaged across a range of habitat types. We lack sufficient sample numbers for reference sites across habitat types, and there is likely substantial variation in CRAM metric scores among habitat types for references sites that could be contributing to the variation which we are observing in mitigation sites. While all wetland classes scored well in connectivity and percent of assessment area with buffer, the average width of buffer and buffer condition metrics had a wide variety of scores. The wetland classes were divided into two groups based on the average width of buffer metric: lacustrine, vernal pool, and high gradient riverine sites had higher scores while other wetland classes scored lower. For the hydrology metrics, vernal pool sites consistently scored high, while the other wetland classes were more variable and often scored lower. For physical structure, the various wetland classes tended to score lower for physical patch richness and higher for organic matter. There was more variability for topographic complexity. Seep and spring wetlands scored particularly well for physical structure, high gradient riverine sites for topographic complexity, and the lagoon site for organic matter accumulation. The one lagoon site assessed also had higher scores for many of the biotic structure metrics. Most of the other wetland classes tended to co-vary among the biotic structure metrics. This was especially true for biotic patch richness and native species richness. The variability was higher for the other three metrics with particular divergence in percent non-natives. Non-natives were problematic for lacustrine and high gradient riverine sites, but low gradient riverine and depressional wetland sites had higher non-native cover as well. Compared to other metrics, most wetland classes had low mean scores for native species richness. As mentioned earlier, this is an interesting result given the emphasis of planting requirements and vegetation-related performance standards in mitigation practices.

Table 8-1. Summary statistics and success breakdowns of overall CRAM scores by wetland class (N=204 mitigation sites

Overall CRAM Scores						
Wetland Class	N	Mean ± SE	Median	% Optimal	% Sub-Optimal	% Marginal / Poor
Depressional	74	55.54 ± 1.41	57.06	10.81	60.81	28.38
Estuarine	8	52.75 ± 4.42	54.70	0.00	62.50	37.50
Lacustrine	5	66.48 ± 5.10	67.18	40.00	40.00	20.00
Lagoon	1	66.09 ± .	66.09	0.00	100.00	0.00
Riverine High	3	64.75 ± 5.86	64.39	33.33	66.67	0.00
Riverine Low	94	58.84 ± 1.23	58.79	17.02	63.83	19.15
Seep and Spring	5	64.56 ± 9.18	71.82	80.00	0.00	20.00
Vernal Pool	14	72.37 ± 1.35	75.45	78.57	21.43	0.00

Table 8-2. Summary statistics and success breakdowns of landscape context metrics CRAM scores by wetland class (N=204 mitigation sites).

Landscape Context CRAM Scores						
Wetland Class	N	Mean ± SE	Median	% Optimal	% Sub-Optimal	% Marginal / Poor
Depressional	74	66.66 ± 2.39	73.91	50.00	25.68	24.32
Estuarine	8	65.64 ± 9.18	81.11	62.50	12.50	25.00
Lacustrine	5	85.85 ± 2.39	85.36	100.00	0.00	0.00
Lagoon	1	74.27 ± .	74.27	100.00	0.00	0.00
Riverine High	3	69.82 ± 16.60	85.90	66.67	33.33	0.00
Riverine Low	94	61.35 ± 1.89	62.45	31.91	35.11	32.98
Seep and Spring	5	64.07 ± 10.74	64.36	40.00	40.00	20.00
Vernal Pool	14	85.10 ± 0.79	86.65	100.00	0.00	0.00

Table 8-3. Summary statistics and success breakdowns of hydrology metrics CRAM scores by wetland class (N=204 mitigation sites).

Hydrology CRAM Scores						
Wetland Class	N	Mean ± SE	Median	% Optimal	% Sub-Optimal	% Marginal / Poor
Depressional	74	55.27 ± 2.54	57.08	20.27	36.49	43.24
Estuarine	8	68.06 ± 4.21	68.52	25.00	62.50	12.50
Lacustrine	5	62.83 ± 8.78	67.50	20.00	60.00	20.00
Lagoon	1	59.26 ± .	59.26	0.00	100.00	0.00
Riverine High	3	84.72 ± 5.01	87.50	66.67	33.33	0.00
Riverine Low	94	61.35 ± 1.51	62.96	18.09	54.26	27.66
Seep and Spring	5	72.00 ± 13.24	85.00	80.00	0.00	20.00
Vernal Pool	14	89.02 ± 0.61	89.82	100.00	0.00	0.00

Table 8-4. Summary statistics and success breakdowns of physical structure metrics CRAM scores by wetland class (N=204 mitigation sites).

Physical Structure CRAM Scores						
Wetland Class	N	Mean ± SE	Median	% Optimal	% Sub-Optimal	% Marginal / Poor
Depressional	74	48.77 ± 1.94	50.00	39.19	28.38	32.43
Estuarine	8	35.16 ± 5.06	37.50	12.50	37.50	50.00
Lacustrine	5	66.94 ± 9.48	58.33	60.00	40.00	0.00
Lagoon	1	54.17 ± .	54.17	100.00	0.00	0.00
Riverine High	3	58.33 ± 4.81	58.33	66.67	33.33	0.00
Riverine Low	94	56.25 ± 1.97	56.25	57.45	18.09	24.47
Seep and Spring	5	71.67 ± 6.24	75.00	80.00	20.00	0.00
Vernal Pool	14	58.22 ± 3.65	65.28	71.43	14.29	14.29

Table 8-5. Summary statistics and success breakdowns of biotic structure metrics CRAM scores by wetland class (N=204 mitigation sites).

Biotic Structure CRAM Scores						
Wetland Class	N	Mean ± SE	Median	% Optimal	% Sub-Optimal	% Marginal / Poor
Depressional	74	51.45 ± 1.76	50.42	54.05	32.43	13.51
Estuarine	8	42.14 ± 3.98	42.92	25.00	50.00	25.00
Lacustrine	5	50.28 ± 9.60	51.67	60.00	20.00	20.00
Lagoon	1	76.67 ± .	76.67	100.00	0.00	0.00
Riverine High	3	46.11 ± 8.56	49.17	66.67	0.00	33.33
Riverine Low	94	56.40 ± 1.54	56.25	69.15	24.47	6.38
Seep and Spring	5	50.50 ± 9.24	55.83	80.00	0.00	20.00
Vernal Pool	14	57.15 ± 1.63	60.07	85.71	14.29	0.00

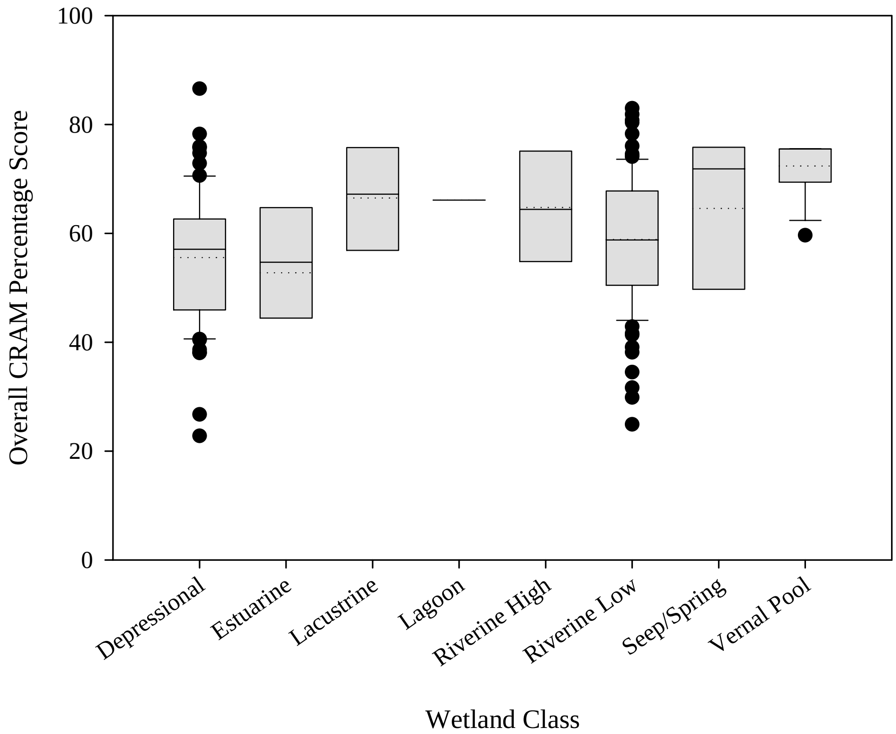


Figure 8-1. Overall CRAM percentage scores by wetland class (N=204 mitigation sites).

The dotted line represents the mean, the solid line the median. The 10th, 25th, 75th, and 95th percentiles are displayed.

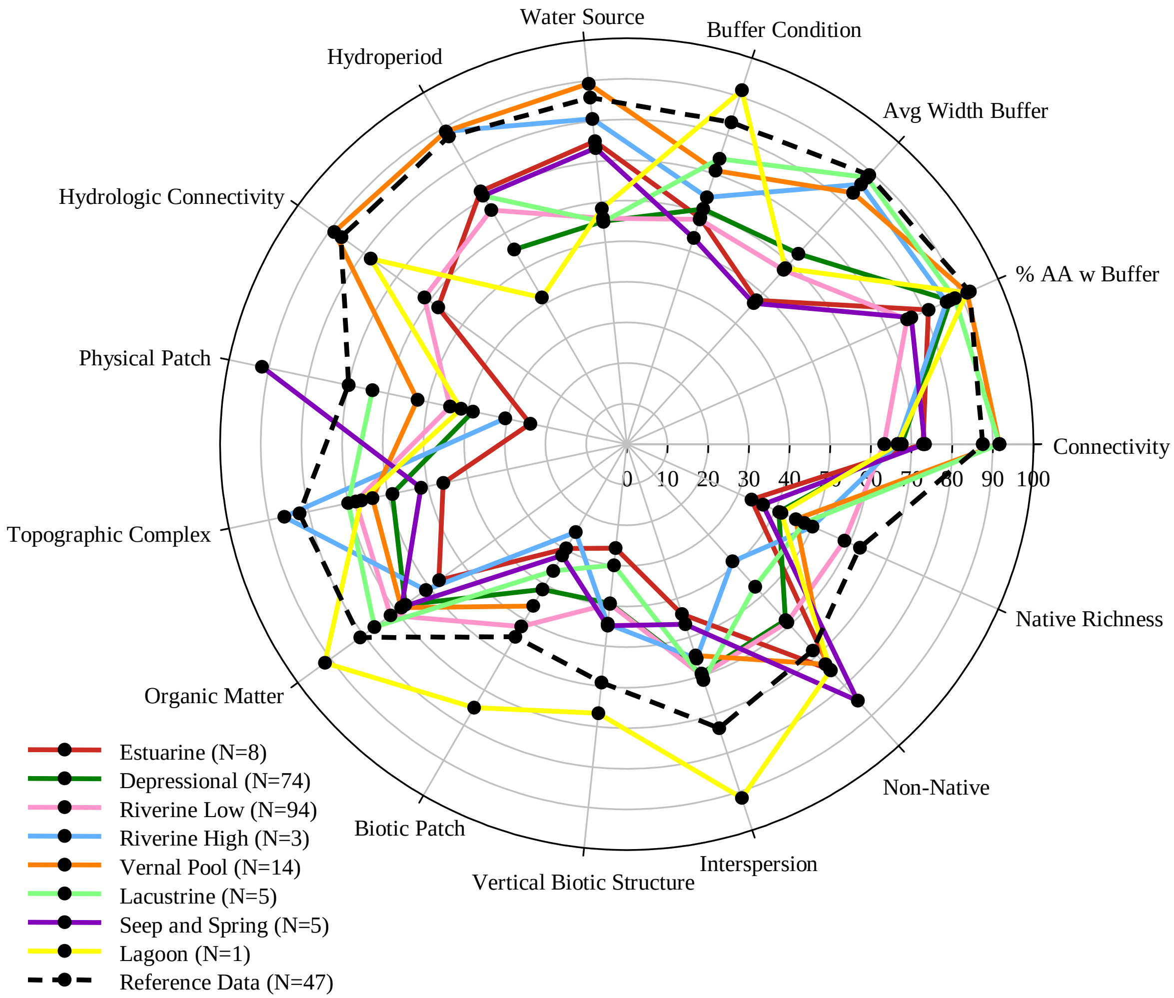


Figure 8-2. Mean percentage scores for each CRAM metric by wetland class (N=204 mitigation sites).

9. Mitigation Bank Analysis

Introduction

A separate analysis of formal and informal mitigation banks is included in our study in order to evaluate any potential differences in the effectiveness of wetland mitigation efforts using these alternative methods for compensatory mitigation. For this component of our study, we compared the conditions of mitigation banks versus conditions of individual projects using CRAM evaluations.

Mitigation banks are being used more widely over time, although there has been some debate concerning their use and benefits. As with other mitigation, the overall goal of mitigation banking is the establishment or reestablishment of self-sustaining, functioning ecosystems that replace the acreage and function of impacted wetlands and other aquatic resources (Brumbaugh and Reppert 1994). Banks concentrate mitigated habitats in one area, with benefits of large, contiguous habitats. The diversity and resilience of species in ecosystems such as wetlands are correlated with the size of habitat area; larger areas devoted to restoration have a greater potential to sustain ecosystems (National Research Council 1992). However, banks result in off-site mitigation, with potential negative effects due to spatial shifts in habitat distributions and loss of wetlands within some regions. In addition, the values wetlands provide often are dependent upon their location in the landscape, such as their position relative to one another, to adjacent waters, and to the human population that would benefit from the services provided (Brow and Lant 1999). Spatial shifts in habitat can be viewed as both a positive and negative affect of mitigation banking as some species may benefit and others may lose. The concentration of wetland habitats that is occurring with mitigation banking is a complex issue that needs to be addressed on a bank-by-bank basis with reference to the functions that wetlands can provide in different positions on the landscape and the value of these functions as they provide ecosystem services to a site specific human population (Brow and Lant 1999).

In addition to pros and cons related to potential habitat shifts, banks are viewed positively in terms of improvements to regulatory efficiency, although some may view this benefit as drawback, as it potentially speeds up impacts to natural wetlands. Mitigation banks are cost-effective both in restoration implementation and management, and they allow for a more rapid permitting process by consolidating mitigation efforts. Banks also usually provide compensation before permitted impacts occur, which is seen as a significant benefit given the uncertainty of restoration success for many projects. Banked lands typically continue to be held and operated by the banker or its successor to conserve the wetlands in perpetuity, with appropriate assurances to this effect provided to the agencies (Marsh et al. 1996).

Methods

In evaluating banks, we have adopted the following definitions for formal and informal banks. Formal mitigation banks must be an established created or enhanced wetland with formal agency approval to sell credits or segments of the land as wetland habitat. In the permitting process purchases are agreed upon through the Regional Water Quality Control Board and the U.S. Army Corps of Engineers in order provide immediate retribution for impacted wetlands. An informal bank was determined as an area of consolidated wetland habitat used as a means of compensation for an impact that may not be available for public purchase, may be part of a larger restoration project, may involve multiple permittees, may be created by a municipality or project, or may be used for future mitigation. As with individual mitigation projects, the purchase ratio of credits is determined by the regulatory agencies and typically reflects the quality of the habitat or habitats affected. Since we have focused on mitigation performance, we intentionally included only mitigation banks in our analysis and excluded preservation or conservation banks where no habitat enhancement or creation was performed.

We classified all files by mitigation categories (file-specific mitigation, formal mitigation bank, informal mitigation bank. In evaluating sites in the field, we followed the same protocol and used the same methodology (CRAM), for formal and informal mitigation banks as for file-specific mitigation projects. We used a similar approach to determine the assessment area (AA) for all sites; however, many banks are much larger than individual, file-specific mitigation. For projects with large habitat areas, sites were divided into sub-areas, and multiple representative areas of each habitat type were evaluated and averaged as described in the general CRAM methods. .

Results for overall CRAM scores and CRAM attributes from each mitigation category were compared statistically using a one-way ANOVA with mitigation category as the independent variable. Statistical analyses were not completed at the habitat type level due to small sample size.

Results and Discussion

We evaluated a total of nine formal mitigation banks, 11 informal mitigation banks (IMB) and 152 file-specific mitigation sites, cover 33 files for formal banks and 15 files for informal banks (Table 9-1). The majority of these files came from region 5S with 24 of the 32 formal mitigation bank files. There were 13 mitigation actions within the nine formal banks and 15 mitigation actions within the 11 informal banks. This difference was due to the fact that a permittee may have been required to mitigate for more than one habitat type or for more than impact within a bank. The habitat types evaluated in formal mitigation banks were depressional (9), estuarine (1), lacustrine (2), riverine low (2) and vernal pools (2). For informal mitigation banks depressional (6), lacustrine (1), riverine low (7) and vernal pool (1) habitats were evaluated. And for file-specific mitigation we evaluated the following mitigation actions: depressional (50), estuarine (7), lacustrine (2), lagoon (1), riverine high (2), riverine low (82), seep and spring (5), and vernal pools (3). It should be noted that all habitat types did not occur within each mitigation category, and the relative distribution of habitat types within each mitigation category was not consistent due to the fact that files were randomly chosen without any specific consideration for these variables. In evaluating overall differences among formal banks, informal banks, and file-specific projects, we have included all files in order to maximize our sample size. We compared means with and without habitats that were not included in all mitigation categories and found only minor differences in means values by mitigation category.

The mean overall CRAM score for formal mitigation banks across all habitat types was 61.3 (± 2.1 standard error here and elsewhere). For informal mitigation banks the mean was 51.2 (± 4.3), and for file-specific mitigation actions it was 56.5 (± 1.0) (Figure 9-1). There were marginally significant differences among these means, (ANOVA $F = 2.23$, $p = 0.11$); however, this did not met the typical level of statistical significance ($p = 0.05$). The low p value that was observed was due primarily to the lower overall scores at informal banks (Figure 9-1); however, it should be noted that scores for this category were lower because many of the informal bank sites were riverine sites that had quite low scores. The biggest difference we found between formal banks and file-specific mitigation sites was in depressional sites, while between formal and informal banks the biggest difference was in riverine low systems as noted above (Figure 9-2). File-specific mitigation also scored higher than informal banks in riverine habitat. Given the trends that we have found, it could be that the marginally significant differences among mitigation classifications would be more statistically significant with a greater sample size and more equally weighted sampling across habitat types.

In comparing CRAM attribute scores across all files, the pattern was similar to overall CRAM scores for landscape connectivity and hydrology attributes, with formal banks being highest and informal banks lowest. Differences were marginally significant for landscape connectivity (ANOVA F = 2.67, p = 0.07) and significant for hydrology (ANOVA F = 3.24, p = 0.04); however, as noted above, this could be due to the large number of riverine within the informal bank category that had low scores. For other CRAM attributes differences were not significant (physical structure ANOVA F = 0.18, p = 0.83; biotic structure ANOVA F = 1.22, p = 0.30).

An assessment of CRAM attributes across the various habitat types indicates the wide range of variability in the data set (Figure 9-3). For the landscape connectivity attribute, formal banks were highest for four of the five habitat types; however, variation was substantial for all habitats except vernal pools (Figure 9-4). In addition, it should be noted that sample size for some habitat types was quite low. Because of high variability and low sample size, no statistical tests were performed on the data at this level. More powerful conclusions at this level would require larger sample sizes. However, it appears that mitigation banks across the state have focused primarily on depressional, riverine and vernal pool habitat types, and this may limit the potential number of samples for some habitat types for future analyses.

For hydrology, formal banks again had the highest CRAM scores for four of the five habitat types (all but vernal pools, where scores were equal to informal banks), but again variability in many means was quite high (Figure 9-5). CRAM physical structure scores were the lower than all other CRAM attributes, with no consistent trends among mitigation categories (Figure 9-6). Informal banks scored the highest for three habitat types but lowest for riverine habitats. Formal banks had the highest biotic structure CRAM scores for four out of five habitat types; however, differences were very small for some of these habitats. File-specific mitigation scores for biotic structure were higher than informal bank scores for two of four habitat types (Figure 9-7).

In conclusion, differences in overall CRAM scores among formal mitigation banks, informal mitigation banks, and file-specific mitigation were marginally significant. In addition, there were some significant differences at the attribute level. Further data are needed to evaluate these differences given the small sample size for this component of our study, as well as the variation within mitigation classifications in habitat types in our sample. Furthermore, other factors, such as the age of sites could be affecting these results. This factor has not yet been evaluated for our mitigation bank analysis. Given the growing popularity of mitigation banks, especially in particular regions, such as region 5S and for particular habitat types, e.g., vernal pools and depressional wetlands, it would be worthwhile to address these potential differences with a study focused particularly on these differences.

Citations

Brown, P., and C. Lant. 1999. The effect of wetland mitigation banking on the achievement of no-net-loss. *Environmental Management.* 23(3): 333-345.

Brumbaugh, R., and R. Reppert. 1994. National wetland mitigation banking study: First phase report. Institute for Water Resources, Water Resources Support Center, US Army Corps of Engineers, Alexandria, VA.

Marsh, L. L., D. R. Porter, and D. A. Salvesen (eds.). 1996. Mitigation banking: Theory and practice. Island Press, Covelo, CA.

National Research Council. Committee on Restoration of Aquatic Ecosystems. 1992. Restoration of aquatic ecosystems: Science, technology, and public policy. National Academy Press, Washington, DC.

Table 9-1. Number of formal and informal banks by region, along with the number of mitigation files associated with these banks.

Region	Formal Banks	Files Per Formal Bank	Informal Banks	Files Per Informal Bank
1	1	3	2	4
2	2	2	1	1
3	-	-	1	1
4	-	-	1	1
5R	1	1	-	-
5S	3	24	1	1
8	1	2	2	4
9	1	1	3	3
TOTAL	**9**	**33**	**11**	**15**

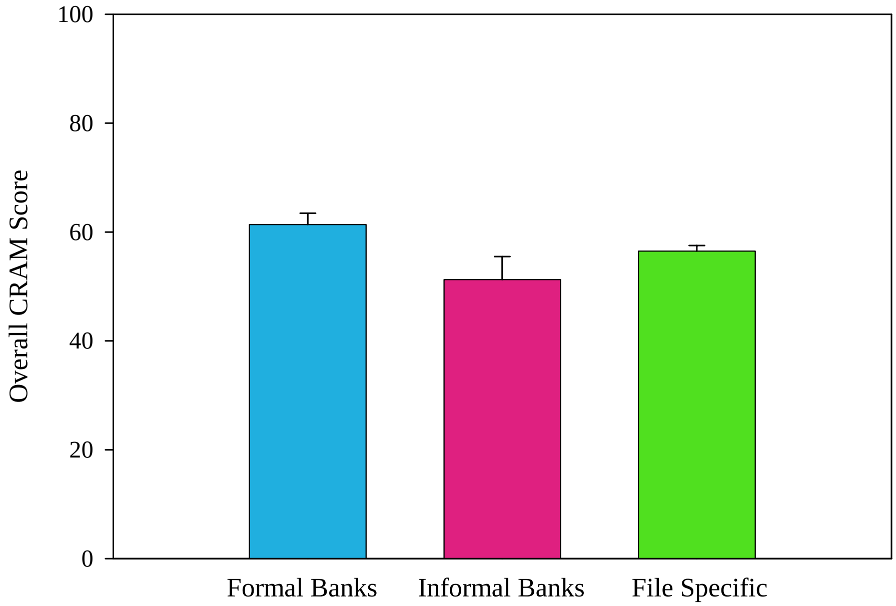


Figure 9-1. Overall CRAM scores for the three mitigation categories (formal mitigation banks, informal mitigation banks, and file-specific mitigation). This includes data from all habitat types within each mitigation category.

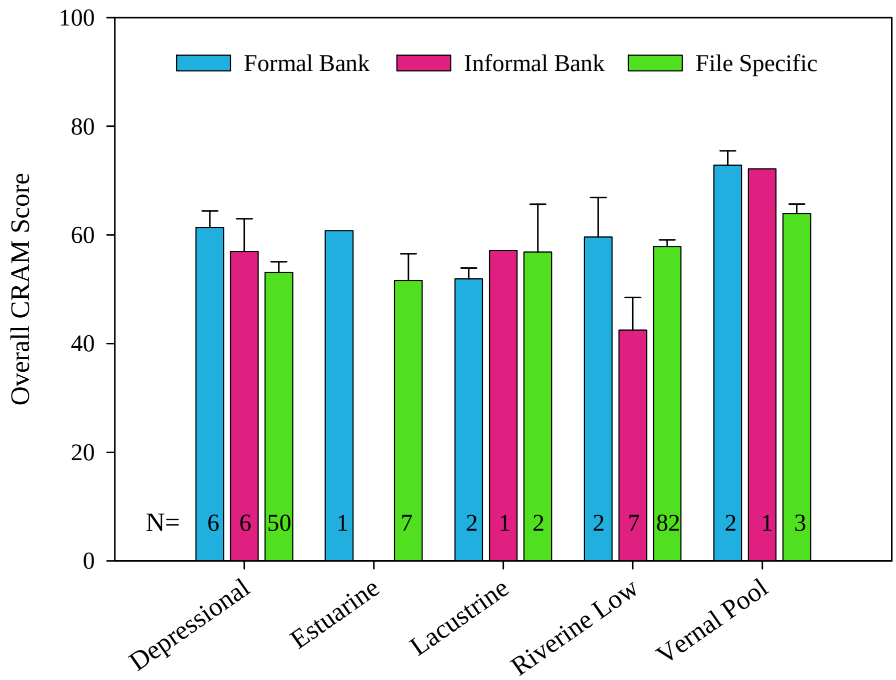


Figure 9-2. Overall CRAM scores by habitat type for the three mitigation categories (formal mitigation banks, informal mitigation banks, and file-specific mitigation).

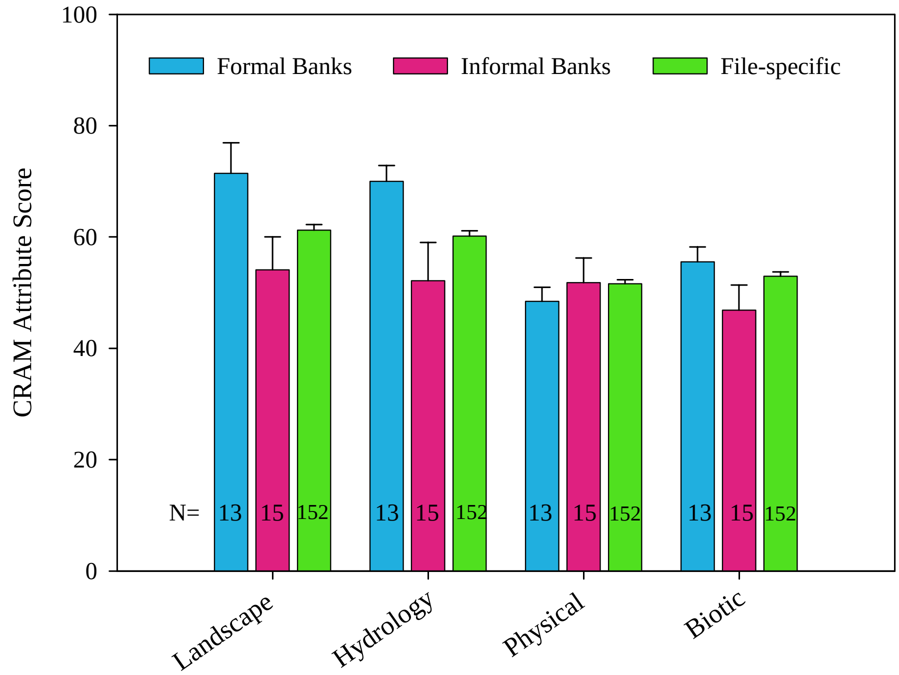


Figure 9-3. CRAM attribute scores for the three mitigation categories (formal mitigation banks, informal mitigation banks, and file-specific mitigation). This includes data from all habitat types within each mitigation category.

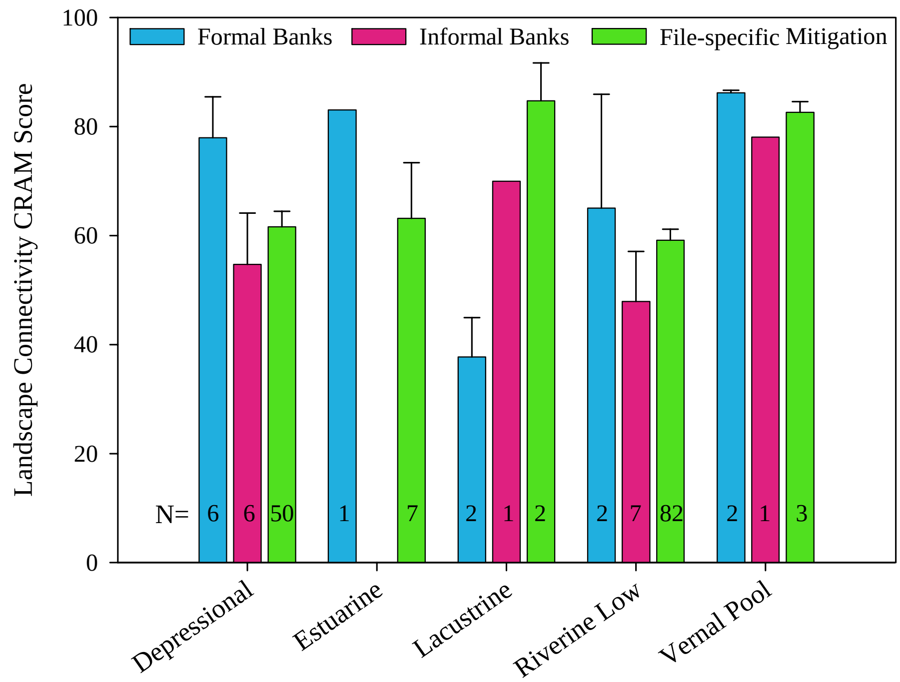


Figure 9-4. Landscape connectivity attribute scores by habitat type for the three mitigation categories (formal mitigation banks, informal mitigation banks, and file-specific mitigation).

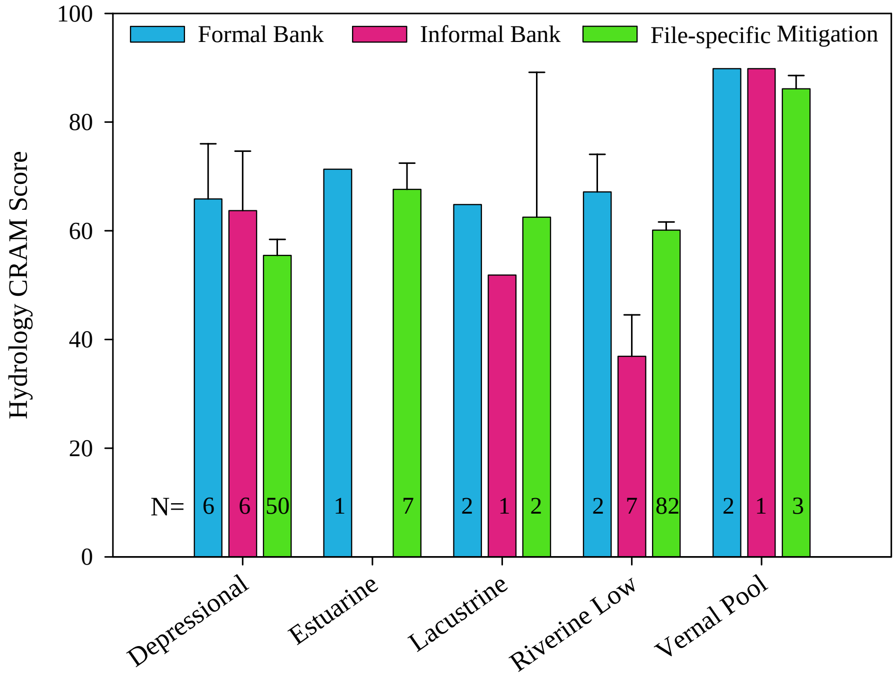


Figure 9-5. Hydrology attribute scores by habitat type for the three mitigation categories (formal mitigation banks, informal mitigation banks, and file-specific mitigation).

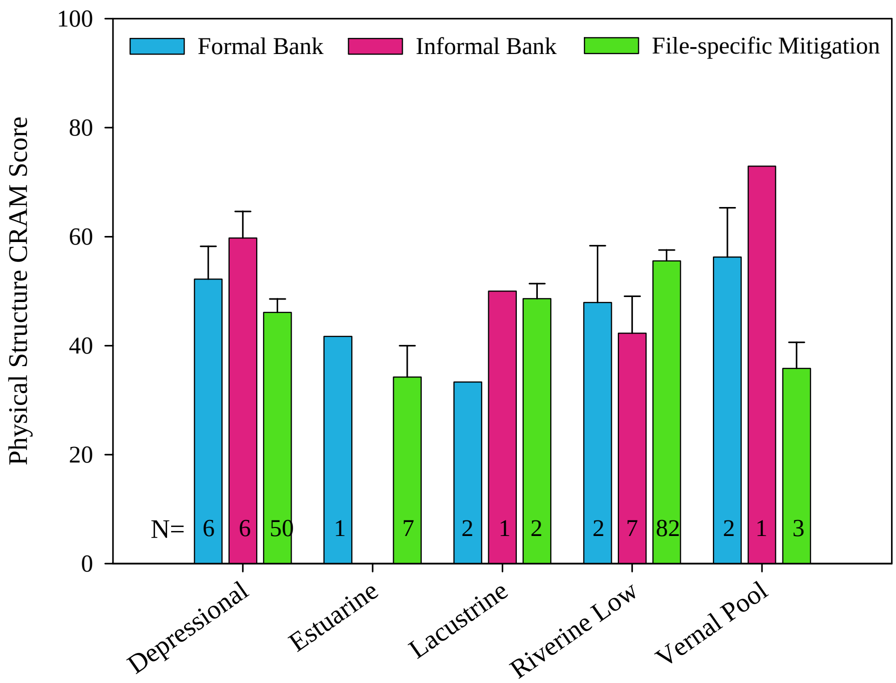


Figure 9-6. Physical structure attribute scores by habitat type for the three mitigation categories (formal mitigation banks, informal mitigation banks, and file-specific mitigation).

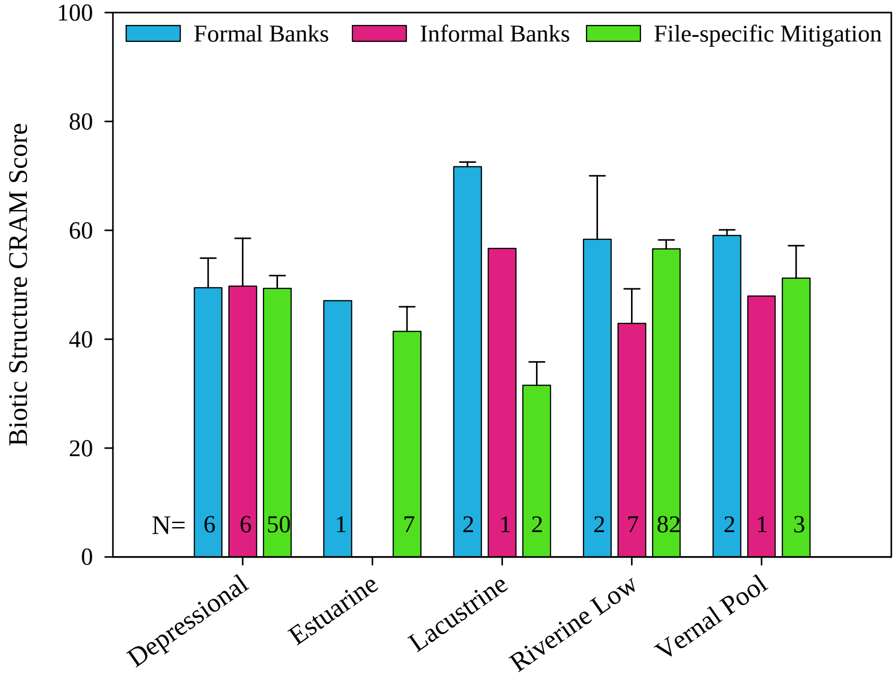


Figure 9-7. Biotic structure attribute scores by habitat type for the three mitigation categories (formal mitigation banks, informal mitigation banks, and file-specific mitigation).

10. Wetland Ecological Assessment (WEA) Analysis

The Wetland Ecological Assessment (WEA) is a mitigation site evaluation methodology created by Andrée Breaux (SFRWQCB) and Molly Martindale (SF ACOE) as an adaptation of the Florida Wetland Rapid Assessment Procedure (WRAP). This method was created specifically for the evaluation of compensatory mitigation projects and the complete methodology can be considered an alternative to our combined Phase I and Phase II evaluations. Breaux and Martindale (2003) used the WEA in a recent study of San Francisco Bay Area mitigation projects, and we sought to repeat their methods here to evaluate their method compared to CRAM and to provide information to compare southern California mitigation projects to those in northern California (although such a comparison is beyond the scope of this report). However, much of WEA was time consuming, requiring the creation of comprehensive species lists by expert plant, invertebrate, and bird experts, and since these aspects of the method were outside the scope of our study, we did not include them in our site evaluations. In addition, we did not use the "overall compliance" score as this was redundant with our compliance evaluation. We simply used the main qualitative evaluation protocol, which assessed site function through five assessment categories on a summed 0-15 scale. These five categories are: surrounding land use, adjacent buffer, indicators of hydrology, averaged vegetation score, and wildlife utilization. This method is heavily focused on vegetation, and evaluates the vegetation community within three structural layers: herbaceous, shrub, and tree.

Introduction

In addition to CRAM, the northern California team employed the Wetland Ecological Assessment or WEA (Breaux and Martindale 2003; Breaux et al. 2005), at almost all of the northern California mitigation sites. WEA is a functional evaluation method created as a joint venture between the San Francisco Regional Board and the San Francisco Army Corps of Engineers as an adaptation of the Florida Wetland Rapid Assessment Procedure (Miller and Gunsalus 1997). This method was created specifically for the evaluation of compensatory mitigation projects.

Ambrose and Lee (2004) compared WEA and CRAM at wetland mitigation sites within the Los Angeles Regional Quality Control Board, so we chose to focus our efforts for the statewide project on northern California sites, further examining the relationship between WEA and CRAM. While there is a great deal of similarity between the two methods, some differences do exist including the fact that WEA includes wildlife evaluation as part of its methodology while CRAM does not.

Methods

Since much of WEA is time consuming, requiring the creation of comprehensive species lists by expert plant, invertebrate, and bird experts, and since these aspects of the method were outside the scope of our study, we decided to use only the main qualitative evaluation protocol. The WEA evaluation protocol assesses site function through five categories: wildlife utilization, surrounding land use, adjacent buffer, hydrology and vegetation score. Each of the categories is assessed on a scale from 0 to 3, in 0.5 point increments. The vegetation score is an average of scores from three, individually evaluated structural layers: herbaceous, shrub, and tree. The evaluation of surrounding land use involves the assignment of one or more land use types outlined by WEA. Each land use type is evaluated as having some fraction of 100%, and a weighted average is calculated to reach a final score.

WEA assessments were made at the end of our site visits after completing CRAM, and the team used overall observations and insight from the CRAM scoring in completing the WEA evaluation. In general, a single WEA evaluation was made for each site, even when a site required multiple CRAM evaluations, because WEA is a more general evaluation than CRAM (five assessment categories for WEA vs. 14 metrics for CRAM). This approach was confirmed during review at a complex mitigation site with Andree Breaux from the San Francisco Bay Regional Water Quality Control Board. In cases where multiple CRAM evaluations were completed with a single WEA evaluation, an acreage-weighted average of CRAM scores was used for WEA/CRAM comparison. For the cases where WEA evaluations were made for only a subset of the mitigation actions for which CRAM evaluations were made, we included only those CRAM evaluations that corresponded exactly to our WEA evaluation in our analysis.

A total of 52 project files were evaluated using WEA, with 29 project files that used individual mitigation projects to satisfy their mitigation requirements. Two of these resulted in multiple WEA evaluations, while the remainder (27) had a single WEA. Twenty three projects used mitigation banks to satisfy their mitigation requirements. For each mitigation bank, a single WEA evaluation was made, resulting in seven individual mitigation bank WEA evaluations. In total, 38 separate WEA evaluations were completed and compared to their companion CRAM scores (Table WEA-1).

Comparisons were made between overall CRAM and WEA scores for each of the 38 evaluations. In addition, CRAM attributes were compared to WEA assessment categories, with the exception of wildlife utilization and with slight modifications outlined below. The sum of the WEA adjacent buffer and surrounding land use scores was compared to the CRAM landscape context attribute scores. The WEA hydrology scores were compared to the CRAM hydrology attribute. The WEA averaged vegetation scores were compared to a modification of the CRAM biotic structure attribute scores with the organic matter metric factored out. Preliminary comparisons to the overall biotic structure attribute were very similar; however, the WEA vegetation scores did not include any component of soil organic matter, so we felt is was more appropriate to make the comparison without this CRAM metric.

Results and Discussion

Overall WEA scores had a mean of 10.15 (out of 15) with a standard deviation of 2.34, while scores ranged from 5.60 to 14.39 (Figure 10-1). The mean for overall WEA scores adjusted to a 100-point scale was 67.64, slightly higher than the mean for overall CRAM scores from these same sites (58.95). Total score distribution appears to be relatively normal although somewhat shifted towards the higher scores (Figure 10-1).

Wildlife utilization, surrounding land use, adjacent buffer and averaged vegetation score all had a fairly normal distribution as well (Figure 10-2 – Figure 10-5), although the distributions were also slightly shifted to the right, with somewhat higher scores more common than lower scores. The WEA hydrology scores had a distribution that increased with score magnitude itself (Figure 10-6). This anomaly may be explained in part by the seven WEA assessments at mitigation banks, which had a mean of 2.79 for this category. This was substantially higher than the overall mean of 2.32 for the WEA hydrology category.

Overall WEA scores were strongly correlated with overall CRAM scores, although in general WEA scores were slightly higher (Figure 10-7; $r^2 = 0.53$), confirming the higher overall mean for WEA vs. CRAM. All but eight of the 38 points fall above the equivalence line on the overall WEA/CRAM comparison graph. Individual attributes varied in the relationship between CRAM and WEA scores. First, the sum of the WEA adjacent buffer and surrounding land use scores had slightly lower scores in comparison with the CRAM landscape context attribute, in contrast to the pattern seen with overall scores (Figure 10-8; $r^2 = 0.63$).

A comparison of the CRAM hydrology attribute to the WEA hydrology category reveals the lowest correlation at the attribute level with little relationship between the two scores (Figure 10-9; $r^2 = 0.07$). It should be noted that in this case, WEA hydrology scores are categorical in 0.5 increments; whereas, other WEA scores were psuedo-continuous because of calculations within vegetation and land use scores. On a site-by-site basis, WEA hydrology scores were higher than CRAM hydrology scores, with a large number of high WEA scores, as noted above. This may be due to the more general wording in WEA hydrology criteria, which focuses on whether or not a site's hydrology is potentially "threatened" in order to distinguish between a score of two and three.

WEA averaged vegetation scores were substantially higher than the scores for the CRAM biotic structure attribute (w/o organic matter) (Figure 10-10; $r^2 = 0.49$). In this case, all but two of the 38 points fall above the equivalence line. The mean biotic structure CRAM score for these sites was 43.14 compared to a mean of 67.88 for WEA scores when converted to a 100-point scale.

The findings of this study mostly coincide with the findings of the study by Ambrose and Lee (2004). In that study, WEA also scored higher than CRAM with strong correlation between the two methodologies. WEA score distribution also compared relatively well, with the exception of the hydrology category where Ambrose and Lee (2004) found a normalized score distribution. Ambrose and Lee (2004) did not make WEA/CRAM comparisons at the attribute level so we cannot evaluate differences at this level.

Table 10-1. WEA Scores for 38 mitigation sites within 52 project files.

Site #	Wildlife Utilization	Surrounding Land Use	Adjacent Buffer	Hydrology	Averaged Vegetation Score	Total Breaux and Martindale Score
1412-1	3	2.80	3	3	2.44	14.24
2055-1	2.5	2.33	2	3	2.19	12.01
2593-1	1.5	2.00	1.5	2	2.00	9.00
2706-1	2.5	2.40	2	2.5	2.58	11.98
2726-1*	3	2.30	2.5	3	2.88	13.68
2998-1	1	1.50	1	2	2.33	7.83
3252-1	0.5	1.35	1.5	1.5	0.75	5.60
3370-1	1.5	1.20	1	2	2.00	7.70
3536-1	2.5	2.95	3	2.5	2.56	13.51
3710-1*	3	1.50	2	3	2.50	12.00
5425-1	1.5	1.50	1	2.5	2.08	8.58
6367-1	0.5	1.73	2	2.5	1.00	7.73
6451-1	0.5	2.70	2.5	0.5	1.44	7.64
6489-1	2	1.73	2	2.5	2.75	10.98
6668-1	2	1.75	1.75	2	0.88	8.38
6855-1	3	2.60	3	3	2.79	14.39
6949-1	1.5	2.35	2	2.5	3.00	11.35
7117-1	3	2.65	2.5	2	1.13	11.28
7154-1	3	2.70	2.5	2.5	1.94	12.64
7154-2	3	2.58	2.5	2.5	2.25	12.83
7270-1	2	1.50	1.5	3	1.63	9.63
7385-1	1.5	1.85	1.5	2	2.50	9.35
7528-1	2	1.50	1.5	3	1.38	9.38
7827-1	2	1.80	1.5	2.5	1.88	9.68
7932-1	2	1.90	2	3	3.00	11.90
8177-1	1.5	1.68	1.5	2	2.38	9.05
8177-2	1	1.68	1.5	1	1.28	6.45
8558-1	2	2.20	2	1.5	1.94	9.64
8704-1	1	1.23	0.5	2	2.25	6.98
8800-1	2	2.17	2	0.5	1.50	8.17
9857-1	1.5	1.50	1.5	3	2.25	9.75
10274-1*	2.5	2.30	2.5	3	2.81	13.11
10304-1*	2	2.40	2	3	0.75	10.15
10495-1	2.5	2.60	2.5	1.5	2.13	11.23
11224-1	0.5	2.00	1.5	2.5	1.50	8.00
**	1	1.20	2	2	1.50	7.70
***	1.5	1.35	1	2.5	2.50	8.85
****	3	2.45	2	3	2.75	13.20
MEAN	1.91	2.00	1.89	2.32	2.04	10.15
SD	0.80	0.51	0.59	0.68	0.65	2.34

*** Wikiup mitigation bank (3 project files)
Dekoupe mitigation bank
**** Laguna Creek mitigation bank (13 project files)
Wildlands-Placer Co. mitigation bank (3 project files)

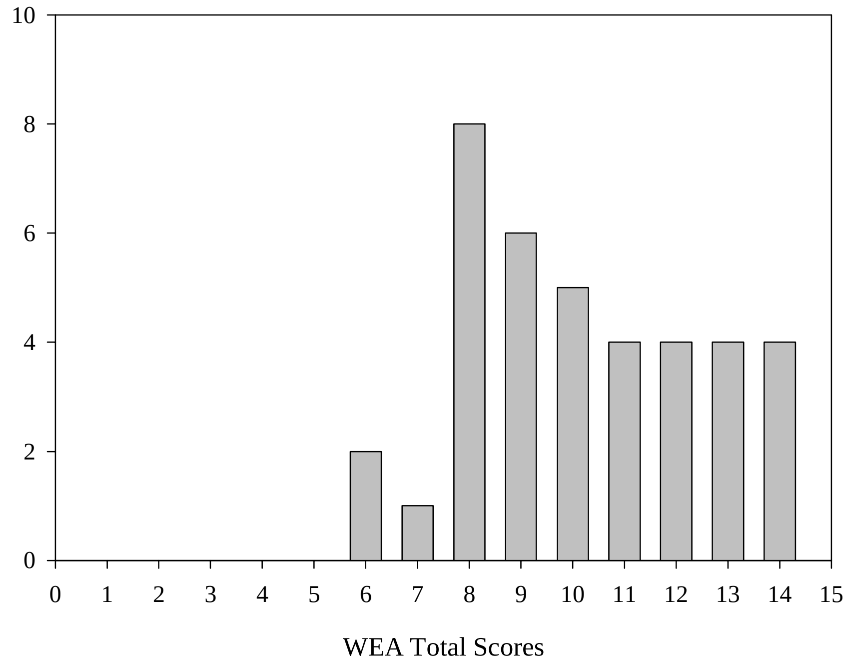


Figure 10-1. WEA total scores histogram for 38 mitigation sites within 52 project files.

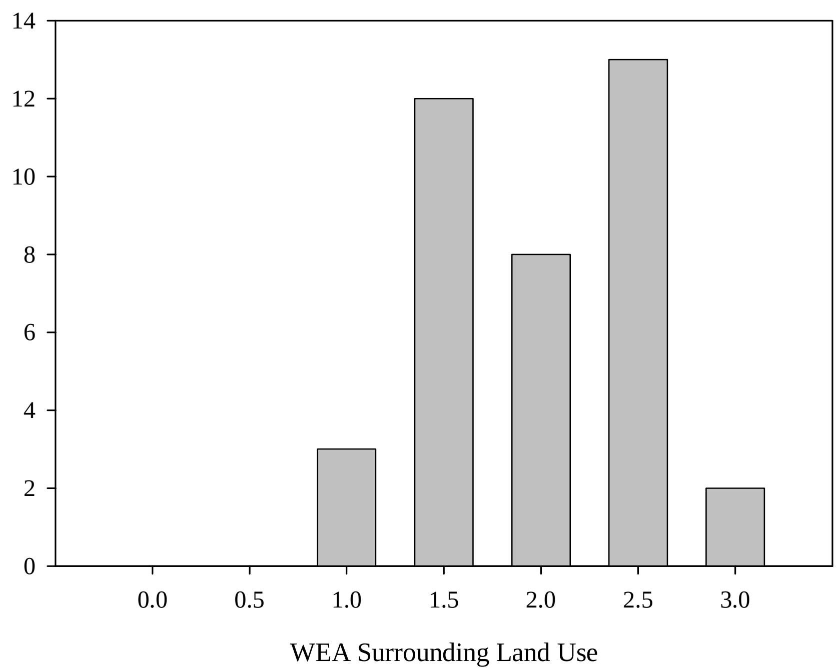


Figure 10-2. WEA surrounding land use scores histogram for 38 mitigation sites within 52 project files.

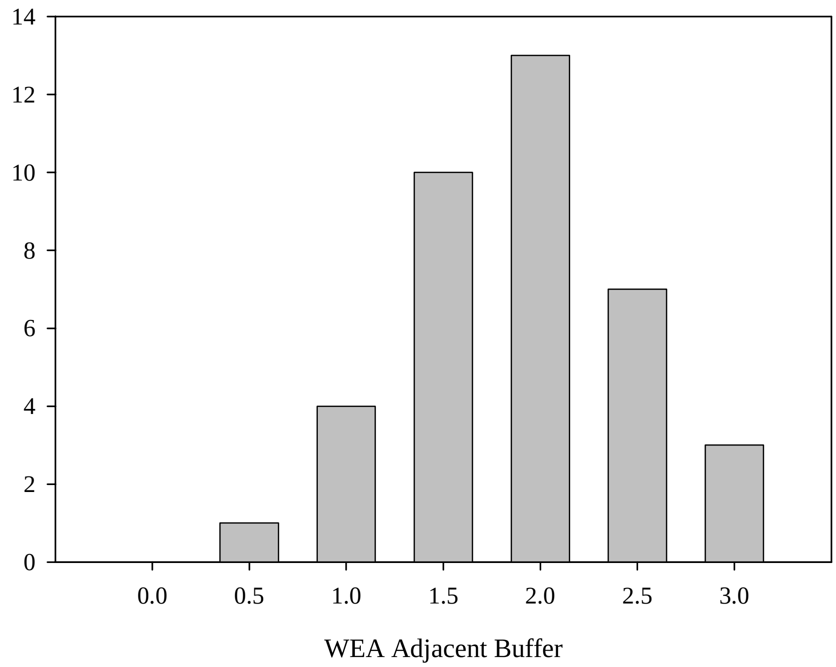


Figure 10-3. WEA adjacent buffer scores histogram for 38 mitigation sites within 52 project files.

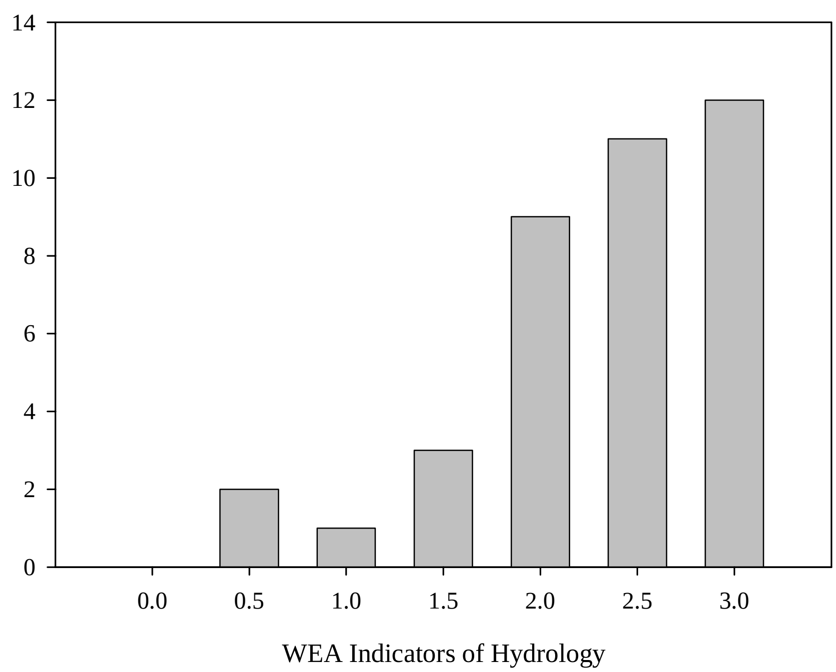


Figure 10-4. WEA indicators of hydrology scores histogram for 38 mitigation sites within 52 project files.

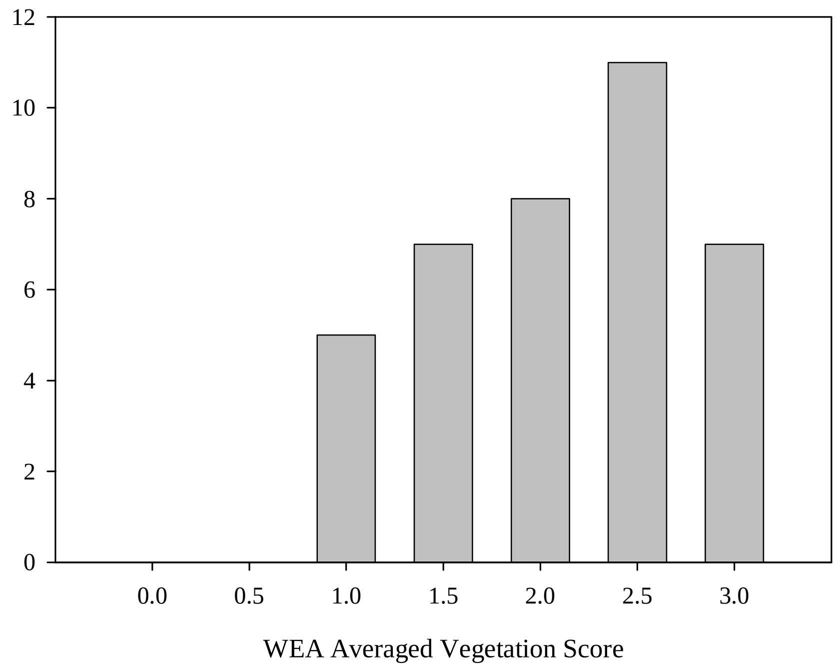


Figure 10-5. Figure WEA-5. WEA averaged vegetation scores histogram for 38 mitigation sites within 52 project files.

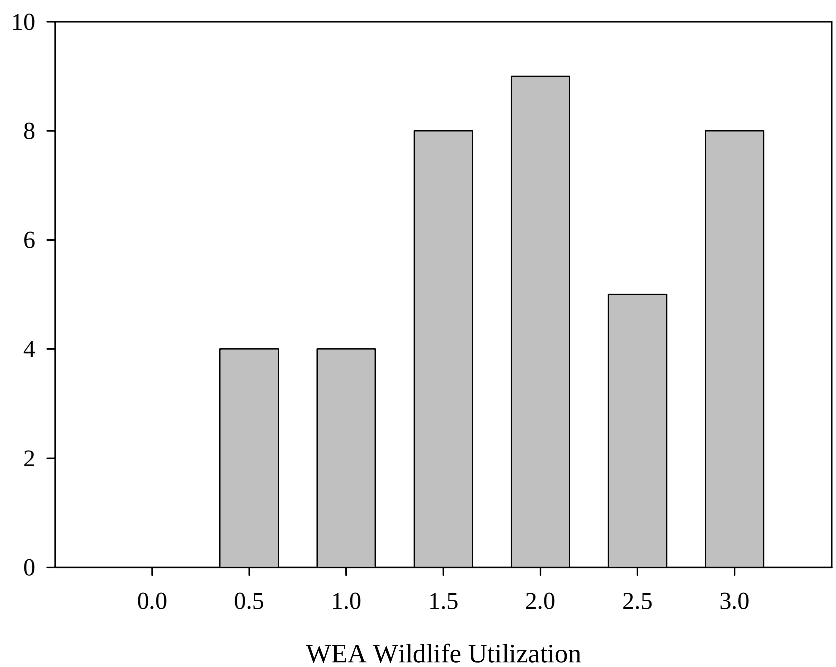


Figure 10-6. WEA wildlife utilization scores histogram for 38 mitigation sites within 52 project files.

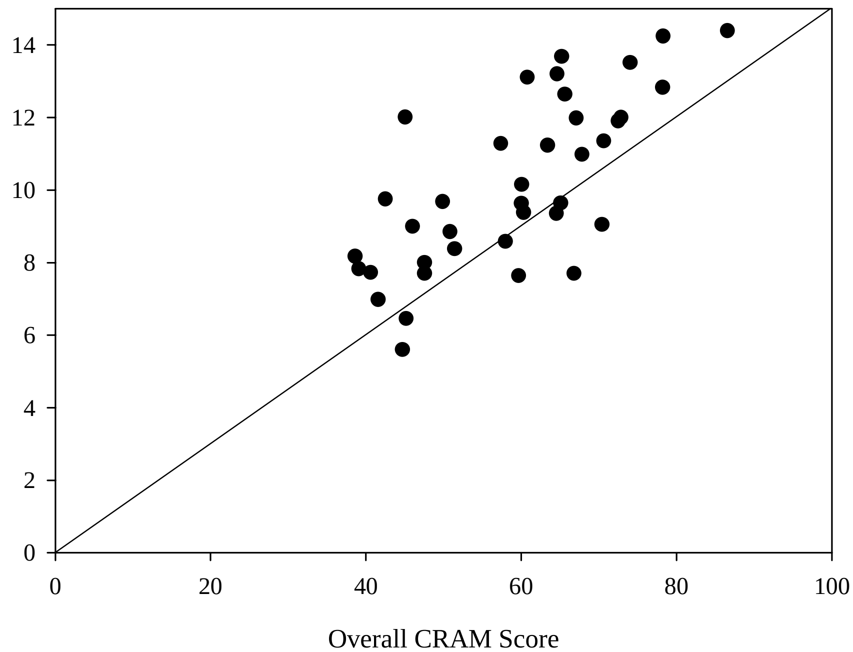


Figure 10-7. Correlation between CRAM and WEA overall scores by site. Diagonal line indicates equivalence between CRAM and WEA scores.

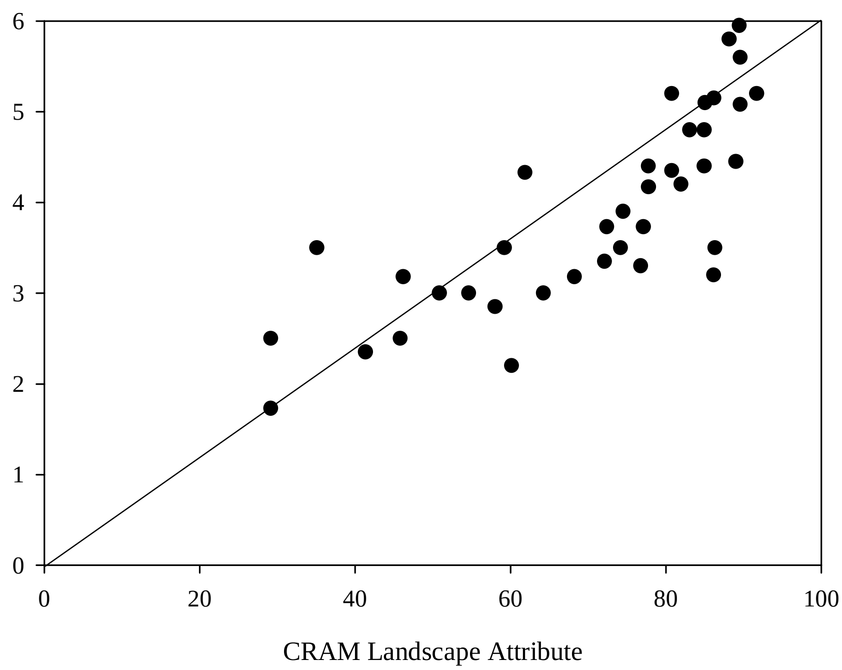


Figure 10-8. Correlation between CRAM landscape context attribute and WEA adjacent buffer category by site. Diagonal line indicates equivalence between CRAM and WEA scores.

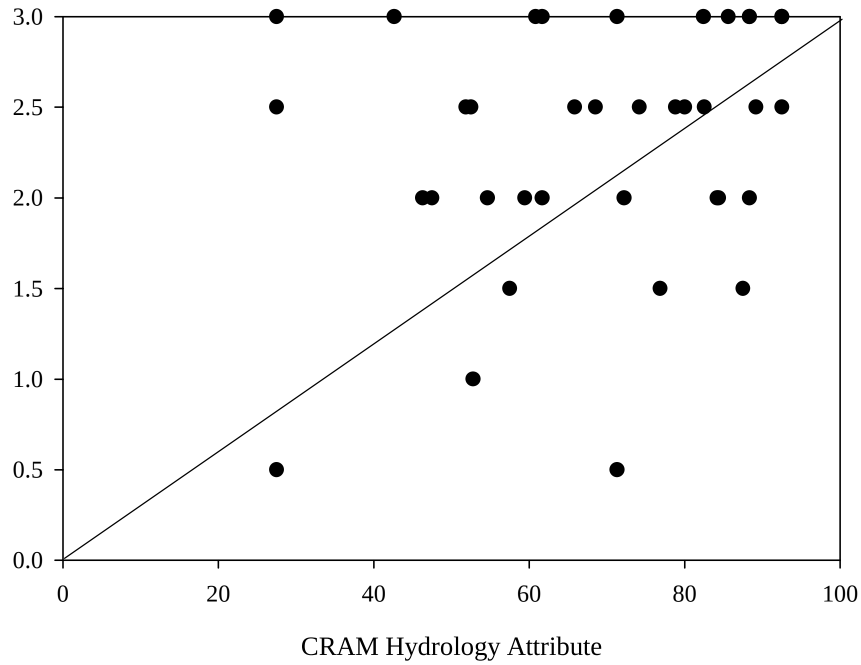


Figure 10-9. Correlation between CRAM hydrology attribute and WEA indicators of hydrology category. Diagonal line indicates equivalence between CRAM and WEA scores.

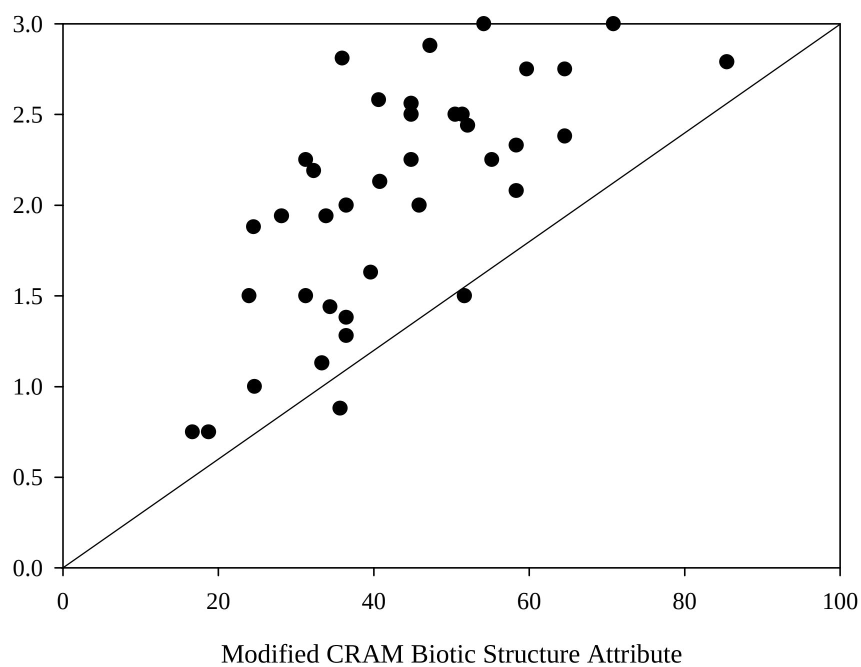


Figure 10-10. Correlation between CRAM biotic structure attribute (w/o organic matter) and WEA averaged vegetation. Diagonal line indicates equivalence between CRAM and WEA scores.

Literature Cited:

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11.Detailed Habitat Acreage Analysis Results

Included in this appendix are all the raw “jurisdictional habitats” data collected at each mitigation site for each permit file (Table 11-1) as well as an analysis of the acreage lost, required, and gained for every file (Table 11-2).

Table 11-1. Jurisdictional habitats data for each of 204 mitigation sites representing 129 files.

		Waters of the US									Non-Waters of the US		
					Non-Wetland Waters								
						Streambed Habitats							
File #	Mitigation Site #	Waters of the US (Total)	Wetland	Non-Wetland Waters (Total)	Non-Streambed Open Water	Streambed (Total)	Open Water	Unvegetated Streambed	Vegetated Streambed	Other (including Riparian)	Non-Waters of the US (Total)	Riparian	Upland
470	1	80	30	50	0	20	5	10	5	30	20	20	0
470	2	80	30	50	0	10	0	5	5	40	20	20	0
470	3	0	0	0	0	0	0	0	0	0	100	0	100
1484	1	60	60	0	0	0	0	0	0	0	40	0	40
1592	1	100	20	80	0	0	0	0	0	80	0	0	0
1664	1	100	85	15	0	15	15	0	0	0	0	0	0
1775	1	100	100	0	0	0	0	0	0	0	0	0	0
1775	2	88	88	0	0	0	0	0	0	0	12	0	12
1788	1	50	40	10	0	2	2	0	0	8	50	40	10
1788	2	38	25	13	0	2	2	0	0	11	63	15	48
1788	3	45	35	10	0	3	3	0	0	8	55	40	15
2055	1	100	55	45	0	0	0	0	0	45	0	0	0
2055	2	100	60	40	40	0	0	0	0	0	0	0	0
2097	1	5	0	5	0	0	0	0	0	5	95	75	20
2097	2	0	0	0	0	0	0	0	0	0	100	100	0
2097	3	60	40	20	0	5	5	0	0	15	40	40	0
2097	4	15	5	10	0	0	0	0	0	10	85	65	20
2219	1	0	0	0	0	0	0	0	0	0	100	100	0
2395	1	93	83	10	0	0	0	0	0	10	8	8	0
2395	2	95	50	45	0	0	0	0	0	45	5	5	0
2395	3	95	15	80	75	0	0	0	0	5	5	5	0
2418	1	40	10	30	0	0	0	0	0	30	60	60	0
2418	2	100	0	100	0	0	0	0	0	100	0	0	0
2443	1	100	100	0	0	0	0	0	0	0	0	0	0
2443	2	100	100	0	0	0	0	0	0	0	0	0	0
2456	1	100	100	0	0	0	0	0	0	0	0	0	0
2456	2	40	30	10	0	0	0	0	0	10	60	60	0

File #	Mitigation Site #	Waters of the US									Non-Waters of the US		
					Non-Wetland Waters								
						Streambed Habitats							
		Waters of the US (Total)	Wetland	Non-Wetland Waters (Total)	Non-Streambed Open Water	Streambed (Total)	Open Water	Unvegetated Streambed	Vegetated Streambed	Other (including Riparian)	Non-Waters of the US (Total)	Riparian	Upland
2591	1	25	0	25	0	20	0	15	5	5	75	20	55
2593	1	100	100	0	0	0	0	0	0	0	0	0	0
2667	1	100	100	0	0	0	0	0	0	0	0	0	0
2706	1	100	10	90	0	90	90	0	0	0	0	0	0
2726	1	100	93	8	8	0	0	0	0	0	0	0	0
2784	1	100	35	65	65	0	0	0	0	0	0	0	0
2804	1	0	0	0	0	0	0	0	0	0	100	0	100
2841	1	60	60	0	0	0	0	0	0	0	40	40	0
2841	2	40	40	0	0	0	0	0	0	0	60	60	0
2841	3	60	60	0	0	0	0	0	0	0	40	40	0
2841	4	0	0	0	0	0	0	0	0	0	100	100	0
2841	5	85	75	10	0	10	10	0	0	0	15	15	0
2841	6	60	20	40	0	20	20	0	0	20	40	40	0
2841	7	100	90	10	0	5	5	0	0	5	0	0	0
2841	8	50	30	20	0	10	10	0	0	10	50	30	20
2940	1	50	40	10	0	0	0	0	0	10	50	15	35
2974	1	100	0	100	0	90	0	0	90	10	0	0	0
2998	1	100	25	75	0	75	10	0	65	0	0	0	0
3079	1	100	5	95	95	0	0	0	0	0	0	0	0
3109	1	100	100	0	0	0	0	0	0	0	0	0	0
3252	1	100	100	0	0	0	0	0	0	0	0	0	0
3252	2	100	100	0	0	0	0	0	0	0	0	0	0
3370	1	100	100	0	0	0	0	0	0	0	0	0	0
3376	1	100	100	0	0	0	0	0	0	0	0	0	0
3417	1	95	80	15	0	5	5	0	0	10	5	5	0
3472	1	100	80	20	0	20	20	0	0	0	0	0	0
3536	1	100	40	60	50	10	0	10	0	0	0	0	0
3617	1	100	100	0	0	0	0	0	0	0	0	0	0
3632	1	65	65	0	0	0	0	0	0	0	35	35	0
3632	2	35	0	35	0	35	0	30	5	0	65	0	65
3632	3	100	0	100	100	0	0	0	0	0	0	0	0
3677	1	75	65	10	0	2	2	0	0	8	25	25	0
3710	1	100	100	0	0	0	0	0	0	0	0	0	0
4206	1	100	0	100	0	0	0	0	0	100	0	0	0
4231	1	100	100	0	0	0	0	0	0	0	0	0	0
4231	2	100	100	0	0	0	0	0	0	0	0	0	0

		Waters of the US									Non-Waters of the US		
					Non-Wetland Waters								
						Streambed Habitats							
File #	Mitigation Site #	Waters of the US (Total)	Wetland	Non-Wetland Waters (Total)	Non-Streambed Open Water	Streambed (Total)	Open Water	Unvegetated Streambed	Vegetated Streambed	Other (including Riparian)	Non-Waters of the US (Total)	Riparian	Upland
4580	1	100	80	20	0	0	0	0	0	20	0	0	0
4858	1	60	10	50	0	0	0	0	0	50	40	35	5
5136	1	100	100	0	0	0	0	0	0	0	0	0	0
5217	1	25	0	25	0	0	0	0	0	25	75	75	0
5401	1	100	75	25	0	0	0	0	0	25	0	0	0
5425	1	100	0	100	0	0	0	0	0	100	0	0	0
5619	1	70	30	40	25	0	0	0	0	15	30	30	0
5625	1	60	30	30	0	5	5	0	0	25	40	35	5
5625	2	60	30	30	0	5	5	0	0	25	40	35	5
5625	3	30	20	10	0	2	2	0	0	8	70	50	20
5747	1	100	100	0	0	0	0	0	0	0	0	0	0
5747	2	80	80	0	0	0	0	0	0	0	20	20	0
5815	1	30	30	0	0	0	0	0	0	0	70	0	70
5815	2	100	100	0	0	0	0	0	0	0	0	0	0
6002	1	60	60	0	0	0	0	0	0	0	40	0	40
6159	1	0	0	0	0	0	0	0	0	0	100	0	100
6159	2	100	60	40	0	0	0	0	0	40	0	0	0
6280	1	0	0	0	0	0	0	0	0	0	100	60	40
6367	1	100	100	0	0	0	0	0	0	0	0	0	0
6369	1	100	70	30	0	0	0	0	0	30	0	0	0
6369	2	20	0	20	0	20	0	0	20	0	80	80	0
6369	3	40	20	20	0	0	0	0	0	20	60	60	0
6369	4	60	40	20	0	0	0	0	0	20	40	35	5
6389	1	100	0	100	0	0	0	0	0	100	0	0	0
6451	1	100	100	0	0	0	0	0	0	0	0	0	0
6489	1	100	100	0	0	0	0	0	0	0	0	0	0
6668	1	100	80	20	0	10	10	0	0	10	0	0	0
6668	2	100	100	0	0	0	0	0	0	0	0	0	0
6668	3	100	100	0	0	0	0	0	0	0	0	0	0
6709	1	0	0	0	0	0	0	0	0	0	100	0	100
6789	1	35	25	10	0	5	5	0	0	5	65	45	20
6845	1	60	20	40	0	0	0	0	0	40	40	40	0
6855	1	100	100	0	0	0	0	0	0	0	0	0	0
6949	1	100	100	0	0	0	0	0	0	0	0	0	0
6970	1	70	50	20	20	0	0	0	0	0	30	30	0
6970	2	50	25	25	0	0	0	0	0	25	50	50	0

File #	Mitigation Site #	Waters of the US									Non-Waters of the US		
					Non-Wetland Waters								
						Streambed Habitats							
		Waters of the US (Total)	Wetland	Non-Wetland Waters (Total)	Non-Streambed Open Water	Streambed (Total)	Open Water	Unvegetated Streambed	Vegetated Streambed	Other (including Riparian)	Non-Waters of the US (Total)	Riparian	Upland
6970	3	20	20	0	0	0	0	0	0	0	80	30	50
7059	1	20	5	15	0	0	0	0	0	15	80	80	0
7117	1	100	100	0	0	0	0	0	0	0	0	0	0
7154	1	100	100	0	0	0	0	0	0	0	0	0	0
7154	2	100	86	14	14	0	0	0	0	0	0	0	0
7154	3	100	100	0	0	0	0	0	0	0	0	0	0
7270	1	82	82	0	0	0	0	0	0	0	18	0	18
7371	1	90	30	60	0	0	0	0	0	60	10	10	0
7385	1	100	100	0	0	0	0	0	0	0	0	0	0
7385	2	100	100	0	0	0	0	0	0	0	0	0	0
7404	1	100	100	0	0	0	0	0	0	0	0	0	0
7456	1	100	100	0	0	0	0	0	0	0	0	0	0
7456	2	0	0	0	0	0	0	0	0	0	100	0	100
7497	1	95	25	70	55	0	0	0	0	15	5	2	3
7521	1	70	15	55	0	5	5	0	0	50	30	30	0
7521	2	0	0	0	0	0	0	0	0	0	100	100	0
7528	1	100	100	0	0	0	0	0	0	0	0	0	0
7640	1	60	5	55	0	10	5	5	0	45	40	40	0
7646	1	100	100	0	0	0	0	0	0	0	0	0	0
7646	2	100	100	0	0	0	0	0	0	0	0	0	0
7678	1	0	0	0	0	0	0	0	0	0	100	0	100
7678	2	0	0	0	0	0	0	0	0	0	100	0	100
7827	1	100	100	0	0	0	0	0	0	0	0	0	0
7827	2	100	100	0	0	0	0	0	0	0	0	0	0
7883	1	100	100	0	0	0	0	0	0	0	0	0	0
7883	2	100	75	25	0	25	25	0	0	0	0	0	0
7932	1	100	100	0	0	0	0	0	0	0	0	0	0
7932	2	100	100	0	0	0	0	0	0	0	0	0	0
7932	3	100	100	0	0	0	0	0	0	0	0	0	0
7936	1	0	0	0	0	0	0	0	0	0	100	100	0
7942	1	10	10	0	0	0	0	0	0	0	90	90	0
7942	2	30	0	30	0	0	0	0	0	30	70	70	0
8044	1	100	100	0	0	0	0	0	0	0	0	0	0
8044	2	100	100	0	0	0	0	0	0	0	0	0	0
8044	3	40	30	10	0	0	0	0	0	10	60	60	0
8061	1	60	20	40	0	0	0	0	0	40	40	40	0

File #	Mitigation Site #	Waters of the US									Non-Waters of the US		
					Non-Wetland Waters								
						Streambed Habitats							
		Waters of the US (Total)	Wetland	Non-Wetland Waters (Total)	Non-Streambed Open Water	Streambed (Total)	Open Water	Unvegetated Streambed	Vegetated Streambed	Other (including Riparian)	Non-Waters of the US (Total)	Riparian	Upland
8125	1	20	10	10	0	0	0	0	0	10	80	60	20
8156	1	20	20	0	0	0	0	0	0	0	80	80	0
8156	2	0	0	0	0	0	0	0	0	0	100	100	0
8156	3	40	35	5	0	5	5	0	0	0	60	60	0
8156	4	70	40	30	0	10	10	0	0	20	30	30	0
8156	5	100	100	0	0	0	0	0	0	0	0	0	0
8156	6	100	78	23	0	0	0	0	0	23	0	0	0
8156	7	75	75	0	0	0	0	0	0	0	25	25	0
8156	8	0	0	0	0	0	0	0	0	0	100	100	0
8177	1	100	100	0	0	0	0	0	0	0	0	0	0
8177	2	0	0	0	0	0	0	0	0	0	100	25	75
8185	1	70	30	40	0	0	0	0	0	40	30	20	10
8185	2	10	0	10	0	0	0	0	0	10	90	70	20
8202	1	75	15	60	0	5	5	0	0	55	25	20	5
8215	1	85	85	0	0	0	0	0	0	0	15	0	15
8248	1	100	100	0	0	0	0	0	0	0	0	0	0
8337	1	100	40	60	20	0	0	0	0	40	0	0	0
8390	1	100	100	0	0	0	0	0	0	0	0	0	0
8529	1	100	0	100	0	100	0	70	30	0	0	0	0
8558	1	100	100	0	0	0	0	0	0	0	0	0	0
8587	1	0	0	0	0	0	0	0	0	0	100	0	100
8677	1	10	0	10	0	0	0	0	0	10	90	15	75
8704	1	100	100	0	0	0	0	0	0	0	0	0	0
8793	1	100	10	90	0	25	5	10	10	65	0	0	0
8800	1	0	0	0	0	0	0	0	0	0	100	0	100
8924	1	100	100	0	0	0	0	0	0	0	0	0	0
8947	1	100	100	0	0	0	0	0	0	0	0	0	0
8980	1	100	100	0	0	0	0	0	0	0	0	0	0
8980	2	100	100	0	0	0	0	0	0	0	0	0	0
9193	1	100	5	95	0	85	20	55	10	10	0	0	0
9193	2	0	0	0	0	0	0	0	0	0	100	0	100
9193	3	0	0	0	0	0	0	0	0	0	100	60	40
9211	1	100	15	85	0	65	40	15	10	20	0	0	0
9392	1	5	0	5	0	0	0	0	0	5	95	95	0
9404	1	90	80	10	0	0	0	0	0	10	10	10	0
9404	2	70	60	10	0	0	0	0	0	10	30	30	0

		Waters of the US									Non-Waters of the US		
					Non-Wetland Waters								
						Streambed Habitats							
File #	Mitigation Site #	Waters of the US (Total)	Wetland	Non-Wetland Waters (Total)	Non-Streambed Open Water	Streambed (Total)	Open Water	Unvegetated Streambed	Vegetated Streambed	Other (including Riparian)	Non-Waters of the US (Total)	Riparian	Upland
9404	3	25	10	15	0	0	0	0	0	15	75	75	0
9510	1	100	100	0	0	0	0	0	0	0	0	0	0
9597	1	100	90	10	0	0	0	0	0	10	0	0	0
9597	2	100	45	55	0	10	10	0	0	45	0	0	0
9597	3	95	90	5	0	0	0	0	0	5	5	5	0
9671	1	100	100	0	0	0	0	0	0	0	0	0	0
9691	1	0	0	0	0	0	0	0	0	0	100	20	80
9857	1	100	100	0	0	0	0	0	0	0	0	0	0
10274	1	100	70	30	30	0	0	0	0	0	0	0	0
10304	1	100	100	0	0	0	0	0	0	0	0	0	0
10347	1	75	0	75	0	0	0	0	0	75	25	25	0
10347	2	25	13	12	0	2	2	0	0	10	75	55	20
10347	3	25	13	12	0	2	2	0	0	10	75	55	20
10399	1	0	0	0	0	0	0	0	0	0	100	0	100
10409	1	100	100	0	0	0	0	0	0	0	0	0	0
10409	2	100	100	0	0	0	0	0	0	0	0	0	0
10453	1	100	100	0	0	0	0	0	0	0	0	0	0
10453	2	100	100	0	0	0	0	0	0	0	0	0	0
10495	1	100	100	0	0	0	0	0	0	0	0	0	0
10495	2	100	100	0	0	0	0	0	0	0	0	0	0
10530	1	100	100	0	0	0	0	0	0	0	0	0	0
10530	2	100	100	0	0	0	0	0	0	0	0	0	0
10843	1	25	25	0	0	0	0	0	0	0	75	75	0
10938	1	100	100	0	0	0	0	0	0	0	0	0	0
11208	1	100	100	0	0	0	0	0	0	0	0	0	0
11224	1	0	0	0	0	0	0	0	0	0	100	0	100

1490

Table 11-2. Summary of mitigation acreage data including lost vs. gained calculations and totals for 143 assessed files. Acres of preserves are not included in the Acres impacted. Acres of preservation are not included in the "Required Acreage" presented here because we did not measure these sites in the field. The methods of determining the obtained acreages are coded as follows: A = assumed, M = based on field measurements, PR = determined through permit review, P = preservation acres.

File #	Total Impact Acreage (Lost)	Permanent Impacts	Temporary Impacts	Required Acreage	Obtained Acreage (Gained)	Acreage Required - Lost	Acreage Gained - Lost	Acreage Gained - Required	Method of Obtained Acreage Determined
0	0.002	0.000	0.002	0.000	0.000	-0.002	-0.002	0.000	A
470	0.099	0.059	0.040	0.700	0.700	0.601	0.601	0.000	M, A
1210	0.009	0.009	0.000	0.000	0.000	-0.009	-0.009	0.000	M
1412	0.270	0.270	0.000	0.520	0.230	0.250	-0.040	-0.290	M
1464	1.870	0.920	0.950	4.030	4.030	2.160	2.160	0.000	A, P, PR
1484	0.087	0.087	0.000	0.170	0.230	0.083	0.143	0.060	M
1592	0.084	0.084	0.000	0.350	0.420	0.266	0.336	0.070	M
1664	0.040	0.017	0.023	0.033	0.033	-0.007	-0.007	0.000	A
1775	2.660	2.660	0.000	9.180	9.180	6.520	6.520	0.000	A, PR, P
1785	0.532	0.310	0.222	1.010	1.010	0.478	0.478	0.000	P
1788	1.010	1.010	0.000	4.690	4.800	3.680	3.790	0.110	M
1817	0.313	0.313	0.000	1.500	1.500	1.187	1.187	0.000	P, PR
2055	0.960	0.000	0.960	1.200	0.639	0.240	-0.321	-0.561	PR, F, A
2097	1.375	0.000	1.375	1.375	0.280	0.000	-1.095	-1.095	M
2219	2.022	2.000	0.022	2.022	2.022	0.000	0.000	0.000	A
2316	0.170	0.170	0.000	0.340	0.340	0.170	0.170	0.000	P
2395	2.740	2.580	0.160	4.660	5.360	1.920	2.620	0.700	M, PR
2418	0.312	0.002	0.310	1.110	1.000	0.798	0.688	-0.110	M
2443	0.077	0.077	0.000	0.154	0.500	0.077	0.423	0.346	M
2456	0.150	0.150	0.000	0.150	0.150	0.000	0.000	0.000	PR
2591	0.094	0.094	0.000	0.570	0.610	0.476	0.516	0.040	M
2593	0.048	0.048	0.000	0.100	0.090	0.052	0.042	-0.010	M
2667	0.380	0.380	0.000	1.140	1.140	0.760	0.760	0.000	P, PR
2706	0.140	0.090	0.050	0.200	0.200	0.060	0.060	0.000	M, A
2726	1.450	1.450	0.000	2.900	2.900	1.450	1.450	0.000	PR
2784	11.170	11.170	0.000	43.900	43.900	32.730	32.730	0.000	PR
2804	0.011	0.011	0.000	0.022	0.090	0.011	0.079	0.068	M
2841	1.740	1.740	0.000	3.500	3.630	1.760	1.890	0.130	M, A
2940	0.300	0.300	0.000	0.500	0.500	0.200	0.200	0.000	M
2974	0.150	0.150	0.000	0.150	0.220	0.000	0.070	0.070	M
2998	0.030	0.030	0.000	0.070	0.040	0.040	0.010	-0.030	M
3079	0.730	0.730	0.000	1.400	1.400	0.670	0.670	0.000	A
3109	0.030	0.028	0.002	0.030	0.030	0.000	0.000	0.000	M
3252	2.120	2.120	0.000	2.120	1.580	0.000	-0.540	-0.540	F, PR
3352	1.100	1.100	0.000	3.300	2.200	2.200	1.100	-1.100	P, PR
3370	0.150	0.150	0.000	0.700	0.700	0.550	0.550	0.000	M/P

File #	Total Impact Acreage (Lost)	Permanent Impacts	Temporary Impacts	Required Acreage	Obtained Acreage (Gained)	Acreage Required - Lost	Acreage Gained - Lost	Acreage Gained - Required	Method of Obtained Acreage Determined
3376	0.190	0.190	0.000	0.190	0.190	0.000	0.000	0.000	PR
3417	0.390	0.340	0.050	1.181	1.181	0.791	0.791	0.000	M, A
3472	0.390	0.390	0.000	0.390	0.390	0.000	0.000	0.000	M
3536	0.681	0.681	0.000	0.505	0.045	-0.176	-0.636	-0.460	A
3617	0.090	0.090	0.000	0.180	0.120	0.090	0.030	-0.060	M
3632	1.520	1.520	0.000	3.320	2.420	1.800	0.900	-0.900	M
3677	0.200	0.000	0.200	0.400	0.400	0.200	0.200	0.000	A
3710	0.177	0.177	0.000	0.410	0.354	0.233	0.177	-0.056	P
4206	1.500	0.000	1.500	1.500	1.500	0.000	0.000	0.000	A
4231	0.190	0.190	0.000	0.254	0.254	0.064	0.064	0.000	PR, P
4580	0.600	0.000	0.600	0.600	0.600	0.000	0.000	0.000	A
4858	1.090	0.220	0.870	0.580	0.580	-0.510	-0.510	0.000	A
5136	0.520	0.520	0.000	0.500	0.080	-0.020	-0.440	-0.420	M
5217	1.500	0.000	1.500	1.500	1.500	0.000	0.000	0.000	A
5401	0.083	0.083	0.000	0.415	0.730	0.332	0.647	0.315	M
5425	0.220	0.220	0.000	0.120	0.120	-0.100	-0.100	0.000	A
5479	0.006	0.006	0.000	0.140	0.140	0.134	0.134	0.000	A
5619	20.000	15.000	5.000	60.000	60.000	40.000	40.000	0.000	A
5625	0.140	0.100	0.040	0.903	0.288	0.763	0.148	-0.616	A
5747	0.300	0.000	0.300	0.600	0.690	0.300	0.390	0.090	M
5815	0.420	0.420	0.000	0.600	0.400	0.180	-0.020	-0.200	M
6002	1.361	1.361	0.000	4.170	3.870	2.809	2.509	-0.300	M
6159	1.500	1.500	0.000	3.000	2.770	1.500	1.270	-0.230	M
6280	0.190	0.090	0.100	0.200	0.190	0.010	0.000	-0.010	M, PR
6367	1.420	1.420	0.000	2.130	0.620	0.710	-0.800	-1.510	M
6369	1.490	1.490	0.000	5.690	5.960	4.200	4.470	0.270	M
6389	12.900	7.100	5.800	6.100	2.400	-6.800	-10.500	-3.700	PR, A
6451	0.650	0.000	0.650	0.650	0.530	0.000	-0.120	-0.120	M
6489	1.740	1.740	0.000	1.740	1.740	0.000	0.000	0.000	PR
6668	10.070	10.070	0.000	14.080	15.490	4.010	5.420	1.410	PR
6709	0.440	0.440	0.000	0.750	0.360	0.310	-0.080	-0.390	M
6789	2.895	2.895	0.000	44.050	37.710	41.155	34.815	-6.340	M
6845	0.400	0.170	0.230	0.170	0.170	-0.230	-0.230	0.000	A
6855	1.000	1.000	0.000	3.000	3.060	2.000	2.060	0.060	M
6949	0.006	0.006	0.000	0.009	0.009	0.003	0.003	0.000	A
6970	4.210	4.210	0.000	4.650	1.190	0.440	-3.020	-3.460	M, A
7014	1.500	0.100	1.400	2.800	2.800	1.300	1.300	0.000	PR
7059	0.100	0.000	0.100	0.100	0.100	0.000	0.000	0.000	A, PR
7117	0.670	0.670	0.000	4.000	4.000	3.330	3.330	0.000	A
7154	2.840	2.840	0.000	8.520	8.730	5.680	5.890	0.210	PR
7270	0.340	0.340	0.000	0.400	0.400	0.060	0.060	0.000	PR
7371	0.580	0.440	0.140	1.250	1.106	0.670	0.526	-0.144	M
7385	5.800	5.800	0.000	6.330	6.040	0.530	0.240	-0.290	A, PR

File #	Total Impact Acreage (Lost)	Permanent Impacts	Temporary Impacts	Required Acreage	Obtained Acreage (Gained)	Acreage Required - Lost	Acreage Gained - Lost	Acreage Gained - Required	Method of Obtained Acreage Determined
7404	0.370	0.370	0.000	0.370	0.370	0.000	0.000	0.000	M
7456	1.700	1.700	0.000	3.400	3.370	1.700	1.670	-0.030	A, P
7497	14.600	14.600	0.000	14.600	14.600	0.000	0.000	0.000	M, A
7521	0.340	0.000	0.340	0.680	0.680	0.340	0.340	0.000	A
7528	0.580	0.580	0.000	1.300	1.300	0.720	0.720	0.000	P, PR
7640	0.120	0.000	0.120	0.120	0.120	0.000	0.000	0.000	A
7646	0.710	0.710	0.000	1.500	2.250	0.790	1.540	0.750	M
7678	1.960	1.960	0.000	2.940	1.920	0.980	-0.040	-1.020	M, A
7827	1.900	1.900	0.000	9.600	9.600	7.700	7.700	0.000	M
7883	0.290	0.290	0.000	0.510	0.520	0.220	0.230	0.010	M
7902	5.300	0.000	5.300	5.300	5.300	0.000	0.000	0.000	A
7932	0.940	0.940	0.000	3.330	2.866	2.390	1.926	-0.464	A
7936	0.480	0.480	0.000	0.980	0.980	0.500	0.500	0.000	M, A
7942	0.780	0.500	0.280	2.850	2.850	2.070	2.070	0.000	A, PR
8044	2.560	2.560	0.000	2.560	2.560	0.000	0.000	0.000	PR
8061	2.450	2.180	0.270	5.960	4.020	3.510	1.570	-1.940	M
8075	1.320	1.320	0.000	1.350	1.350	0.030	0.030	0.000	A
8125	0.840	0.230	0.610	5.360	5.360	4.520	4.520	0.000	A
8156	3.320	2.640	0.680	6.340	7.160	3.020	3.840	0.820	M, A
8177	0.335	0.335	0.000	0.140	0.310	-0.195	-0.025	0.170	M
8185	0.310	0.310	0.000	1.110	1.030	0.800	0.720	-0.080	M
8202	0.280	0.280	0.000	0.940	0.330	0.660	0.050	-0.610	M
8215	1.840	1.840	0.000	2.500	2.500	0.660	0.660	0.000	A
8217	9.300	0.000	9.300	9.300	9.300	0.000	0.000	0.000	A
8248	1.090	1.090	0.000	1.420	1.420	0.330	0.330	0.000	PR
8337	0.042	0.042	0.000	0.042	0.042	0.000	0.000	0.000	M
8525	0.070	0.070	0.000	0.210	0.210	0.140	0.140	0.000	M
8529	2.000	2.000	0.000	8.550	4.360	6.550	2.360	-4.190	P, A
8558	6.900	1.780	5.120	0.140	0.190	-6.760	-6.710	0.050	C
8587	0.100	0.100	0.000	0.100	0.100	0.000	0.000	0.000	A
8677	5.300	2.500	2.800	1.250	1.260	-4.050	-4.040	0.010	M, A
8704	0.021	0.002	0.019	0.002	0.002	-0.019	-0.019	0.000	A
8793	2.270	2.270	0.000	1.400	1.400	-0.870	-0.870	0.000	A
8800	0.400	0.400	0.000	0.830	0.260	0.430	-0.140	-0.570	M
8890	0.660	0.600	0.060	10.000	10.000	9.340	9.340	0.000	P
8924	0.400	0.400	0.000	1.200	1.200	0.800	0.800	0.000	P, PR
8947	1.000	1.000	0.000	2.000	2.680	1.000	1.680	0.680	M
8980	1.570	1.570	0.000	2.010	2.010	0.440	0.440	0.000	P, PR
9193	2.955	0.705	2.250	3.940	2.020	0.985	-0.935	-1.920	A/M
9211	0.130	0.130	0.000	0.250	0.250	0.120	0.120	0.000	A
9392	0.350	0.110	0.240	0.350	0.320	0.000	-0.030	-0.030	M, A
9404	11.940	11.940	0.000	11.940	11.940	0.000	0.000	0.000	A
9430	0.044	0.044	0.000	0.230	0.230	0.186	0.186	0.000	A

File #	Total Impact Acreage (Lost)	Permanent Impacts	Temporary Impacts	Required Acreage	Obtained Acreage (Gained)	Acreage Required - Lost	Acreage Gained - Lost	Acreage Gained - Required	Method of Obtained Acreage Determined
9432	0.040	0.040	0.000	0.210	0.270	0.170	0.230	0.060	M
9448	0.036	0.036	0.000	0.370	0.400	0.334	0.364	0.030	P
9510	0.615	0.615	0.000	0.650	0.650	0.035	0.035	0.000	M
9597	1.630	1.630	0.000	3.000	2.930	1.370	1.300	-0.070	M, A
9671	0.155	0.155	0.000	0.155	0.155	0.000	0.000	0.000	PR
9691	0.100	0.100	0.000	0.900	0.900	0.800	0.800	0.000	M, A
9857	0.170	0.170	0.000	0.340	0.410	0.170	0.240	0.070	A
10274	0.027	0.027	0.000	0.027	0.027	0.000	0.000	0.000	PR
10304	0.140	0.140	0.000	0.200	0.200	0.060	0.060	0.000	P
10329	0.060	0.060	0.000	0.060	0.060	0.000	0.000	0.000	P
10347	0.050	0.050	0.000	0.120	0.180	0.070	0.130	0.060	M
10356	3.130	3.040	0.090	6.930	6.930	3.800	3.800	0.000	P
10399	0.095	0.095	0.000	0.101	0.067	0.006	-0.028	-0.034	A
10409	0.560	0.460	0.100	0.600	0.570	0.040	0.010	-0.030	M, A
10453	0.520	0.520	0.000	8.670	8.670	8.150	8.150	0.000	P, PR
10495	1.465	1.242	0.223	3.098	1.988	1.633	0.523	-1.110	M, A
10530	1.124	0.490	0.634	3.170	3.170	2.046	2.046	0.000	P, PR
10843	0.041	0.021	0.020	0.123	0.290	0.082	0.249	0.167	M
10938	0.151	0.151	0.000	1.356	1.359	1.205	1.208	0.003	P
11208	0.088	0.088	0.000	0.088	0.088	0.000	0.000	0.000	PR
11224	0.035	0.007	0.028	4.300	4.300	4.265	4.265	0.000	A
Totals	**216.833**	**165.753**	**51.080**	**445.245**	**417.035**	**228.412**	**200.202**	**-28.211**	

1498

12. Site Narratives

0- Highway 99/Merced River Bridge Replacement Project, California Department of Transportation, Merced County

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
0	5F	Sacramento	1998	ND	N/A	100.00	N/A

This project involved replacing the northbound Highway 99 Merced River Bridge which required the installation of a cofferdam and falsework. These installations resulted in the temporary fill of approximately 0.002 acres of open-water streambed (non-wetland waters of the US). When visited, this bridge did not seem to have footings inside waters of the US and mitigation was not evident. Thus, the mitigation site associated with the project, if it existed, could not be evaluated. The only two assessable conditions in this file were both imposed by the DFG permit which was invoked by the 401 permit. These conditions, both of which were met, were to stabilize slopes in the impact area and return impacted areas in the streambed or banks to pre-project contours without creating future erosion problems. All impacts were listed as temporary, but they did not include the 0.15 acres of permanent shading impacts on waters of the US caused by the expanded bridge. Mitigation was not required for these permanent impacts. This was a compliance-only file.

470- Hummingbird's Nest Ranch Project, Five S Properties, LTD., Simi Valley.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
470	4	Los Angeles	2002	100.0	57.992	82.7	79.7

This project involved installation of bridges and widening of roads within the Hummingbird Nest Ranch which was located a couple of miles north of Highway 118 in the relatively undeveloped northeastern corner of the City of Simi Valley. Permanent impacts of 0.059 acres and 0.040 acres of temporary impacts were offset by restoration and enhancement of 0.70 acres of habitat onsite. Waters of the US comprised 0.224 acres of the habitat mitigated (0.084 acres of wetland and 0.140 acres of non-wetland waters) and non-waters of the US comprised 0.376 acres (0.286 riparian and 0.090 upland). The stretches of the unnamed tributary in which mitigation took place were low-gradient, intermittent streams located high in the watershed with little development upstream of them beyond the ranch. Mitigation was undertaken at the impact sites of the two bridge installations and at an Arizona crossing towards the eastern edge of the ranch. All mitigation sites had flowing surface water and were connected well to the adjacent upstream and downstream reaches of the river. Buffer width was extensive at all sites and of moderately good condition, but surrounded less than 50% of the first two mitigation sites. Over 75% of the third mitigation site was surrounded by buffer. Organic matter accumulation at all sites was characterized by moderate amounts of materials ranging in size from fine organic matter to coarse, woody debris.

The first mitigation site where a bridge and culvert were installed was vegetated relatively densely with 155% absolute vegetative cover, the majority of which was provided by native species. The short-herb stratum, comprising 70% of the vegetative cover at the site, was dominated by non-natives (mustard and nut sedge) and ragweed (native). The tall-herb stratum, comprising 10% of the vegetative cover at the site, was dominated by three native plant species: telegraph weed, horseweed, and mugwort. Coast live oak and sycamore trees dominated the shrub layer at the first mitigation site and comprised 40% of its vegetative cover. Coast live oak and two species of willow, red and arroyo, dominated the tree layer which comprised 35% of the vegetative cover at the mitigation site.

The second mitigation site where a bridge and culvert were installed at the ranch was also vegetated densely with 165% absolute vegetative cover, the majority of which was provided by native species. The short-herb stratum, covering 75% of the site, was dominated by the non-native Bermuda grass and three natives: horseweed, cocklebur, and ragweed. The tall-herb layer was not measurable. The shrub stratum comprised 50% of the vegetative cover at the site and was dominated by mulefat. The tree stratum comprised 40% of the vegetative cover at the site and was dominated by red and arroyo willow. The stream channel at the first and second mitigation sites was about 15 feet wide with gently sloping banks about 10 feet high. Both sites also had wingwalls installed during culvert-and-bridge installation, so the mitigation plantings were done behind these wingwalls and on the rest of the banks upstream and downstream of them. The streambed at both sites was vegetated sparsely (note: the vegetation descriptions above apply to the banks only).

The third mitigation site, located at the eastern edge of the ranch, was not as densely vegetated as the first two mitigation sites with 120% absolute vegetative cover. The short-herb stratum, comprising 70% of the cover at the site, was dominated by an African daisy. Tall herbs and trees were absent from the site. The shrub stratum, covering 50% of the site, was dominated by toyon and lemonade berry. This site was characterized by steep, incised canyon walls and a narrow stream channel about 20 feet below where the mitigation plantings occurred towards the top of the right bank. The hydrological connection of this stream to the adjacent uplands was poor as the walls were so steep and high.

1210-Extended Box Culvert, California Department of Transportation, San Luis Obispo County.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
1210	3	Los Angeles	2000	ND	N/A	25.00	N/A

This project involved extending a box culvert to accommodate the widening of State Route 41 between Atascadero and Morro Bay. Permanent impacts totaling 0.009 acres to wetland waters of the US (0.007 acres) and streambed waters of the US (0.002 acres) were to be mitigated by planting of willow cuttings, maintenance of the plantings for three years, and confirmation that the impacted wetlands reestablished naturally. The presence of five dead willow cuttings at the impact area suggested that the plantings were done, but they were not maintained and confirmation that the impacted wetlands reestablished was not included in the file. Requirements for the mitigation acreage were not specified.

1412- Picketts Junction, California Department of Fish and Game, South Lake Tahoe

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
1412	6T	Sacramento	2000	44.23	78.26	90.70	N/A

The California Department of Fish and Game (CDFG) constructed a barrier free fishing access facility, which included a parking area for 11 vehicles, two concrete fishing platforms adjacent to the West Fork Carson River, and a concrete and asphalt walkway to the platforms. The project occurred in the Hope Valley Wildlife Area (WLA) in South Lake Tahoe. The construction permanently impacted 0.27 acres of wetland vegetation found along the stream channel. The mitigation for the impact required an approximate 2:1 mitigation ratio of 0.52 acres of onsite riparian and riverine restoration. Additionally, CDFG removed grazing from the WLA in order to restore wetland and riparian functions and values and to restore habitat for special-status species.

We conducted our field assessment using CDFG maps found in the 404 permit. We were able to locate the impact area and onsite mitigation with these maps and used CRAM to evaluate the riverine wetland. Dominant native species used in the restoration of the stream bank were *Salix geyeriana* and *Carex nebrascensis*, and both species seemed to be healthy and vigorous. Alien plant species were not abundant at the mitigation site and, if present, made up less than 5% cover. We utilized the bridge to the east of the mitigation area as the downstream boundary and the sharp left turn in the river to the west as the upstream boundary, which coincided with CDFG maps. The condition of the site was excellent, and CRAM scores were high; however, the native plant species richness scored low due to the presence of only two dominant native plants. After assessing GPS acreage in the office, we concluded that CDFG did not meet their required 0.52 acres. They only managed to obtain 0.23 acres of restored wetland. Overall CRAM scores were optimal.

1464- PG&E Foothills Park, PG&E, Roseville

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
1464	5S	Sacramento	2001	100.00	66.01	100.00	N/A

This project site was located in Roseville, 5 miles west of Interstate 80, and about 0.5 miles north and west of Blue Oaks interchange on State Route 65. The overall purpose of the proposed project was to develop light industrial uses on the PG&E parcel as part of Foothills Business Park development. The project permanently impacted 0.41 acres of vernal pool and temporarily impacted 0.89 acres of vernal pools. Other impacts included: 0.14 acres of drainage swales, 0.34 acres of seasonal wetlands, 0.03 acres of palustrine emergent marsh, and 0.06 acres of temporary impacts for manholes. The total permanent impacts were 0.89 acres of wetlands and other waters of the US As compensation, 0.96 acres of seasonal wetlands were purchased at Wildlands Sheridan. To offset the vernal pool impacts, 2.60 acres of vernal pool preservation credit were purchased, and 0.41 acres of creation credits were purchased from the US Fish and Wildlife Service Vernal Pool Conservation Fund. We did not evaluate the area in which the vernal pool creation credits were purchased. However, we did assess the seasonal wetlands purchased from Wildlands Inc.

Wildlands Sheridan Mitigation Bank is located north of Roseville and was established in 1994. Although there are many habitat types found within the bank, we assessed three: riparian, depressional and vernal pools. The site was created in four phases. In the first three phases there was a total construction of 28.78 acres of vernal pools, 24.46 riparian acres, 4.91 seasonal wetland acres, 89.81 acres of emergent marsh, and 45.99 acres of perennial marsh. Phase four created 28.06 acres of vernal pools, 7.22 acres of riparian habitat, and 77.73 acres of seasonal, emergent and perennial marsh. Phase four was not completed at the time of our assessment, and acreage had not been approved for credits to be purchased. Therefore, we focused our evaluation on phases one to three. We were joined in the field by Riley Swift, president and owner of Restoration Resources, which manages Sheridan Mitigation Bank, and Valerie Layne, Senior Conservation Biologist for Wildlands Inc. The area is surrounded by orchards; however, they advised us that there has been no evidence of pesticides or fertilizers impacts from these adjacent orchards. The hydrology of the site is managed to maintain target wetness levels for each wetland area. The main distribution of water for the site is synchronized with a back-up well receiving runoff from adjacent irrigation systems and recycled waters within the bank. The hydrology has been designed for gravity flow from ditches in the easternmost section of the site to other areas throughout the bank. They use overflow weirs where areas need to be inundated for longer periods of time. Mr. Swift also mentioned that skunks, voles, beavers, jack rabbits and coyotes are the main disturbances to the mitigation bank. During our assessment we found wildlife and evidence of wildlife to be abundant.

The depressional areas, or as Wildlands refers to the areas, seasonal wetlands, were highly variable in terms of levels of inundation. We randomly selected two assessment areas that included an isolated ponded area (area 17) and a muddy low land (area 1). The freshwater marsh at area 17 appeared to have an altered hydrologic regime and remained inundated for a long-duration of time. Area 1 had saturated soils but no surface water. Area 17 was surrounded by open water, other wetlands and bordered by a riparian area. The CRAM scores for these areas were similar, except that the second site had slightly higher scores for physical and biotic patch richness, vertical biotic structure, and native plant species richness. The short herb stratum dominant species for both sites were *Paspalum dilatatum* and *Eleocharis macrostachya.* Tall herb stratum dominants were *Scirpus californicus* and *Typha angustifolia*. *Salix* sp. and *Populus deltoides* were only found in area 1.

1484- Santa Ynez Valley YMCA Project, Channel Island YMCA, Solvang.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
1484	3	Los Angeles	2001	135.29	52.22	94.20	95.80

This project involved the construction of the Santa Ynez Valley YMCA in the town of Solvang. Construction of this facility involved a parking lot, complete site landscaping, underground utility installation, improvement to Refugio Road, a county road and improvement to an existing drainage retardation basin. Prior to these impacts this site contained a small residence and landscaping. Vegetation was sparse, with non-native annual weeds and planted Brazilian pepper trees. Construction of the YMCA facility on this site permanently impacted 0.087 acres of jurisdictional wetlands. To mitigate for these impacts, the permittee was required to create 0.17 acres of wetland. During our site visit we measured the mitigation area to be 0.230 acres, of which 0.138 acres was wetland and 0.092 acres were upland habitat. The mitigation area on the file maps showed a long strip alongside the eastern side of the YMCA and to the west of the playing field, and jutting to the east, parallel to Route 246 at the southern most part of the site. The northern most part of this area did not appear to have been used as mitigation, as it was barren with no plantings. In the more southern two-thirds of the mitigation area, arroyo willow, red willow, mulefat, Californian rose, coyotebush, cattails, mugwort, and deer grass were dominant. Clear evidence of non-native plant removal was also found. There was a small stone lined drainage along the eastern boundary of the mitigation site that seemed to supply runoff to the site. The site was buffered to the east and north by the playing field, to the west by a landscaped slope, and to the south by disturbed habitat between the site and a paved road.

1592- Rafael Village Development, Novato Community Partners LLP, Marin County.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
1592	2	San Francisco	2001	120.00	47.67	50.00	N/A

The Novato Community Partners LLP project directly impacted 0.084 acre of waters of the US, in order to construct single and multiple family homes and all necessary facilities on the Capehart Hillside subdivision area. No wetlands or special aquatic sites were disturbed in the process. The 401 permit required the applicant to create new vegetated seasonal wetland habitat with a success criteria of 30% absolute vegetation cover over three growing seasons, to offset impacts to waters of the US The mitigation was implemented onsite at Hamilton Field, Marin County.

During our field assessment, a map from the project's preconstruction notification was used to locate the mitigation site. The seasonal wetland was created by the construction of a bypass channel around Pacheco Creek on the Capehart Hillside. Seasonal stormwater flows entered the channel. Perpendicular to the bypass channel, the applicant constructed four cutoff walls creating ponding conditions behind the walls. These conditions were able to support the creation of new seasonal and perennial wetlands. Native emergent wetland species such as *Typha angustifolia* and *Typha latifolia* dominated 50% of the mitigation site and appeared very healthy. The native species *Cyperus eragrostis* and *Rorippa nasturtium-aquaticum* were the dominant short herbs. Alien grasses such as *Polypogon monspeliensis* and *Lolium multiflorum* also were dominants at the site. Overall, the wetland was functioning to support an array of native vegetation. CRAM metrics were scored average except for physical patch richness, which scored low due to the lack of physical patch types. The width and condition of the buffer scored average because mitigation was surrounded by homes and a school and lacked native vegetation. After reviewing the GPS acreage, we concluded that the applicant complied with the creation of 0.350 acres of new vegetated seasonal wetland habitat. Overall CRAM scores were marginal for this mitigation area.

1664- Cholame Creek Bank Stabilization, California Department of Transportation, Cholame.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
1664	3	San Francisco	2001	100.00	62.84	100.00	100.00

High water flows in 1997 and 1998 eroded the base of a concrete slab protection along Cholame Creek off Route 46. The California Department of Transportation repaired approximately 64 meters of storm-damaged concrete slope protection by placing approximately 17 linear meters of rock slope protection in place of the damaged slab. During the repairs, the creek was diverted around the project area using a gravel bag diversion. Replacing this slope protection permanently impacted 0.017 acres and temporarily impacted 0.023 acres of jurisdictional habitat. Prior to the repairs, the creek contained areas of boulders and cobble bottomed unvegetated streambed, while other areas vegetated by grasses and shrubs. To mitigate for losses to this habitat, the permittee was required to create 0.033 acres of jurisdictional habitat, including 0.013 acres of wetlands.

During our site visit, the vegetation at the impact site blended into the natural vegetation both upstream and downstream of the project. Although we could not define the exact boundary of the mitigation site, greater than the required 0.033 acres of jurisdictional habitat was present and thriving in the presumed mitigation area. We determined that the site was 85% wetlands and 15% streambed open water. Vegetation at this site consisted primarily of bulrushes, cattails, and saltgrass. The mitigation area was located at the edge of a perennial section of the creek, providing enough hydrology at the site to support the revegetation efforts. The mitigation area was adjacent to the rock slope protection and Route 46 on the northwestern side, while ample open space buffered the site to the southeast.

1775 -Bickford Ranch, Bickford Holdings LLC, Placer County

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
1775	5S	Sacramento	2002	100.00	60.45	100.00	100.00

This project involved the filling of 2.66 acres of waters of the US, including 2.45 acres of wetlands and 0.21 acres of intermittent streams for the Bickford Ranch Subdivision residential development (1800 homes, commercial center, golf course and 690 acres of open space in a total area of 1942 acres). The project is between the towns of Lincoln and Newcastle in Placer County. Mitigation for these impacts included the restoration of 8.49 acres of onsite wetlands, as well as the purchase of 0.46 acres of vernal pool preservation credits at the Orchard Creek Conservation Bank in Placer County and the purchase of 0.23 acres of vernal pool creation habitat at the Wildands Mitigation Bank, also in Placer County. The onsite wetlands included a mix of open water marsh, emergent marsh, and seasonal wetlands (totaling 4.33 acres) and willow and valley oak riparian habitats (totaling 4.33 acres). The impacts included the loss of elderberry (*Sambucus mexicana*), which is the host plant for the threatened valley elderberry longhorn beetle or VELB (*Desmocerus californicus dimorphus*). There were 57 elderberry shrubs at the site, with possible evidence of VELB on five plants. Direct impacts occurred to 2 elderberry plants and potential indirect impacts to 19 plants. Elderberry mitigation included the transplanting of plants prior to the project to avoid impacts, monitoring, and a conservation easement for the area to preserve the elderberry habitat.

The mitigation site included three distinct networks consisting of a mix of depressional swales and riparian habitat. Soils were heavily compacted in the created swales. This site score well in terms of landscape context and buffer with a mixed grassland in the nearby upland that included some native species. Hydrology score lower as the site lacked a well-defined channel. It scored lowest for physical structure with few patch types and moderate topographic complexity. Biotic structure was variable: very few non-native species, but low scores for biotic patch richness and vertical structure. Dominant species at the site included *Salix* sp., *Typha latifolia*, *Scirpus acutus*, *Eleocharis* sp. Based on a review of the file material, including annual reports for 2003 and 2004, we determined that this project met the mitigation acreage requirements.

1785-Replace Miles Avenue Bridge, City of Indian Wells, Indian Wells

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
1785	7	Los Angeles	2002	100.00	N/A	100.00	N/A

This project involved stabilizing the banks of the Whitewater River to protect the Whitewater Channel Hotel, the bridge, and other structures. The work consisted of removing existing golf turf, laying a concrete foundation on the bank, and relining the area with golf course turf. Impacts to waters of the US totaled 0.532 acres which involved 0.090 acres of wetlands and 0.442 acres of streambed (non-wetland). About sixty percent of these impacts were permanent (0.310 acres) and the other forty percent were temporary. Permanent impacts affected non-wetland streambed waters (0.310 acres). Temporary impacts included 0.090 acres of wetlands and 0.132 acres of streambed. The mitigation that was required was the purchase of 1.01 acres of vegetated streambed, waters-of-the-US credits from the Valley Mountain Conservancy. This purchase of $13,500 was made, thereby fulfilling the mitigation requirement for the file.

1788-Damon-Garcia Sports Complex Project, City of San Luis Obispo Parks and Recreation Department, San Luis Obispo.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
1788	3	Los Angeles	2002	102.35	51.45	68.90	63.50

The City of San Luis Obispo had the Damon-Garcia Sports Complex created in the southeastern edge of San Luis Obispo. This sports complex included the development of sports fields, parking, walking paths, lighting, and restrooms. Prior to the construction of this complex the project site was disturbed and compacted by livestock with oak woodlands, riparian woodlands, chaparral, coastal sage scrub, and grassland habitats. In particular, Acacia Creek, Orcutt Creek, and seasonal wetlands were present on the project site. Prior to these impacts Acacia Creek was a deeply incised channel with spike rush, northwestern mannagrass, watercress, and rabbitfoot grass. Orcutt Creek had less severely incised banks and supported more wetland vegetation, including cattails, spike rush, northwestern mannagrass, watercress, and rabbitfoot grass. The seasonal wetlands were dominated by hydrophytic vegetation, including northwestern mannagrass and bird's foot trefoil. The construction of this sports field complex required realigning about 775 linear feet (0.19 acres) of Orcutt Creek and filling permanently 0.82 acres of adjacent wetlands. Total impacts of 1.01 acres, all of which were permanent, were mitigated by creating and enhancing 4.8 acres of habitat adjacent to the new sports field. The mitigation area surrounded the perimeter of the eastern most sports field. The mitigation for this project was divided into three main areas, including upper Orcutt Creek, Orcutt and Acacia Creek confluence, and Acacia Creek.

The first mitigation site consisted of 0.48 acres of wetland creation and creation of 0.10 acres of non-wetland waters of the US in Orcutt Creek. This site was located between the playing field to the west, Broad Street to the east, and the complex parking lot to the south. Orcutt Creek flows into the site from the east in a box culvert under Broad Street and exits to the southwest out the southern property boundary. The first mitigation site was comprised mostly of herbs. The short-herb layer of the site which covered 70% of the site was dominated by sowthistle, white clover and two native plants: deer weed and cattails. The tall-herb layer covered 10% of the site and was dominated by cattails. The shrub stratum covered 20% of the site and was dominated arroyo willow and mulefat. The tree layer covered 5% of the site and was dominated by arroyo willow.

The second mitigation site, located at confluence of Orcutt and Acacia Creeks, involved the creation of 0.72 acres of wetland enhancement and 0.06 acres of wetland creation. The second mitigation site was also vegetated mostly by herbs. The short-herb layer covered 30% of the site and was dominated by deer weed, cattails, and giant wild rye. The tall-herb layer covered 70% of the site and was dominated by cattails. The shrub and tree layers each covered 5% of the site and were dominated by wild rose and coast live oak, and arroyo willow, respectively. Buffer of an average 30 meters wide surrounded most of the second mitigation site and was of poor quality.

The third mitigation site consisted of creation of 3.20 acres of riparian buffer along Acacia Creek. Acacia Creek flowed into the site from the northeast corner of the sports complex and flows out through the southwest corner at the confluence with Orcutt Creek. The site is bordered by the sports field to the southeast, Broad Street to the northeast, and disturbed open space to the northwest. The Acacia Creek mitigation area is bisected by a walking path, dividing the site into upper and middle Acacia Creek mitigation sections. The vegetation at the third mitigation site consisted mostly of short herbs. This layer covered 80% of the site and was dominated by deer weed, giant wild rye, Bermuda grass, and harding grass. The tall-herb layer consisted entirely of cattails and covered 5% of the site. The shrub stratum covered 15% of the site and was dominated by native species: coyote bush, California sagebrush, sycamore, black cottonwood, and coast live oak. The tree layer covered 5% of the site and was dominated by arroyo willows and sycamores. Organic matter accumulation at all the sites was abundant and ranged in size from fine organic material to coarse, woody debris.

1817-Construction of Mark West Commons Subdivision, Larkfield Investors, Santa Rosa

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
1817	1	San Francisco	2002	100.00	N/A	100.00	N/A

This project involved the construction of a residential subdivision consisting of 44 single-family residences on a 4-acre site, which had already been partially constructed. The parcel originally contained 0.313 acres of jurisdictional wetland habitat onsite, but they were found to have been filled previously. Mitigation for these impacts to wetland waters of the US were to be mitigated through the purchase of 0.30 acres of mitigation credits from Evelyn’s Ranch Mitigation Bank, 0.60 acres of preservation credits from Wright Preservation Bank, and 0.60 acres of preservation credits from Sotoyome Resource Conservation District. Another requirement of the permittee was to conduct a public-education effort which consisted of running an ad in a local newspaper each Sunday for four weeks and running an ad once in a trade newsletter. All of these mitigation requirements were met; the mitigation sites were not surveyed due to lack of time.

2055- Little Dry Creek Siphon Project, Western Canal Water District, Chico

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
2055	5R	Sacramento	2002	53.25	51.73	73.90	N/A

The purpose of the project was to improve the water conveyance facilities of Western Canal Water District’s (WCWD’s) Main Canal by constructing a siphon under Little Dry Creek, south of Chico, California, while maintaining water deliveries to existing WCWD customers. The project also removed existing obstructions in Little Dry Creek in order to restore the stream channel. There were temporary impacts of 0.96 acres to waters of the US, which included 0.76 acres of fresh emergent wetland and 0.20 acres of riverine habitat. Mitigation for impacts to the wetlands was to restore 0.96 acres of emergent wetland vegetation and riverine habitat within the project area. Additionally, the US Fish and Wildlife Service (USFWS) required 0.08 acres onsite and 0.16 acres off-site creation of fresh emergent vegetation for the temporary impacts to Giant Garter Snake habitat that would be disturbed during the construction period.

During our field assessment, we utilized hand drawn maps from a WCWD specialist who was responsible for all monitoring reports for the Little Dry Creek project. We were able to locate the onsite mitigation area and used CRAM to evaluate the site. The side banks of the creek channel consisted of only rip rap from the road crossing at Nelson Road to 200-300 feet downstream. The hydrologic flow regime was perennial. Vegetation consisted of non-native grasses and short herbs and tall herbs such as *Centarium erythraea*, *Avena sativa*, *Hordeum vulgare*, *Echinochloa crus-galli,* and *Trifolium hirtum,* all of which dominated the creek bank. Native emergent species found at the site were *Scirpus californicus, Typha latifolia,* and *Ludwigia peploides*. Although present in low numbers, these species seemed moderately healthy. Nelson Road was identified as the upstream boundary, with the newly installed siphon as the downstream boundary. After assessing onsite acreages in the office, we concluded that WCWD obtained 0.479 acres of wetland and riverine habitat, falling short of the 401 permit requirements of 0.96 acres. Vegetation did not meet the success criteria of 80% cover with native hydrophytic species, and thus failed to provide adequate cover for the Giant Garter Snake. Overall CRAM score for this site was sub-optimal.

Off-site mitigation for the Giant Garter Snake was east of Little Dry Creek, in Butte Wildlife area. A USFWS official took us directly to the mitigation site. The depressional wetland provided 80% absolute cover of native *Ludwigia peploides, Typha latifolia,* and *Scirpus californicus. Salix* sp. was the only dominant native tree found at the site. Plants seemed to be in healthy condition. The CRAM evaluation revealed low scores for the biotic structure metric due to low organic matter content found at the site. The mitigation area scored low for not attaining different vegetation height classes and biotic patch richness. After assessing GPS acreages of the wetland, we concluded that WCWD was in compliance of creating 0.16 acres of fresh emergent vegetation habitat for the Giant Garter Snake.

2097- Replace Camp San Luis Obispo Bridge, California National Guard, San Luis Obispo.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
2097	3	Los Angeles	2002	20.36	62.55	94.40	95.00

The California National Guard permanently removed two bridges (101 and 107) and replaced two bridges (102 and 106) at Camp San Luis Obispo. Additional impacts were encountered due to the removal of debris collected behind the structural supports within the stream channel from winter storms. There is also description of the bridge 108 removal in the file, but we found this impact was not completed during our site visit. The impacted bridges were constructed in 1941 of wood and were supported by timber pilings driven into the streambed, and were therefore unusable in their current state. In total, these bridge removal and replacement activities temporarily disturbed 0.825 acres of Chorro Creek and 0.55 acres of Dairy Creek. As mitigation for these impacts, the permittee was required to restore and enhance a total of 1.375 acres of streambed and riparian habitat on-site.

To mitigate for impacts to bridge 101, a restoration plan was designed to revegetate and improve the stream banks disturbed by the bridge demolition and piling removal. This mitigation area is located along approximately 50 feet of the east bank of Dairy Creek, an ephemeral stream, and was completed in December of 2003. We determined this mitigation site was 0.10 acres with approximately 40% wetland, 5% open water stream, 15% riparian waters, and 40% non-waters riparian. Prior to these impacts, the site contained a dense riparian canopy dominated by arroyo willow. During our visit we found a dominance of arroyo willow, coyote bush, sycamore, cattails, mugwort, and grasses. Although non-native plant species were present, we found evidence of removal attempts. The creek was vegetated with many boulders and concrete refuse. This site was bordered by Route 1 to the north, Amador Avenue to the east, ruderal disturbed habitat and Solando Road on the west, and the downstream Dairy Creek riparian corridor to the south.

Bridge 102 was removed and replaced in the same location with a pre-stressed concrete bridge. The bridge 102 revegetation is located on the east and west banks of Dairy Creek on both sides of the newly constructed bridge, and was completed in December of 2003. We determined that this mitigation area was 0.06 acres, with only 5% riparian waters, 75% non-waters riparian habitat, and 20% upland. We found a prominence of coyote bush, elderberry, mugwort, and black mustard. Many of these planting were very young, leaving much of the site barren ground with erosion matting. Relatively high mortality was also observed at this site. The stream was unvegetated with many boulders, cobble stones, and concrete refuse. The banks were very steep and showed signs of significant erosion in the past. This mitigation area was surrounded by the Dairy Creek riparian corridor to the north and south, Solando Road to the west, and Amador Avenue to the east.

Bridge 106 was removed and replaced in the same location with a pre-stressed concrete bridge. The bridge 106 revegetation is located on the north and south banks of Chorro Creek along the newly constructed bridge, and was completed in August of 2003. We determined that this mitigation area was 0.02 acres and 100% non-waters riparian habitat. Dominant vegetation at this site included coast live oak, walnut, mugwort, and California poppy. These planting were also very young, leaving much of the site barren ground with significant erosion matting. This section of the stream was also unvegetated with boulders and cobble stones. The banks were very steep and showed signs of significant erosion in the past. Old wooden erosion walls remained in place along the western side of the bridge. This site was boarded by the Chorro Creek riparian corridor to the northwest and south east, Kern Avenue to the northeast and Colusa Avenue to the west.

The bridge 107 mitigation area is located on the north and south banks of Chorro Creek approximately 300 feet east of Bridge 106, and was completed in August of 2003. The site is 10 to 15 foot wide strip of disturbed riparian habitat that extends from the creek bed to the edge of the riparian canopy. Additionally, a 15 foot wide by 100-foot long area on the northern side of the creek was also restored along the edge of the riparian canopy. We determined that this site was 0.10 acres, with 5% wetland, 10% waters riparian, 65% non-waters riparian, and 20% upland. We found a dominance of pine, walnut, coyote bush, and mugwort. These planting were also very young, leaving much of the site barren ground with significant erosion matting. We found evidence of non-native plant removal effort on top of the southern bank. The bases of the old bridge wood pilings were left in position, which provided excellent habitat for flora and fauna. Although, this creek was mostly unvegetated and peppered with boulders, it did support emergent vegetation habitat. The banks were very steep and had significant erosion on the southern bank. This site was also boarded by the Chorro Creek riparian corridor to the northwest and south east, Kern Avenue to the northeast and Colusa Avenue to the west.

2219- Gravel Bar Excavation on the Sacramento River, M & T Ranch, Llano Seco Ranch and the City of Chico, Chico

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
2219	5R	Sacramento	2001	100.00	58.12	66.70	38.00

The M & T Ranch, the Llano Seco Ranch, and the City of Chico collaborated on a project to partially excavate a gravel bar from the Sacramento River encroaching on a pumping plant in Chico. It was estimated that 2.00 acres of newly established riparian vegetation on the gravel bar would be permanently lost by interrupting the downstream progression of the east-bank gravel bar. Additionally, 0.022 acres of streambed habitat were temporarily impacted. As compensatory mitigation, the applicants were to restore 2.022 acres of degraded riparian habitat on the east bank of Big Chico Creek across from the gravel bar and excavation site on the M & T Ranch's property. Restoration was to include the removal of non-native, invasive plants such as Himalayan blackberry and fig trees.

A representative from M & T Ranch guided us to the mitigation site and identified the mitigation boundaries. Limited access to the riverine section closest to the mitigation site compromised our ability to evaluate several CRAM metrics including those related to physical structure. The buffer of the site was very large including a massive expanse of orchards. However, the quality was poor with a large amount of invasive vegetation and dirt roads immediately encircling the site. The area was dominated by non-native vegetation including the fig trees which had been targeted for removal. However, very little Himalayan blackberry was present on site. The area had recently been mowed. Willows had also been planted, but only three individuals were found living. The restoration area met their required acreage.

2316-Residential Development, Brian and Lisa Weir, Ramona

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
2316	9	Los Angeles	2001	100.00	N/A	95.80	N/A

This project involved construction of a lot-split subdivision which resulted in the creation of two new legal residential lots consisting of between 5.8 and 8.3 acres each. Road improvements necessary to cross Santa Maria Creek resulted in the loss of 0.17 acres of wetland waters of the US. Mitigation for these impacts included purchasing 0.34 acres of wetland preservation credits from San Miguel Conservation Bank (a County-of-San-Diego-approved mitigation bank). A portion of the property was also placed in a Dedicated Biological Open Space Easement for which buffer and easement specifications (including building restrictions within 50 feet of the preservation area) were required and followed for this file. Restrictions on stormwater runoff and sedimentation rates were also required and carried out as mitigation conditions.

2395-Shady Canyon Golf Course and Residential Development Project, The Irvine Company, Irvine.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
2395	8	Los Angeles	2000	115.02	68.90	91.70	94.50

This project involved construction of 400 residential houses, an 18-hole golf course, and related facilities on 1,046 acres east of the Village of Turtle Rock and south of Sand Canyon Reservoir in the City of Irvine. This large project area consisted of many habitat types, including riparian and wetland habitats. Prior to the construction of this development there were southern willow riparian habitats within portions of Shady, East Shady, North Shady, and Bommer Canyon Creeks. These areas had steep banks and dense vegetation dominated by willows and mulefat. On-site seasonal wetlands were saturated by stream flows and surface saturation throughout the winter months, and supported hydrophytic vegetation including cattails, saltgrass, and tule. During the dryer months, these seasonal wetlands became dominated by non-native annual grasses. Ephemeral drainages were also present on the project site and supported little to no vegetation. Impacts to these habitats totaling 2.74 acres of waters of the US, 2.58 of which were permanent, were mitigated by creating 4.380 acres (2.426 acres of wetland waters and 1.954 acres of non-wetland waters) and enhancing 0.532 acres of waters of the US (0.280 acres of wetland waters and 0.252 acres of non-wetland waters). An additional 0.448 acres of creation and enhancement mitigation was considered riparian non-waters of the US. Mitigation was established onsite in Area A and in temporary impact areas, as well as offsite at the San Joaquin Duck Pond Mitigation Bank. Other mitigation actions were performed for this project including the removal of a road crossing over a drainage and revegetation in its place, establishment of natural upland vegetation buffers to pre-existing wetlands, and the stabilization and revegetation of stream banks, although we did not perform CRAM evaluations at these sites.

Mitigation area A was located in the northwestern portion of the development along Shady Creek and East Shady Creek. This site was divided into a north and south area, on which we performed a single CRAM evaluation. The southern site had more shrub and tree vegetation, while the northern site had more open, emergent vegetation. Hydrology for this mitigation site was supported by Shady Creek and East Shady Creek, perennial and low-gradient rivers, as well as ample irrigation lines throughout the site. All of the dominant vegetation at this site was comprised by native plant species. The short-herb layer covered 20% of the site and was dominated by yerba mansa and cattails. The tall-herb layer, covering 25% of the site, was dominated by cattails and bulrush. The shrub stratum, covering 20% of the site, was dominated by mulefat. The tree layer was dominated by arroyo and black willow and covered 20% of the site. Organic matter accumulation at this site was moderately abundant and ranged in size from fine organic material to coarse, woody debris. Buffer of moderately high quality with extensive soil disruption and an average width of 45 meters surrounded the site. A bike path was adjacent to the east of mitigation area A, while a tributary flowed just to the north and existing trees and stream to the west. One of the temporary impact areas was just south of mitigation site A.

There were 5 small areas of temporary impacts and onsite mitigation adjacent to two neighboring bridges on Bonita Canyon Road. Shady Creek and East Shady Creek supplied these temporary-impact-mitigation areas with intermittent and low-gradient hydrology. Buffer of moderately high quality with extensive soil disruption and an average width of about 80 meters surrounded about 60% of the site. Like mitigation site A, all of the vegetation at this site was dominated by native plant species. The short-herb stratum covered 10% of this site and was dominated by mugwort and yerba mansa. The tall-herb stratum also covered 10% of the site, but was dominated by cattails. The shrub layer covered 10% of the site, as well, and was dominated by mulefat. The tree layer covered 40% of the site and was dominated by sycamore and arroyo, black, and red willow.

The offsite mitigation at the San Joaquin Mitigation Bank is located to the northwest of the Shady Canyon Development. This mitigation bank was formerly settling ponds used for water treatment and was disconnected hydrologically from surrounding water bodies. The mitigation areas for this project included the lake margins of two adjacent lakes within the mitigation bank. Like the other two onsite mitigation sites, all of its vegetative cover was provided by native plant species. Buffer around this site was extensive, of high quality, and surrounded the entire mitigation site. The short-herb layer, covering 5% of the site, was dominated mugwort and cheeseweed. The tall-herb layer, dominated by three-square bulrush, covered 40% of the site. Mulefat and California sagebrush dominated the shrub layer which covered 15% of the site. Black willow and cottonwood, covering 15% of the site, dominated the tree layer.

2418-Construct Shaffer Bridge, Merced County Department of Public Works- Roads Division, Atwater.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
2418	5S	Sacramento	2001	90.09	67.75	N/A	N/A

The Merced County Department of Public Works replaced the existing Shaffer Bridge on Oakdale Road over the Merced River with a new bridge. Shaffer Bridge was a steel truss one-land bridge constructed in 1912 and was structurally deficient with limited weight-carrying capacity. The original Shaffer Bridge was left in place. The new bridge was constructed to the northeast, 29 meters upstream of the original Shaffer Bridge. This bridge was constructed of a new cast-in-place, 4 span, pre-stressed reinforced concrete. In addition to constructing the new bridge, Oakdale Road was realigned, two railroad piers were removed, the existing Shaffer Bridge was restored to permit pedestrian access, and a cul-de-sac was constructed adjoining the new with the existing bridge. These activities permanently impacted 0.002 acres of wetland habitat and temporarily impacted 0.310 acres of jurisdictional waters habitat. To offset these impacts the permittee was required to restore 1.11 acres of jurisdictional habitat onsite. Two mitigation areas were established, including one that spanned both sides of the Merced River, adjacent to the newly installed bridge, and an additional smaller site where a railroad footing was removed.

The larger site was 0.99 acres, and consisted of approximately 10% wetland, 30% riparian waters, and 60% non-waters riparian habitat. Although the perennial flows of the Merced River provide hydrology to both mitigation areas, much of this site was dry and walking paths were established throughout. Most planting were dead, regardless of irrigation in the western area. The site was dominated by non-native grasses as well as box elder, black willow, California blackberry, Mexican elderberry, horseweed, and mugwort. Erosion control matting was scattered throughout the mitigation area. The additional restoration area at an old railroad pier footing removal site was 0.01 acres of jurisdictional riparian habitat. This site was within the northwest section of the larger mitigation site. Dominant vegetation at this site included box elder, California blackberry, and mugwort. Both mitigation areas were open with very little overlapping vegetation layers. These mitigation areas were buffered by the Merced River riparian corridor to the northeast and southwest, the cul-de-sac and parking area to the northwest, and a private driveway and agricultural lands to the southeast.

2443- Great America Parkway Road Extension, Legacy Partners, San Jose

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
2443	2	San Francisco	2001	324.68	49.33	83.30	83.30

The Legacy Partners Commercial Inc. project filled approximately 0.077 acres of perennial emergent wetlands and other waters for the purpose of constructing a five lane road extension and associated improvements to Great America Parkway and the Gold Street Connector Roadway in San Jose. The applicant was required to create 0.154 acres of perennial wetlands to mitigate for the impacts associated with the project. The mitigation for permanent impacts to wetland habitat was to be located onsite, in linear areas along the northern boundaries of existing wetlands in the area.

During our field assessment, we used maps from the wetland mitigation and monitoring plan to locate the two mitigation areas. Both mitigation areas were found to be just down slope of an existing landfill. The first wetland, labeled “Eastern Mitigation” was located just adjacent to the Southern Pacific Railway. At the time of the assessment, the perennial freshwater marsh was inundated supporting two dominant native species, *Typha angustifolia* and *Atriplex triangularis.* These native plants were found to be in healthy condition. However, we noted that the wetland could possibly be nutrient impaired because of the abundance of algae growing in the pond. The one dominant alien species present in the mitigation area was *Cynodon dactylon.* The site scored poorly topographic complexity and biotic patch richness and scored excellent for percent of the assessment area with a buffer and the average width of the buffer. Overall, the site received marginal CRAM scores.

The second wetland used as mitigation for impacts, labeled “Western Mitigation”, was located west of the project site, adjacent to San Tomas Aquino Creek. This mitigation area was identical to the Easter Mitigation site in every CRAM metric. The only difference was in the dominant native vegetation. *Ludwigia peploides* along with *Typha angustifolia* were the two native species. Overall, the site received marginal CRAM scores. During our office assessment of GPS acreages, we concluded that the applicant fully complied with the required acreage of 0.154 acres of perennial wetlands, in fact, the applicant exceeded mitigation requirements by creating 0.50 acres.

2456- Sculpture Park, City of Roseville, Roseville

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
2456	5S	Sacramento	2001	100.00	64.27	100.00	N/A

The city of Roseville proposed a Sculpture Park for the Harding Boulevard Bikeway project. The new path passes under Interstate 80 toward Eureka Road. It was designed exclusively for the use of bicycles and pedestrians with minimal cross flow. The project permanently impacted 0.15 acres of wetlands for the construction of a bikeway. This included 0.03 acres riparian habitat in Miners Ravine Creek, 0.07 acres of riparian scrub wetland, and 0.05 acres of seasonal wetland. To mitigate for the loss of 0.15 acres of waters of the US, 0.08 acres of credits of seasonal wetland and 0.07 acres of credits of riparian scrub wetland were purchased from Wildlands Inc. There were many permits and communications on file, and we used the most recent 401 requirements, which matched with the final purchases made.

Wildlands Sheridan Mitigation Bank is located north of Roseville and was established in 1994. Although there are many habitat types found within the bank, we assessed three: riparian, depressional and vernal pools. The site was created in four phases. In the first three phases there was a total construction of 28.78 acres of vernal pools, 24.46 riparian acres, 4.91 seasonal wetland acres, 89.81 acres of emergent marsh, and 45.99 acres of perennial marsh.

Phase four created 28.06 acres of vernal pools, 7.22 acres of riparian habitat, and 77.73 acres of seasonal, emergent and perennial marsh. Phase four was not completed at the time of our assessment, and acreage had not been approved for credits to be purchased. Therefore, we focused our evaluation on phases one to three. We were joined in the field by Riley Swift, president and owner of Restoration Resources, which manages Sheridan Mitigation Bank, and Valerie Layne, Senior Conservation Biologist for Wildlands Inc. The area is surrounded by orchards; however, they advised us that there has been no evidence of pesticides or fertilizers impacts from these adjacent orchards. The hydrology of the site is managed to maintain target wetness levels for each wetland area. The main distribution of water for the site is synchronized with a back-up well receiving runoff from adjacent irrigation systems and recycled waters within the bank. The hydrology has been designed for gravity flow from ditches in the easternmost section of the site to other areas throughout the bank. They use overflow weirs where areas need to be inundated for longer periods of time. Mr. Swift also mentioned that skunks, voles, beavers, jack rabbits and coyotes are the main disturbances to the mitigation bank. During our assessment we found wildlife and evidence of wildlife to be abundant.

The riparian area was created by redirecting water from the adjacent agricultural fields into the mitigation bank. The creek receives water from overflow weirs and is regulated to be a perennial, low-gradient and low-flowing stream. The riparian corridor is entirely man-made with artificial irrigation and is completely straight. We selected a representative section of the corridor as our assessment area. We used the wrack line and the ordinary high water mark which included the drip line of the vegetation and rooted trees to delineate the streamside area. Overall the riparian corridor scored well for the CRAM assessment. Buffer and landscape context scores were high. The riparian area also scored well for hydroperiod, but did worse for water source. Within the physical structure attribute, the area scored well, except for physical patch richness. Vegetation cover within the area was high, with 65% within the tree stratum. *Populus fremontii* and *Salix* sp. dominated the area, and *Acer negundo* was also prominent. *Baccharis salicifolia* dominated the shrub stratum, *Scirpus californicus* was dominant in the tall herb stratum, and *Avena* sp. was dominant in the short herb stratum.

The depressional areas, or as Wildlands refers to the areas, seasonal wetlands, were highly variable in terms of levels of inundation. We randomly selected two assessment areas that included an isolated ponded area (area 17) and a muddy low land (area 1). The freshwater marsh at area 17 appeared to have an altered hydrologic regime and remained inundated for a long-duration of time. Area 1 had saturated soils but no surface water. Area 17 was surrounded by open water, other wetlands and bordered by a riparian area. The CRAM scores for these areas were similar, except that the second site had slightly higher scores for physical and biotic patch richness, vertical biotic structure, and native plant species richness. The short herb stratum dominant species for both sites were *Paspalum dilatatum* and *Eleocharis macrostachya.* Tall herb stratum dominants were *Scirpus californicus* and *Typha angustifolia*. *Salix* sp. and *Populus deltoides* were only found in area 1.

2591- Oak Creek Estates, Curtis Development, Buellton.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
2591	3	Los Angeles	2001	107.02	58.74	N/A	90.70

Curtis Development developed 57 low-density residential lots on approximately 18.7 acres within the city of Buellton. As part of this development, Peterson Creek was permanently diverted into an underground pipe. Additionally, debris that was placed into Peterson Creek in 2000 was removed as part of this project. These two activities permanently impacted a total of 0.094 acres of non-wetland jurisdictional waters, including an existing ephemeral swale and the eroded drainage channel of Peterson Creek. Prior to these impacts, Peterson Creek meandered through the project area in a north-to-south direction, was deeply incised, and supported sparse vegetation. Many mature coast live oak trees lined Peterson Creek, and were not impacted as part of this project.

To mitigate for impacts to waters of the US the permittee was required to create 0.57 acres of streambed habitat on-site, through restoration of the entire stream channel above the culvert intake structure and non-native plant removal. Specifically, they were required to restore approximately 0.34 acres of coastal sage scrub, 0.17 acre of oak riparian scrub and 0.06 acre of alluvial scrub. During out site visit, we measured the mitigation site as 0.61 acres and consisted of approximately 20% streambed, 5% riparian waters, 20% non-waters riparian, and 55% upland habitat. Although, they divided the mitigation area into upper slope, lower slope, and stream channel habitats, we performed a single CRAM at this site. We found a dominance of coast live oak, coyotebush, mulefat, ragweed, and non-native grasses. The stream is narrow, cobble bottomed, and was dry at the time of our site visit. The mitigation area is surrounded by a vacant agricultural field to the north, Sycamore Ranch subdivision to the west, and single-family dwelling to the south and east. In addition to this on-site mitigation, the permittee were required to place a deed restriction on potential future upstream development, in an attempt to ensure no net loss of aquatic resources.

2593- Garin Heights Estates Housing Development, DeNova Homes, Hayward

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
2593	2	San Francisco	2001	90.00	46.00	74.60	70.30

DeNova Homes proposed filling 0.048 acres of isolated seasonal wetlands in association with grading for the Garin Heights Estate project in Hayward. Most of the impacted wetlands were sustained by groundwater (0.04 acres), while 0.008 acres were fed by surface runoff. Requirements for mitigation included the creation of 0.1 acres of wetlands. The mitigation plan specified that the wetlands be constructed by excavating a shallow basin along the ephemeral channel located in the northwestern corner of the project area. The plan also called for the planting of willow sprigs in the mitigation wetland.

During field evaluation, the created wetland was located and the boundaries were determined using a map in the mitigation plan. The upstream boundary included a culvert and the side stream boundaries included the toe of the slope. The immediate buffer of the wetland was very poor with a little vegetation cover, heavily compacted soils, and narrow width before abutting residential development. Downstream, wooded riparian habitat provided improved buffer conditions. The hydrologic flow regime of the wetland was intermittent with some inflows likely originating from surface runoff from surrounding urban areas. The willow plantings were not evident at this site. However, it was not clear if they were never planted or if they died after planting, as the steep gradient to the creek may have affected survival. The vegetation was dominated by two native species, *Typha latifolia* and *Mimulus guttatu*, and two non-natives, *Phalaris* sp. and *Picris echioides*. The size of the created wetland was measured substantially less than the acreage required in the permits.

2667- Ketscher-Reed Housing Subdivision, Lewis Operating Corp, North Natomas Basin

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
2667	5S	Sacramento	2001	100.00	75.45	100.00	N/A

This project was located east of Highway 99, west of the east drainage canal and immediately north of Del Paso Road in North Natomas Basin. The project developed 232 acres as a residential subdivision. The area was level irrigated cropland with irrigation ditches once used for crop cultivation. The area was plowed and disked regularly. For this reason the vegetation in the impacted vernal pools was either obscured or absent. The habitat throughout the remaining areas was characterized by non-native annual grassland and dominated by *Bromus mollis*, *Centaurea solstitialis*, *Lactuca serriola* and *Cardaria draba*. To offset these impacts, 0.38 acres of vernal pool creation credits were purchased at Wildlands Sheridan. Also, to minimize the potential adverse effects to vernal pool fairy shrimp and vernal pool tadpole shrimp, a purchase of 0.76 acres of vernal pool preservation credits were purchased at Orchard Creek Conservation Bank.

Wildlands Sheridan Mitigation Bank is located north of Roseville and was established in 1994. Although there are many habitat types found within the bank, we assessed three: riparian, depressional and vernal pools. The site was created in four phases. In the first three phases there was a total construction of 28.78 acres of vernal pools, 24.46 riparian acres, 4.91 seasonal wetland acres, 89.81 acres of emergent marsh, and 45.99 acres of perennial marsh. Phase four created 28.06 acres of vernal pools, 7.22 acres of riparian habitat, and 77.73 acres of seasonal, emergent and perennial marsh. Phase four was not completed at the time of our assessment, and acreage had not been approved for credits to be purchased. Therefore, we focused our evaluation on phases one to three. We were joined in the field by Riley Swift, president and owner of Restoration Resources, which manages Sheridan Mitigation Bank, and Valerie Layne, Senior Conservation Biologist for Wildlands Inc. The area is surrounded by orchards; however, they advised us that there has been no evidence of pesticides or fertilizers impacts from these adjacent orchards. The hydrology of the site is managed to maintain target wetness levels for each wetland area. The main distribution of water for the site is synchronized with a back-up well receiving runoff from adjacent irrigation systems and recycled waters within the bank. The hydrology has been designed for gravity flow from ditches in the easternmost section of the site to other areas throughout the bank. They use overflow weirs where areas need to be inundated for longer periods of time. Mr. Swift also mentioned that skunks, voles, beavers, jack rabbits and coyotes are the main disturbances to the mitigation bank. During our assessment we found wildlife and evidence of wildlife to be abundant.

To evaluate the created vernal pools we sampled individual pools and pool clusters. We randomly selected the clusters based on age of creation, then on location within the bank. The three assessment areas all had distinct boundaries based on grading and vegetation. We choose area 18 which encompasses 5.3 acres of vernal pools, as well as area 12 and area 6. The entire area had been inoculated with collections from neighboring vernal pools to assure the establishment of native vernal pool species. The pools were dry at the time of the evaluation. The physical structure of the pools was fairly complex with various patch types present, including soil cracks, mounds, and burrows. According to Mr. Swift, the area is mowed regularly to alleviate problems with invasive non-natives, especially star thistle. All three areas that we assessed received the same CRAM scores for three out of four attributes. There was slight variation among the areas for biotic structure characteristics, mainly due to plant species richness, interspersion, and zonation. Native species found in the pools were *Eryngium vaseyi, Eleocharis macrostachya, Hemizonia* sp., and *Psilocarpus brevissimus.* The dominant species for all pools were native, yet there were few species present. In addition, there were some unidentifiable species, mainly grasses, in the pools due to the time of our assessment.

2706- I-880 Widening at Coyote Creek, Santa Clara Valley Transportation Authority, San Jose

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
2706	2	San Francisco	2001	100.00	67.06	100.00	96.50

The widening of I 880 permanently impacted 0.09 acres of jurisdictional wetlands and caused 0.05 acres of temporary impacts to Coyote Creek. The project also impacted riparian areas. The US Army Corps of Engineers required 0.18 acres of depressional wetlands to be created, and the California Department of Fish and Game required riparian mitigation (the exact size of riparian impacts and associated mitigation requirements could not be determined because the Streambed Alteration Agreement was missing from the file). The mitigation was implemented by the Santa Clara Valley Transportation Authority (SCVTA) as part of a larger consolidated mitigation area for several construction projects. The consolidated mitigation area spanned two large sites and included the creation of a single depressional wetland and the enhancement of 15.87 acres of riparian and 6000 linear feet of shaded riverine aquatic (SRA) habitat. The SRA enhancement included planting cottonwood and willow cuttings and the riparian enhancement included planting various tree and shrub species along with the removal of *Arundo donax*. In our field assessment, we evaluated the entire depressional wetland and a section of the SRA habitat area.

The SRA sampling area was chosen based on ease of access. Time constraints prevented sampling additional SRA areas. Some of the restored riparian areas were not included in the CRAM evaluation because they were located well outside of the high-water mark and were not hydrologically connected to Coyote Creek. Nevertheless, the survival rate of plantings in these riparian areas was high, and most of the planted individuals appeared to be flourishing. The SRA area was biologically diverse with a proliferation of native herbaceous plants, shrubs, and trees. The buffer of both the SRA and depressional wetland was very large, with a number of native trees. However, the soils of the buffer area were heavily compacted and filled with gravel, likely a result of past gravel mining activity on the site. It was found that the *Arundo donax* had been successfully removed from the area.

2726- Goliti Property Housing Subdivision, JAD Associates, Shasta Lake

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
2726	5R	Sacramento	1999	100.00	65.19	100.00	N/A

Construction of the Goliti Property Subdivision in Shasta Lake resulted in the permanent fill of 1.45 acres of jurisdictional wetlands on the east side of Churn Creek. This included 1.33 acres of wet meadow and 0.12 acres of ephemeral drainage. Initially, the Water Board approved a 1:1 mitigation ratio in which the applicant would purchase 1.45 acres of wetland credits at the Cottonwood Creek Mitigation Bank owned and operated by the

California Department of Fish and Game (CDFG). However, CDFG felt that the ratio should be 2:1, and so they set the requirement at 2.9 acres of mitigation. At the Cottonwood Creek Mitigation Bank, Fish and Game classified three types of wetlands that had been created: permanent, semipermanent, and moist soil areas.

We used a map to identify the three permanent, five semi-permanent, and three moist soil wetlands that were found onsite, and we randomly selected one wetland from each class for evaluation. The upland areas buffering the wetlands were large in size, but they mostly contained invasive species such as annual non-native grasses and Himalayan blackberry. Both the semi-permanent and the moist soil areas exhibited saturated soils, and the dry season water source for all wetlands was irrigated water. The wetlands exhibited a moderate amount of physical structural complexity. The semi-permanent and moist soil wetlands were biologically rich with a large amount of organic matter accumulation and a wide range of species interspersed in various patches. The permanent wetland was mostly open water areas and was dominated by *Ludwigia* spp. and *Tyhpa latifolia*.

2784- Route 37 Widening, Caltrans, Vallejo

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
2784	2	San Francisco	2000	100.00	66.08	100.00	100.00

Caltrans widened State Route 37 and impacted 6.41 acres of tidal wetland habitat. As part of the mitigation, the project was required to create 14.8 acres of mudflat and 29.1 acres of tidal wetland habitat, totaling 43.9 acres. Additionally 5.6 acres of adjacent upland refugia was created. The mitigation project is located west of the Napa River and north of State Route 37. This area was used for military housing during World War II. The levee was breached at Dutchman Slough between Pritchard Marsh and Cullinan Ranch, returning tidal action to the site on October 31, 2001. The adjacent undisturbed tidal wetlands at Dutchman Slough are used as reference sites.

We sampled this project during low tide, and we determined our assessment area by randomly choosing a subset of grid locations from the site maps, with four areas for assessment. The project was designed to include unvegetated subtidal and mud flats areas; however, at present the site does not match the intended distributions of habitats, with more unvegetated mudflat then vegetated marsh. At the end of the mitigation monitoring period the site should have a minimum of 75% vegetative cover with low marsh, marsh plain, high marsh, and upland species. *Salicornia virginica, Cotula coronopifolia,* and *Spartina foliosa* were dominant short herb species throughout the wetland. *Grindelia stricta* was a dominant shrub species in assessment areas that included high marsh. All four areas had similar CRAM scores, with the exception of physical patch richness and biotic structure, and the site had a moderately high overall CRAM score.

2804- South Mountain Catch Basin, Vintage Petroleum Corporation, Santa Paula.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
2804	4	Los Angeles	2000	409.09	31.62	42.00	N/A

This project involved the installation of an oil spill containment basin in an unnamed tributary to the Santa Clara River at 19424 South Mountain Road, in an attempt to increase control preventive measures and reduce the danger of contamination by petroleum products and byproducts. The basin permanently impacted 0.011 acres of unvegetated streambed habitat though the installation of a concrete headwall and ungrouted rock rip-rap in the creek. Although this creek is dry the majority of the year, with minimal annual run-off in the winter months, these impacts left the stream banks deeply cut and vulnerable to erosion.

These impacts were intended to be mitigated through a 0.022 acre riparian creation area located directly across the road from the impact site, although the resulting mitigation actually enhanced 0.090 acres of upland habitat. The exact mitigation site was clearly defined by wooden beams. Although the site was buffered on the eastern and northern edge by oak-dominated forest, the western edge was aligned with the entrance road to Vintage Petroleum and the northern edge by South Mountain Road. This site provided no topography and was hydrologically separated from the watershed of the impacted creek by a road. Despite the use of riparian vegetation in the mitigation site, the appropriate hydrology was not present to allow these plants to thrive. The planted vegetation primarily consisted of coast live oak, laurel sumac, coyote bush, California sagebrush, black sage, and morning glory. Goldenrod was also abundant in the mitigation site, as well as non-native grasses.

We spoke with a Vintage Petroleum employee who remembers the mitigation site being affected by both flooding and fires in the past. On our site visit the effects of fires were evident. Much of the woody vegetation was charred, while other shrubs and trees had clearly died due to these flames. As a result of these fires, coarse, woody debris was profuse in the mitigation site.

2841- La Paz Project, City of Laguna Niguel, Laguna Niguel.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
2841	9	Los Angeles	1999	103.71	56.73	N/A	94.10

The city of Laguna Niguel developed a park for recreational purposes that included a little league baseball field, a lighted full-sized soccer field, two lighted batting cages, a lighted parking lot, restroom, storage, and other supporting facilities. Prior to the development of this park, this area consisted of degraded open space and low-quality wetlands, including depressional wetlands and degraded stream habitat. Dominant vegetation included mulefat, sedge, curly dock, salt cedar, and cattails. The creation of this park permanently impacted 1.74 acres of depressional and riverine habitat. To offset impacts to these low quality jurisdictional habitats, the permittee was required to create 0.30 acres and enhance 0.40 acres of onsite wetland habitat, and to create 1.20 acres and enhance 1.60 acres of wetlands offsite. The onsite mitigation consisted of three depressional wetlands around the perimeter of the new park and one riparian enhancement along Aliso Creek to the south of the new park. The offsite mitigation was spread across 4 different areas including a Sulfur Creek creation/restoration, Crown Valley enhancement, Sulfur Creek enhancement, and Alicia creation/restoration/enhancement.

The first onsite depressional wetland mitigation site was located to the northwest of the ball field. This mitigation area measured 0.12 acres, including 60% wetland and 40% non-waters riparian habitat. Dominant vegetation included sycamore, arroyo willow, red willow, coyote bush, mulefat, California rose, and California blackberry. Vegetation was thick with overlapping layers. The metal fencing, parking lot and wide cement sidewalks inhibited buffer on the northern and eastern sides of this site. A mulched access road and open space to the west and riparian corridor to the south provided buffer.

The second onsite depressional wetland mitigation site was located to the southeast of the ball field. This mitigation area measured 0.14 acres and consisted of 40% wetland and 60% non-waters riparian habitat. Dominant vegetation included cottonwood, arroyo willow, sycamore, California brittlebush, coyote bush, mulefat, and rushes. Vegetation was much less layered at this site, with much of the site singly vegetated with clumps of rush. Patches of unvegetated ground were also scattered throughout the site. This site was noticeably dryer and had steeper banks than the first onsite depressional wetland. The site was bordered to the north by the ball-park fence and surrounded on the remaining sides by a mulched access road.

The last onsite depressional wetland mitigation area was located to the north east of the ball field. This mitigation area measured 0.02 acres and consisted of approximately 60% wetland and 40% non-waters riparian habitat. The dominant vegetation at this site included arroyo willow, mulefat, California blackberry, and bulrush. This site had heavily overlapping shrub and vine layer. Drainage from the paved parking lot drains into this site. This mitigation area was surrounded by heavy metal fencing and was lodged in between a parking lot and the chain link ball field fence, which in combination prohibited available buffer.

The onsite riverine enhancement area was located to the south of the ball field along Aliso Creek. This mitigation area measured 0.31 acres of non-waters riparian habitat. Vegetation was fairly thick and was predominantly shrubs and trees. Dominant plants included sycamore, red willow, arroyo willow, Mexican elderberry, coyote bush, California rose, and sow thistle. Other non-native plant species were found at this site including black mustard, castor bean, and fennel. Aliso Creek and thick, emergent vegetation bordered this site to the south, while the mulched access road lined the northern edge. The site was buffered to the east and west by the Aliso Creek riparian corridor.

The Crown Valley Park creation mitigation area consisted of removing an existing v-ditch and excavating to create a wetland channel of approximately 15 feet along a length of 700 feet. This site was 0.64 acres, consisting of approximately 75% wetlands, 10% streambed open water, and 15% non-waters riparian habitat. Much of the restored channel supported emergent vegetation, with shrub and tree layers predominantly on the western bank. Dominant vegetation included arroyo willow, cottonwood, California rose, bulrushes, watercress, and sedges. This site was buffered to the west by a well manicured turf grass detention basin and to the east by the basin’s bank and maintenance road. This creek is a tributary to Sulfur Creek that flows into the mitigation site from the north under the Crown Valley Park entrance driveway and flows out to join Sulfur Creek to the south.

The Sulfur Creek enhancement mitigation site was located on the west side of Crown Valley Parkway and connects with Crown Valley Park. This area consists of an existing riparian, wetland and transitional area that was infested with exotic weeds such as eucalyptus, tamarisk, pampas grass, artichoke thistle, Brazilian pepper trees, ice plant, and non-native palms. The enhancement of this area included the removal of non-native plant species. We estimated that this site consisted of 20% wetland, 20% streambed open water, 20% riparian waters, and 40% non-waters riparian habitat. Vegetation was very thick with many overlapping layers. We found a dominance of black willow, arroyo willow, Spanish sunflower, mulefat, cattails, sea lavender, and salt heliotrope. Although other non-native plant species were also present, such as eucalyptus, tamarisk, fennel, and artichoke thistle, they were not dominating the site. Hydrology is influenced by the perennial Sulfur Creek flows as well as runoff from the adjacent developments and paved roads. This site is bordered by Crown Valley Parkway to the east, Sulfur Creek riparian corridor to the north and south, and open space associated with a residential development to the north.

The Sulfur Creek creation area was downstream from the Sulfur Creek enhancement area, and immediately to the north of the Crown Valley Park creation mitigation site. For this mitigation rip rap was removed and an area of about 4 to 5 feet was cut away on the eastern bank to accommodate over-bank flows and promote wetland hydrology. This site was 1.40 acres, of which approximately 90% was wetland, 5% streambed open water, and 5% riparian waters habitat. Dominant plants in this mitigation area included arroyo willow, Spanish sunflower, clover, bulrushes, sea lavender, alkali sea heath. The water directly adjacent to the mitigation site was a small backwash from Sulfur Creek. This site was surrounded to the south, west, and north by Sulfur Creek and its associated riparian corridor, and to the east by upland open space.

The Alicia Parkway creation and enhancement area entailed the removal of non-native plant species, the expansion of the existing wetland and drainage, and the establishment of native vegetation. Expansion of existing wetlands was accomplished though removal of a v-ditch on the south side of the mitigation site. This site was 0.40 acres and consisted of approximately 30% wetland, 20% streambed open water, 10% riparian waters, 30% non-waters riparian, and 20% upland habitat. We found arroyo willow, sycamore, coyote bush, Caterpillar phacelia, bulrushes, cattails, and poison hemlock. In addition to the preceeding non-native plant species, pampas grass was also at the site. Stacks of plastic planters were left in the mitigation site beneath vegetation. The site was bordered to the west by Alicia Parkway and to the north, east, and south by open space with non-native grasses and coyote bush. A tributary to Sulfur Creek, as well as runoff from nearby residential developments and Alicia Parkway, provide hydrology to this site.

2940- Piedmont 237 Housing Development, Piedmont 237 Development, Milpitas

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
2940	2	San Francisco	1999	100.00	64.67	80.00	80.00

The Piedmont 237 Development Project impacted 0.3 acres of permanent riparian habitat, affecting approximately 560 linear feet of Los Coches Creek in Milpitas, Santa Clara County, for the purpose of constructing a 15-lot subdivision for single family homes. The 401 permit required the applicant to create 0.5 acres of new, onsite, riparian habitat.

Maps from the mitigation and monitoring plans were used to help us locate the mitigation site. The riparian creation area was heavily invaded by non-native grasses such as *Bromus hordeaceus, Avena fatua,* and *Lolium monspeliensis*. We identified native species plantings of *Sambucus mexicana, Salix laevigata*, *Platanus racemosa*, and *Rosa californica* upslope from Los Coches Creek. A row of *Salix laevigata* and the California Blackberry, *Rubus ursinus* was also planted along the creeks edge. The riparian plantings upslope seemed water stressed and many were found dead. Monitoring reports stated that irrigation was installed to water plantings; however, none was found. Plantings along the creeks edge seemed to be doing well and looked very healthy, probably because they were planted closer to the stream, allowing plants easy access to water. The average width of buffer scored very poorly because a major road was 20 feet north, a parking lot was 40 feet south, and to the west were homes adjacent to the mitigation site. Biotic patch richness also scored badly because the site lacked diverse patch types. The overall CRAM score for the mitigation site was sub-optimal. After assessing acreages in the office, we determined that the applicant complied with acreage requirements of creating 0.5 acres riparian habitat.

2974-Widening Road Crossing in Rattlesnake Creek for Eastvale Development, Barrarr American, Poway.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
2974	9	Los Angeles	1999	146.67	51.15	N/A	N/A

An existing earthen berm ephemeral stream crossing near the end of Eastvale Road on Canyon Pass Road was widened and paved to provide reliable access for a new 32 acre, 14-single family housing development. To widen this road, three 6-inch culverts and 4,000 cubic yards of soil were used as fill material in Rattlesnake Creek. This creek is a tributary of Poway/Peñasquitos Creek. This stream crossing is located one mile downstream from the head of a small drainage swale which drains agricultural groves and chaparral-covered slopes. Hydrology for this drainage is supplied from storm, urban, and agricultural runoff. Prior to the installation of this new stream crossing, the crossing was 15 feet high with a 12-inch culvert and an overflow dip section. On the project site, wetlands associated with this stream crossing area were located in the northeast portion. These wetlands support black willow, arroyo willow, as well as other shrub and herb obligate wetland plants along the channel. Impacts of 0.15 acres, all of which were permanent, included 0.133 acres of impacts to wetland waters of the US, 0.017 acres of impacts to non-wetland waters of the US (unvegetated streambed).

To mitigate for these impacts, the permittee was required to restore 0.15 acres of wetland habitat. The mitigation site was 0.22 acres and consisted of 90% vegetated streambed and 10% jurisdictional riparian habitat. Approximately 75% of the mitigation site was surrounded by buffer which was, on average, about 60 meters wide and of moderately low quality. The site was vegetated mostly by native woody plants. The short-herb layer covered 5% of the site and was dominated by mustard and curly dock. Tall herbs were virtually absent from the site. Mulefat formed the shrub layer which covered 70% of the site. The tree layer was dominated by arroyo willow and cottonwood trees which covered 30% of the site. Organic matter accumulation at the site was moderate and included materials ranging in size from fine organic material to coarse, woody debris. The general surrounding included the residential development, pre-existing private residences, avocado orchards, and Canyon Pass Road.

2998- Clipper Bay Housing Project, Gateway Development Company, Benecia

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
2998	2	San Francisco	1999	57.14	39.07	89.60	97.00

This project filled 250 feet of creek and 0.03 acres of waters of the US for a housing development project. The mitigation was to create 0.07 acres of waters of the US, to redesign the creek, to dig a new trench, and to grade the area to handle high flows into the Carquinez Strait. The area was to be rid of non-native vegetation and revegetated with native species.

We identified the length of the mitigation wetland to be from an upstream outfall structure to the downstream culvert, and the width was based on the distinct change of elevation and vegetation. The plantings were mainly found in the uplands and on the bank side. The acreage as measured onsite met just over half the requirement and did not meet the mitigation acreage requirement. This site scored poorly for physical structure with few physical patch types present. *Rorippa aquaticum, Typha angustifolia, Salix exigua* and *Populus fremontii* were the dominant species at this site. Overall the site scored poorly on CRAM, with no high scores for any attribute.

3079- Legacy-Stevenson Development Project, Legacy Partners, Newark

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
3079	2	San Francisco	1999	100.00	38.02	48.00	43.30

The Legacy-Stevenson Development Project was located in the city of Newark in Alameda County, between Stevenson Boulevard and Addition Road to the northeast of the Union Pacific Railroad. The project involved the development of approximately 75 acres of a 173-acre farming tract for the construction of research, development and manufacturing facilities. The project impacted 0.73 acres of seasonal wetlands associated with past agricultural activities at the site. Impact site vegetation included *Rumex crispus*, *Lolium multiflorum*, *Juncus balticus*, *Distichlis spicata* and *Typha latifolia*. Mitigation requirements for the project involved the creation of 1.4 acres of emergent freshwater wetlands. The created wetland area was excavated out of a portion of an existing detention basin at the southern tip of the parcel, and the wetlands were intended to be in contact with groundwater for the majority of the year. Target vegetation included *Scirpus californicus* and *Typha latifolia*. The applicants were required to relocate any burrowing owls encountered during construction.

Mitigation site boundaries were easily determined from the detailed maps included with the project mitigation plan. A single CRAM evaluation was done for the site. Almost 99% of the site was open water devoid of emergent vegetation. A narrow strip of *Typha latifolia* represented the remaining 1%. Due to the extent of the open water, the site was determined to have very poor hydrology, physical structure and biotic structure. Landscape connectivity and buffer condition were above average due to undeveloped areas to the south and west of the site. At the time of evaluation, the site was being used by bird species such as geese and the black-necked stilt. Several burrowing owl burrows were observed on the levee surrounding the detention basin. The total area of created wetlands was determined to be 0.07 acres, approximately 1% of the required 0.73 acres.

3109- Gonzales Slough Improvement Project, DKB Homes, Gonzales

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
3109	3	San Francisco	2000	100.00	40.41	100.00	N/A

DKB Homes applied for a permit for the placement of 120 cubic yards of permanent fill into Gonzales Slough, an agricultural drainage ditch. This included 0.028 acres of permanent fill associate with a drainage ditch outfall, overflow weir dam, associated erosion protection, and a permanent access road, as well as 0.002 acres of temporary fill. Vegetation in the channel included *Urtica dioica*, *Scirpus acutus*, *Lemna* sp., *Atriplex triangularis*, *Marrubium vulgare*, and *Rumex crispus*. The proposed mitigation for the project was 0.003 acres of wetland habitat in the areas of the slough that was occupied by upland species at the time of mitigation. In addition, all temporary fill was required to be removed and the impacted areas returned to their original configuration. Given the small size of this project, little information was available concerning the specifics of the mitigation activities that were undertaken as part of this project.

The mitigation site was identified in the field based on the presence of the outfall structure and overflow weir; however, it was difficult to identify the exact boundaries of the mitigation area. This project scored poorly in terms of buffer and landscape context as it was surrounded by agricultural fields on three of four sides. The buffer was dominated by non-native species with disturbed ground and trash throughout. In addition, there appeared to be little connectivity to any other wetland or aquatic habitats. A large sediment mound blocked flows on the downstream end of the site. The site also scored poorly on for hydrology with agricultural inputs and unnatural hydroperiod. Scores for physical structure were better than other CRAM attributes with a range of slopes and complexity; however, biotic structure scored poorly, with very little patch richness, biotic structure or native species. Given the lack of any specific boundary for the mitigation area, no specific acreage data were collected with GPS in the field; we assumed that the project met the acreage requirement based on information from the file review.

3252- Thorton Road realignment and Route 12 widening, Omni Means, San Joaquin County

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
3252	5S	Sacramento	1999	74.53	55.57	76.00	64.00

The project site was located in a rural area of San Joaquin County, along State Route 12 and Thorton Road, adjacent to Interstate 5. The project consisted of widening Route 12 and realigning Thorton Road to accommodate increased traffic volume from Flying J Plaza. The site extended from the northbound I-5 on-ramp to the eastern edge of the widened road. The project filled 2.12 acres of human-induced wetlands which formed at the bottom of a detention basin and were fed by road runoff and direct precipitation. The wetlands were considered to have low biological value because there was little species diversity, and they were hydrologically isolated from natural wetlands. To partially offset the loss, a road was removed which allowed a hydrologic connection between existing wetlands and created an additional 0.75 acres of wetlands. To offset the remaining loss, 1.37 credits of seasonal wetlands were purchased from Conservation Resources Laguna Creek.

We assessed the onsite mitigation and found the wetlands to be dry, sparsely vegetated and highly disturbed. The area had indistinct boundaries; therefore, we used the evidence of the road removal and visual alignment with existing wetlands as well as the change in vegetation to determine our assessment area. The buffer had highly disturbed soils, was dominated by non-natives, and served as a homeless encampment. The water source at the mitigation site was primarily local runoff, and all of the dominant plants at this site were invasive species.

Laguna Creek is a mitigation bank located in Sacramento County, at the eastern edge of the county at the intersection of Ione and Meiss Roads. The total bank acreage is 780 acres with 170 acres of restored wetlands and 25 acres of created wetlands. The habitat establishment work was completed in fall 1997, and the bank was established as an official bank on December 31, 1998. The bank is a complex of 45 created vernal pools intermingled with natural vernal pools and 18 created seasonal depressional wetlands. We visited the site with a Conservation Resources consultant from ECORP. The entire area was heavily grazed by cattle and heavily impacted with hoof prints; however, the hoof prints added some topographic complexity to the pools. The pools were dry during our assessment, but we were informed that the area is usually wet about 5 months of the year.

The complex of seasonal wetlands is located along the terrace of the dry Laguna Creek in the southwest section of the bank. This area of the bank has been so heavily impacted by cattle that there was no vegetation over two inches. There also was dung in the wetlands, and the soils were highly compacted. We randomly selected seasonal wetlands 3 and 10 for our sampling and delineated boundaries mainly based on vegetation. Seasonal wetland 3 was slightly less impacted than wetland 10. Both areas scored poorly in physical and biotic structure, with few patch types present. Dominant species for both areas were *Eleocharis macrostachya, Cynodon dactylon* and vernal pool species, *Eryngium vaseyi*.

3352-Grade Site for Commercial Development, Valley Children's Hospital, Fresno County

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
3352	5F	Sacramento	1999	66.67	N/A	100.00	N/A

This project involved grading an approximately 39-acre property consisting of three parcels in order to prepare the site for a commercial development. Approximately 1.1 acres of Northern Hardpan Vernal Pools (wetland waters of the US) were filled permanently. Preservation credits for 2.2 acres of vernal pools were purchases, as required. Funding for an additional 1.1 acres of credit to the Vernal Pool Mitigation Fund was also required and provided. However, since the 1.1 acres of vernal pools that were funded had not yet been created at the time of our analysis, this acreage did not count towards fulfilling the 3.3-acre-mitigation requirement for this file.

3370- Arbor View Corporate Center, New Millennium Development, Roseville

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
3370	5S	Sacramento	1999	100.00	47.54	66.70	100.00

The New Millennium Development project filled 0.15 acres of perennial drainage to install roads, water, sewer, and utilities lines for the construction of the Arbor View Corporate Center in Roseville, California. The applicant was required to create 0.10 acres of perennially wet marsh onsite, adjacent to the Arbor View Preserve Area, and to purchase 0.10 acres of perennial wet marsh at an approved mitigation bank.

During our field assessment, we used monitoring report maps and pictures to locate the onsite mitigation area. The created wet marsh was enclosed on the north and west end by a retaining wall. The wetland was ponded when we evaluated the site. Surrounding vegetation in the area was composed of oak woodland, with patches of non-native annual grasslands. We identified that the wetland was fed by storm water run-off, which flowed southward. Native plants such as *Typha angustifolia*, *Typha latifolia*, and *Scirpus* sp. and two alien plants, *Polygonum persicaria* and *Echinochloa crus-galli* dominated the wet marsh. We recognized that surrounding alien annual grasses were slowly encroaching into the mitigation site. Native plants were healthy and vigorous. Overall, the site was given marginal scores for CRAM. The applicant was found to be in compliance of creating 0.10 acre perennial wet marsh; the acquired acreage that we measured in the field was 0.12 acre, 0.02 acre more than the applicant was required to create. We also confirmed the purchase of 0.10 acres of perennial wet marsh at the Beach Lake Mitigation Bank.

3376- Lakehills Community Covenant Church, GA Krause & Associates, El Dorado Hills

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
3376	5S	Sacramento	1999	100.00	57.24	100.00	N/A

Lakehills Community Covenant Church on White Rock Road in El Dorado Hills installed two culverts in two drainages in order to construct a church, school, and parking area. The property consisted of annual grassland habitat dominated by medusahead grass (*Taeniatherum caput-medusa*) and wild oats (*Avena* sp.). There was a shallow linear swale bisecting the northeastern portion of the site. The vegetation in the swale was primarily ryegrass (*Lolium perenne*). The direct impacts for this construction were within 0.19 acres of drainage swales on the 20.5-acre project site. With authorization, the project previously had impacted 1.55 acres of jurisdictional waters. To offset the impacts associated with this permit, the Church purchased 0.19 acres of seasonal wetland habitat at Laguna Creek, Conservation Resources Mitigation Bank.

Laguna Creek is a mitigation bank located in Sacramento County, at the eastern edge of the county at the intersection of Ione and Meiss Roads. The total bank acreage is 780 acres with 170 acres of restored wetlands and 25 acres of created wetlands. The habitat establishment work was completed in fall 1997, and the bank was established as an official bank on December 31, 1998. The bank is a complex of 45 created vernal pools intermingled with natural vernal pools and 18 created seasonal depressional wetlands. We visited the site with a Conservation Resources consultant from ECORP. The entire area was heavily grazed by cattle and heavily impacted with hoof prints; however, the hoof prints added some topographic complexity to the pools. The pools were dry during our assessment, but we were informed that the area is usually wet about 5 months of the year.

The complex of seasonal wetlands is located along the terrace of the dry Laguna Creek in the southwest section of the bank. This area of the bank has been so heavily impacted by cattle that there was no vegetation over two inches. There also was dung in the wetlands, and the soils were highly compacted. We randomly selected seasonal wetlands 3 and 10 for our sampling and delineated boundaries mainly based on vegetation. Seasonal wetland 3 was slightly less impacted than wetland 10. Both areas scored poorly in physical and biotic structure, with few patch types present. Dominant species for both areas were *Eleocharis macrostachya*, *Cynodon dactylon* and vernal pool species, *Eryngium vaseyi*.

3417-Torrey del Mar, Horton, D. R., San Diego.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
3417	9	Los Angeles	1999	100.00	74.50	N/A	96.40

The Torrey Del Mar residential development included 320 single-family homes and 144 multi-family housing units, associated utilities and roadways, on a 151-acre area in northwestern San Diego. These activities affected jurisdictional habitats in two distinct portions of the project area. In the first area, grading and filling of jurisdictional habitats for the construction of homes and roadways permanently impacted 0.23 acres of southern willow scrub and 0.11 acres of disturbed wetlands. In the second area, installation of the sewer line temporarily impacted 0.02 acres of disturbed wetlands and 0.03 acres of disturbed southern willow scrub. The southern-willow-scrub habitat contained typical southern-willow-scrub species including willows, cottonwoods, and sycamores, as well as non-native species such as California fan palm, scarlet pimpernel, curly dock, African umbrella sedge, Bermuda grass, pampas grass, bristly ox-tongue, sow thistle, and scattered grasses. The disturbed wetland habitat was dominated by various weeds and non-native species, including bird of paradise, bristly ox tongue, California fan palm, Bermuda grass, giant reed, tamarisk, curly dock, African umbrella sedge, and Bermuda buttercup. To mitigate for impacts to these habitats, the permittee was required to create and enhance 1.18 acres of wetland and riparian habitat.

They mitigated 1.18 acres, including 80% wetlands, 5% streambed open water, 10% jurisdictional riparian habitat, and 5% non-jurisdictional riparian habitat. The mitigation site was a restoration of a degraded stream tributary to McGonigle Canyon in a small valley. Both sides of the incised channel were graded to channel elevation and side channels were installed. All of the dominant vegetation at the mitigation site was native. The short-herb layer covered 20% of the site and was dominated by ragweed and hooker's evening primrose. The tall-herb layer, dominated by California sagebrush, covered 30% of the site. The shrub layer covered half the site and was dominated by mulefat, sagebrush, and coyote bush. The tree layer covered 30% of the site and was dominated by arroyo willow. Organic matter accumulation at the site was abundant and ranged in size from fine organic material to coarse, woody debris. A walking path ran through the mitigation site. High-quality buffer surrounded almost the entire perimeter of the mitigation site and was approximately 100 meters wide, on average. Specifically, an upland buffer was planned around the mitigation site, followed by an additional upland-slope buffer. The general area was bordered by private residences, agricultural land, Highway 56, and open space.

3472- Dog Creek Relocation, Clovis Unified School District, Clovis.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
3472	5F	Sacramento	1999	100.00	46.51	100.00	78.80

The Clovis Unified School District widened Leonard Avenue on the north side of Ashlan Avenue as part of the Clovis Colony High School educational center. The widening of Leonard Avenue required Dog Creek to be relocated to the east of its current location at that time. Approximately 0.39 acres of jurisdictional waters, including 0.32 acres of wetland, were impacted as a result of this relocation. Prior to its relocation, Dog Creek supported curly dock, Hyssop's Loosestrife, salt grass, cattails, spike rush, soft rush, and water cress. Surrounding the previous streambed were areas of non-native, disturbed habitat. At that time, the topography of the creek bed had almost no variation in elevation.

To mitigate for these impacts, the permittee was required to create 0.39 acres of jurisdictional waters, including 0.32 acres of jurisdictional wetlands in the relocated channel. In relocating Dog Creek, they widened the channel and steepened the banks to withstand a greater flow capacity. During our visit, we found that the mitigation site met their required acres and contained approximately 80% wetlands and 80% streambed open water. This freshwater emergent habitat had a dominance of cattails, smartweeds, and grasses. Although some non-native plant species were present, they were predominantly on the upper banks, away from the created wetlands. The mitigation area is L-shaped with flows entering the site from the northeast and through an inlet pipe, and exiting from an outlet under Ashland Avenue. The surrounding area includes orchards, Leonard and Ashlan Avenue, and a sewage treatment water reuse facility that is currently being developed.

3536- Wentworth Springs Road Reconstruction, Federal Highway Administration, El Dorado County

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
3536	5S	Sacramento	2000	8.91	74.02	100.00	N/A

The Federal Highway Administration filled 0.505 acres of seep and spring wetlands and 0.07 acres of riparian wetlands to reconstruct Forest Highway 137 in El Dorado County. To compensate for the impact they relocated the reservoir outside the stream. We met with a National Forest Park Ranger and he guided us to the mitigation site.

The mitigation site was a seep and spring wetland, as intended in the permit, with an outflow into a riparian area leading to a high meadow marsh. Although the site appeared to have been implemented according to design, the size of the site was smaller then required. The GPS did not receive satellites; therefore, we estimated the size of the wetland and used a hand held GPS device to take a point. We estimated that the wetland had a 25 foot radius with a roughly circular area, equaling 0.045 acres. There was a distinct area within this where a watering hole was created on the side of the road. The watering hole was lined with thick black plastic and secured with riprap, and appeared to be wet year round. The vegetation at the site was well established, and the trees were thriving in the upland surrounding the wetland, resulting in a relatively high overall CRAM score.

3617- Mission Bay Project and Mission Creek Channel Impacts, Catellus Development, San Francisco

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
3617	2	San Francisco	2000	66.67	44.42	73.90	73.90

The impact to wetland vegetation at this site was due to bank maintenance and stabilization activities. The Mission Bay project redeveloped 303 acres surrounding Mission Creek Channel, with housing and commercial development. Mitigation for impacts to existing salt marsh vegetation included the creation of a shallowly sloped tidal basin that was intended to have hydrology similar to the high marsh zone of nearby natural areas. This was intended to expand the existing narrow band of *Salicornia virginica* at the site. The area was seeded and planted with distinct transitional zone species.

The mitigation area that we identified at the site was a narrow strip on the north side of the creek with northern/southern boundaries being the edges of the area between two bridges and the jurisdictional waters edge above the riprap. We sampled this site at low tide. Hydrology appeared to be appropriate, but the site scored low on most metrics. *Grindelia stricta, Frankenia salina, and Jaumea carnosa* were found in the area with *Salicornia virginica* being the dominant species. The area was supposed to be 20-30 feet wide and 330 feet long, but it was smaller and fell short of its required acreage.

3632- Moorpark Estates and Golf Course, Toll Brothers, Inc., Moorpark.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
3632	4	Los Angeles	2000	72.89	44.27	72.00	70.80

This 655-acre project consisted of a 216-unit residential development, two 18-hole golf courses, and a driving range in northern Moorpark. Although most of the project area consisted of Venturan coastal sage scrub, this project also permanently impacted 1.52 acres of waters of the US by constructing a road crossing across Gabbert Canyon Wash, discharging fill material into 9 unnamed tributaries to Gabbert Canyon Wash, grading for access roads, and placing rip-rap protection around gold-cart bridges. To accommodate the development, two unnamed ephemeral washes and a small section of Walnut Canyon Wash were replaced with underground storm drains.

To mitigate for these impacts, the permittee was required to create 3.32 acres of jurisdictional habitat. Three areas of mitigation (A, B, and C), were originally planned, although area A could not be found when we visited the site. This mitigation site originally received irrigation by way of runoff from neighboring orchards. Mitigation included the installation of a man-made permanent spring/game guzzler to encompass 0.56 acres. The Habitat Mitigation and Monitoring Plan dated January 8, 2002 described the creation of 4.17 total acres of jurisdictional waters, which is 1.09 acres in excess of their required acreage. Therefore, we determined that mitigation area A may not have been implemented because these acres were not needed as compensatory mitigation.

Mitigation area B was an existing pond area that emptied into Gabbert Creek, which contained 0.11 acres of jurisdictional wetland behind a breached earthen berm. This berm was repaired and raised to allow expansion of the pond. Additionally, a permanent game guzzler was installed above the pond, so that water from the guzzler flowed down a small swale and into the pond. These mitigation actions were supposed to create 2.70 acres of wetland at the pond area and 0.12 acres of jurisdictional waters at the guzzler. We performed CRAM assessments on the pond and guzzler separately. No vegetation was found within the pond mitigation area; rather, it was 100% open water. The pond was mostly bordered by the golf course except along its northern side, where Championship Drive was only a few meters away. Vegetation in the guzzler area was predominantly coyote bush, black sage, buckwheat, thistle, plantain, black mustard, and goldenrod. The game guzzler was 0.10 acres, consisting of approximately 35% streambed and 65% upland. This area had minimal buffer surrounding it, although the golf course and Championship Drive minimized the site's functional buffer.

Mitigation area C was designed as a desilting basin located in the southwestern corner of the site. Mitigation of 0.79 acres included planting shrub and perennial species in and around the basin to mimic a natural plant community. During our site visit we found a dominance of sycamore, California brittlebush, cattails, black mustard, and pearly everlasting. This area received runoff from the development and overflow from the adjacent stream. These inflows pass through the mitigation site, creating a wetland swale, and drain back out into an underground pipe. We determined that approximately 65% of this site was wetland and 35% was non-jurisdictional riparian habitat. This site is adjacent to the residential development and small orchards to the north, a parking area to the west, and a riparian area to the south and east.

3677-Pipeline Installation and Replacement- Marine Corps Air Station Miramar, Kinder Morgan Energy, San Diego.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
3677	9	Los Angeles	2000	100.00	80.72	100.00	92.70

This project took place on Marine Corps Air Station Miramar, immediately north of State Route 52 and west of Convoy Street, in a tributary canyon to San Clemente Canyon. It involved the installation of a 700-foot-long segment of 16-inch-diameter pipeline to replace the existing 10-inch-diameter pipeline, modifying an existing piping within Kinder Morgan facilities at Miramar Junction, and construction of a receiving and launching facility for internal pipeline inspections. All of the impacts associated with this project were temporary and affected 0.19 acres of arroyo willow forest and 0.01 acres of impacts to freshwater marsh. To mitigate for these impacts, the permittee was required to restore 0.19 acres of arroyo willow forest, 0.01 acres of freshwater marsh, and 0.01 non-jurisdictional wetlands, as well as remove pampas grass from 0.19 acres.

They obtained all of their required acreage, which included 0.23 acres of wetlands, 0.004 acres of streambed open water, 0.116 acres of jurisdictional riparian habitat, and 0.05 acres of non-jurisdictional riparian habitat. The mitigation area consisted of a swath of a small perennial stream about 40 feet wide. All of the dominant plants at this mitigation site were natives. The short-herb layer covered 20% of the site and was dominated by yerba mansa and bulrush. The tall-herb layer covered 40% of the site and was dominated by ragweed. The shrub layer, covering 40% of the site, was dominated by mulefat. The tree layer which covered half the site was dominated by red and narrow-leaf willow. Organic matter accumulation at the site was abundant and ranged in size from fine material to coarse, woody debris. Extensive, fairly-high-quality buffer surrounded virtually the entire perimeter of the mitigation site. The general surroundings include San Clemente Canyon, Miramar Landfill, State Route 52, the City of San Diego Metropolitan Wastewater Department Biosolids Center, and open space.

3710- Jenmar Gas Station Project, Jenmar Land Corporation, Fremont

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
3710	2	San Francisco	2000	86.34	72.83	100.00	100.00

This project was to construct a convenience store and gas station in Fremont. It filled 0.177 acres of isolated freshwater seasonal wetlands. The mitigation took place off-site. The permittee obtained their acreage by purchasing 0.354 acres of created seasonal wetland credits from Plummer Creek mitigation bank. The project also donated $2,000.00 to “Kids in Marshes”, a local non-profit educational program.

Plummer Creek is owned and managed by Wildlands Inc. A consultant from Wildlands Inc. joined our team in the field and assisted in our site assessment. Originally we selected pools to assess; however, after further review of the site we completed one CRAM for the entire site. The vegetation was consistently the same throughout all the pools. The hydrologic regime was sustained by a high water table and precipitation. The native vegetation, including *Salicornia virginica*, *Jaumea carnosa*, *Frankenia salina,* and *Distichlis spicata,* has established as expected, with few non-natives in the area. Non- native *Spartina alterniflora* has been found at the mouth of the river but not within the project site. The site has met its performance standards for years one and three and will continue to be monitored through year five (2005).

4206- Piru Creek Bridge, California Department of Transportation, Los Angeles.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
4206	4	Los Angeles	1992	100.00	66.99	83.30	N/A

During the early 1990s, Caltrans rehabilitated the south abutment of the old Route 99 Bridge (53-82) over Piru Creek in the Angeles National Forest in Los Angeles County. Because the existing abutment was failing, Caltrans removed existing broken concrete and ungrouted rock slope protection and placed 2000 cubic yards of material to construct a new embankment. To construct this embankment, Caltrans had to divert Piru Creek, temporarily impacting 0.99 acres of jurisdictional habitat. Additionally, 0.51 acres were also temporarily disturbed by construction activities. Therefore, 1.50 total acres were temporarily impacted, including 0.40 acres of wetland habitat.

Releases from Pyramid Lake Dam, located several miles to the north of the impact site, augment the water supply of Piru Creek, providing perennial flows. Although dense riparian woodland vegetation was present both upstream and downstream of the bridge at the time of the impact, the actual construction area contained only sparse vegetation due to heavy recreational use. Therefore, construction did not disturb high-quality habitat. The permittee was required to replace and enhance the native vegetation disturbed by these construction activities with cottonwood, willow, and mulefat cuttings taken from the immediate impact area.

Employees of the Angeles National Forest fire station unlocked the Route 99 gate to facilitate access to the impact site. These men also informed us of forest fires that swept over the mitigation area since its implementation. Although we could clearly find the repaired abutment, the temporary impact areas were difficult to determine because of the old age of the mitigation site (12 years) and the fires that swept through the area. Thus, we were not able to GPS the mitigation area, but did take a general point at the site. We performed one functional evaluation on the area that we determined was most likely the location of the temporary impacts, which included the assumed stream diversion along stream banks and the assumed construction areas adjacent to the abutment. We determined that this mitigation area was jurisdictional riparian habitat.

The mitigation site primarily consisted of arroyo willow, red willow, cottonwoods, toyon, and mulefat, which blended into the natural vegetation well. The majority of the site was buffered by the creek and natural vegetation, with the ungrouted rip-rap abutment and the old Route 99 causing minor buffer barriers. The mitigation site was connected naturally to the Piru Creek watershed and the hydrological function did not appear to have been compromised by the impacts. Although the assumed temporary impact area was currently riparian waters, other wetland habitats were also present on site.

4231- Johnson Ranch Racquet Club Annex, Sugnet & Associates, Roseville

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
4231	5S	Sacramento	1992	100.00	64.25	100.00	100.00

Johnson Ranch Racquet Club Annex was located in the city of Roseville. The site is bordered by Eureka Boulevard to the north, Ashland Drive to the east, and housing developments to the southwest. The project filled all onsite wetlands to construct a racquet club with pools, tennis courts, and a clubhouse. Existing wetlands consisted of an isolated vernal pool (0.01 acres) and seasonal wetlands and swales (0.18 acres). Dominant plant species in the wetlands were *Rumex* *crispus*, *Plagiobothrys stipitatus,* and *Lythrum hysspoifolium*, as well as surrounding non-native annual grasslands. To compensate, 0.032 acres of vernal pool creation credits and 0.158 acres of seasonal emergent marsh credits were purchased at Wildlands Sheridan Mitigation Bank. Also, 0.064 acres of vernal pool preservation credits were purchased at Orchard Creek Preservation Bank.

Wildlands Sheridan Mitigation Bank is located north of Roseville and was established in 1994. Although there are many habitat types found within the bank, we assessed three: riparian, depressional and vernal pools. The site was created in four phases. In the first three phases there was a total construction of 28.78 acres of vernal pools, 24.46 riparian acres, 4.91 seasonal wetland acres, 89.81 acres of emergent marsh, and 45.99 acres of perennial marsh. Phase four created 28.06 acres of vernal pools, 7.22 acres of riparian habitat, and 77.73 acres of seasonal, emergent and perennial marsh. Phase four was not completed at the time of our assessment, and acreage had not been approved for credits to be purchased. Therefore, we focused our evaluation on phases one to three. We were joined in the field by Riley Swift, president and owner of Restoration Resources, which manages Sheridan Mitigation Bank, and Valerie Layne, Senior Conservation Biologist for Wildlands Inc. The area is surrounded by orchards; however, they advised us that there has been no evidence of pesticides or fertilizers impacts from these adjacent orchards. The hydrology of the site is managed to maintain target wetness levels for each wetland area. The main distribution of water for the site is synchronized with a back-up well receiving runoff from adjacent irrigation systems and recycled waters within the bank. The hydrology has been designed for gravity flow from ditches in the easternmost section of the site to other areas throughout the bank. They use overflow weirs where areas need to be inundated for longer periods of time. Mr. Swift also mentioned that skunks, voles, beavers, jack rabbits and coyotes are the main disturbances to the mitigation bank. During our assessment we found wildlife and evidence of wildlife to be abundant.

The depressional areas, or as Wildlands refers to the areas, seasonal wetlands, were highly variable in terms of levels of inundation. We randomly selected two assessment areas that included an isolated ponded area (area 17) and a muddy low land (area 1). The freshwater marsh at area 17 appeared to have an altered hydrologic regime and remained inundated for a long-duration of time. Area 1 had saturated soils but no surface water. Area 17 was surrounded by open water, other wetlands and bordered by a riparian area. The CRAM scores for these areas were similar, except that the second site had slightly higher scores for physical and biotic patch richness, vertical biotic structure, and native plant species richness. The short herb stratum dominant species for both sites were *Paspalum dilatatum* and *Eleocharis macrostachya.* Tall herb stratum dominants were *Scirpus californicus* and *Typha angustifolia*. *Salix* sp. and *Populus deltoides* were only found in area 1.

To evaluate the created vernal pools we sampled individual pools and pool clusters. We randomly selected the clusters based on age of creation, then on location within the bank. The three assessment areas all had distinct boundaries based on grading and vegetation. We choose area 18 which encompasses 5.3 acres of vernal pools, as well as area 12 and area 6. The entire area had been inoculated with collections from neighboring vernal pools to assure the establishment of native vernal pool species. The pools were dry at the time of the evaluation. The physical structure of the pools was fairly complex with various patch types present, including soil cracks, mounds, and burrows. According to Mr. Swift, the area is mowed regularly to alleviate problems with invasive non-natives, especially star thistle. All three areas that we assessed received the same CRAM scores for three out of four attributes. There was slight variation among the areas for biotic structure characteristics, mainly due to plant species richness, interspersion, and zonation. Native species found in the pools were *Eryngium vaseyi, Eleocharis macrostachya, Hemizonia* sp., and *Psilocarpus brevissimus.*

The dominant species for all pools were native, yet there were few species present. In addition, there were some unidentifiable species, mainly grasses, in the pools due to the time of our assessment.

4580-Repair Leak in Improvement District U-1 Pipeline, Western Municipal Water District, Corona.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
4580	8	Los Angeles	1993	100.00	67.80	100.00	N/A

This project involved an emergency repair to a leak on a 27-inch-diameter water main that crossed Cajalco Canyon Creek. Temporary impacts to 0.60 acres of waters of the US were mitigated by enhancing the impact area with plantings of native species. Wetland waters comprised 0.48 acres of the mitigation site; the other 0.12 acres consisted of non-wetlands waters. The mitigation site was located in a remote area in Cajalco Canyon a couple of miles west of Lake Matthews, a few miles south of Highway 91, and a few miles east of Highway 15. The creek was a perennial, soft-bottom channel surrounded by extensive buffer of moderately high quality on all sides. The mitigation area was a continuous riparian corridor, so determining the exact mitigation site was difficult. The entire site was considered waters of the US, 80% of which was wetland and 20% of which was non-wetland waters. Dirt roads led to the vicinity of the site and we walked down into the canyon (several hundred feet deep) by way of a dirt trail to reach the actual site, though there was also a dirt road leading to it.

The site was vegetated densely with 145% absolute vegetative cover. The short-herb layer was dominated by curly dock (non-native) and salt heliotrope (native). Three-square bulrush dominated the tall-herb stratum which covered 40% of the site. Substantial ponding upstream of the pipeline crossing was occurring at the site, possibly caused by a berm left across the creek after the repairs were made to the pipeline. Likely due to the ponding, sediment seemed to be accumulating and enabling the bulrush to become abundant. Coyote bush and California sagebrush dominated the shrub stratum which covered 20% of the site. Arroyo willows comprised the entire tree layer which covered 70% of the site. Organic matter accumulation at the site was abundant and ranged in size from fine organic material to coarse, woody debris.

4858&5371-Construction of Groins to Divert Flow at Newhall Ranch Bridge, Newhall Land & Farming, Newhall.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
4858&5371	4	Los Angeles	1993	100.00	70.02	100.00	100.00

This project involved the construction of six ungrouted, rip-rap groins to protect existing lemon orchards on the southern edge of the Santa Clara River's floodplain from being washed out by high flows. Impacts totaling 1.09 acres, 0.22 acres of which were permanent, were mitigated by enhancing 0.348 acres of waters of the US (0.058 acres of wetland waters and 0.290 acres of riparian waters) and 0.232 acres of non-waters of the US downstream of the newly installed groins. The site was located in the southern portion of a valley which was characterized by the presence of orchards and row crops. Specifically, the site was located south of highway 126 and about 10 miles west of the 5 freeway. The hills surrounding this agricultural valley were semi-natural, open-space areas with little development. Half of the mitigation site was surrounded by the floodplain of the Santa Clara River which provided buffer of moderate quality characterized by an abundance of *Arundo*. The mitigation site was located in the lower to middle portion of the watershed. The active channel of the river at the time we visited the sites meandered through the floodplain, coming to within 50 feet of the mitigation sites. As suggested by the need to install groins to protect the orchard on the banks of the river, the banks upstream and downstream of the mitigation site appear to be degrading.

Since the six mitigation areas were all similar, we surveyed the plants intensively at three of them and applied the results to all of the sites. The short- and tall-herb layer at the sites was virtually non-existent. The shrub layers at all the sites were dominated by mulefat, tamarisk, and/or willows. Shrubs covered 15%, 30%, and 50% of the mitigation sites, respectively. The tree layer at the first site, which covered 80% of the area, was dominated by arroyo willow, narrow-leaf willow, and cottonwood. Narrow-leaf willow, covering 30% of the area, dominated the tree layer of the second mitigation site. There was not a tree layer at the third mitigation site surveyed. Aside from the tamarisk shrubs, all of the dominant plant species in the mitigation sites were native. Organic matter accumulation at these sites was abundant and consisted of materials ranging in size from fine to coarse-woody. The abundance of coarse, woody debris in the mitigation areas seems to indicate that plants from the vicinity of the mitigation areas, likely the top of the berm adjacent and roughly perpendicular to the groins, were removed and dumped into the mitigation areas.

5217- Hitchcock Ranch Construction Project, Penfield & Smith, Santa Barbara.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
5217	3	Los Angeles	1994	100.00	55.37	81.30	N/A

This project involves modifications to San Roque Creek with the intention of diverting potential 100-year flood flows away from a residential development. Specifically, this involved excavation of the channel bottom, installation of two concrete box culverts, installation of concrete inlet and outlet structures, installation of 4 gabion retaining walls, construction of a concrete retaining wall, placement of 2 storm drain outlet pipes, and the placement of rock (reno) mattresses on the south bank. These activities temporarily impacted 1.50 acres of jurisdictional streambed waters. To mitigate for these impacts, the permittee was required to enhance 1.50 acres of jurisdictional streambed waters through revegetation of the gabion surfaces.

The northern bank of the upstream side had reno mattresses installed, but these were clearly not functional, as heavy erosion had removed the bank behind these mattresses. At that point, mattress served to collect trash and wrack. We did not perform a CRAM evaluation on this area, as the revegetation efforts had since been eroded. During our site visit we found gabions on the northern bank downstream of Hitchcock Way, and on the southern bank of the upstream side. We performed CRAM assessments on these two areas separately. The downstream area was primarily English ivy, poison oak, and nasturtium, while the upstream area was mostly eucalyptus, black walnut, and German ivy. These mitigation areas were surrounded by streets, driveways, and parking areas and very little natural buffer was available. The surrounding areas were commercial and residential. Because mitigation revegetation was performed on the gabion wall surfaces, little connection to the creek hydrology was available, unless deep roots could be established through the gabion walls.

5401- Realignment and Rock Slope Protection on English Channel and Carbon Canyon Creek, San Bernardino County, Chino Hills.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
5401	8	Los Angeles	1994	175.90	61.44	100.00	N/A

This project involved realigning and installing rock-slope protection on a 1000-foot reach of the English Channel. Impacts of 0.083 acres of waters of the US were mitigated by enhancing 0.730 acres of waters of the US onsite on the right bank of English Channel. Wetlands comprised the majority of the mitigation site (0.548 acres) and riparian, non-wetland waters of the US comprised the remainder (0.182 acres). Carbon Canyon Channel was a perennial, concrete-box channel into which English Channel flowed; after the confluence, the channel was called Chino Creek which had a soft-bottom channel and grouted rip-rap banks. English Channel was realigned and reinforced with a 15-foot-high, gently sloping left bank covered with grouted rip-rap that protected a flood-control road running along the channel. Aside from a few drop structures that extended across the channel, the right bank of the creek was free of rip-rap or unnaturally high banks, so rising water from the channel had access to the adjacent riparian areas that comprised the mitigation site. Both bodies of water flowed through an urban residential and commercial area. The site was bordered on the north by a housing development and on the south by commercial lots, so there was not buffer around the site.

The herb layers (tall and short) were absent from the mitigation area. Mulefat dominated the shrub layer which covered 20% of the area. The tree layer comprised the majority of the vegetative cover (90%) and was dominated by arroyo, red, and black willow and cottonwood trees. Organic matter accumulation was abundant and ranged in size from fine organic material to coarse, woody debris.

5425- Adobe Creek Bank Stabilization, Adobe Creek Golf Course, Petaluma

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
5425	2	San Francisco	1994	100.00	57.96	N/A	N/A

Adobe Creek Golf Course placed 498 cubic yards of riprap along 2377 feet of Adobe Creek for bank stabilization. Willows were also to be removed from the stream channel to reduce the impedance of flood flows. This action resulted in 0.22 acres of impacts to riparian wetlands along the creek. Adobe Creek, which lies along the western edge of the golf course, was found to have high vegetative cover (*Rubus* spp., *Salix* spp.). The creek was buffered from the golf course on the eastern side and from a residential area on the western side by approximately 3 to 5 meters. Agency permits required the applicants to use willow plantings in place of riprap at seven of the fourteen proposed riprap locations.

During our field assessment, a map from the project's mitigation plan was used to locate the riprap and willow planting locations along Adobe Creek. A single CRAM assessment was made for the stretch of Adobe Creek where riprap and willow plantings were installed. At the time of assessment, the creek was low, but not dry. Our assessment determined that riprap and willow plantings were installed as per mitigation requirements. The site was found to have good physical and biotic structure, but a high percentage of invasive, co-dominant species. Buffer condition was affected significantly by the presence of the golf course, and buffer width was very low. The mitigation project was determined to have created 0.12 acres of riparian wetlands, slightly more than half of the 0.22 acres of that were impacted.

5479-Culvert and Fill Replacement for Residential Subdivision, LSA Associates, Gilroy

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
5479	3	San Francisco	1994	100.00	N/A	97.70	97.50

This project involved culvert and fill placement in Babbs Canyon Creek to facilitate the extension of a culvert and installation of a storm-drain outfall as part of the construction of a residential subdivision. Permanent impacts to 0.006 riparian non-wetland waters of the US were mitigated by enhancing 0.14 acres of upland non-waters of the US habitat. The mitigation areas were located along the top of the banks in a 10-15-foot band and consisted of plantings of valley oak, coast live oak, and western sycamore. The mitigation site for this file was not surveyed due to lack of time.

5619-Deepening, Construction of Channel, Diversion Dike at Three Fingers Lake-Cibola National Wildlife Refuge, US Fish and Wildlife Service- Cibola, Blythe

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
5619	7	Los Angeles	1995	100.00	48.05	70.00	71.40

Three Fingers Lake is located on the California side of the Refuge, just west of the Colorado River in the extreme southern part of Cibola National Wildlife Refuge. Three Fingers Lake once ranged from 20 – 150 acres and supported wetland and aquatic vegetation, as well as habitat for a variety of birds, fish, and other wildlife. When the Colorado River was realigned in 1964 and a groundwater drain was completed in 1970, flows to Three Finger Lake were significantly reduced, leaving the lake with only 20 acres of wetland during periods of high flow. The purpose of this project was to enhance and restore beneficial uses to the Three Fingers Lake area of the Cibola National Wildlife Refuge. This project involved deepening approximately 20 acres in Three Fingers Lake, construction of approximately 12,000 linear feet of channel, construction of a diversion dike near the mouth of Milpetas Wash to prevent sediment from accumulating in the restored lake area, installation of an inlet and outlet structure on Three Fingers Lake and a flow-through structure to connect the Colorado River to the old river channel in order to refresh flows to Three Fingers Lake. Impacts totaling 20 acres to wetland waters of the US were three-quarters permanent (15 acres) and one-quarter temporary (5 acres). Mitigation for these impacts consisted of the conversion of 15 acres of wetland to lake habitat and 45 acres of riparian restoration. Most of the mitigation site consisted of 42 acres of waters of the US and 18 acres of non-waters of the US. The waters-of-the-US portion of the mitigation consisted of 18 acres of wetland, 15 acres of non-streambed open water, and 9 acres of vegetated streambed. Just over half of the mitigation consisted of created habitat (32 acres) and the remaining part consisted of enhanced habitat.

The mitigation was performed onsite along the perimeter of Three Fingers Lake. To assess the whole site, we performed and averaged three CRAM evaluations. Extensive buffer surrounded the entire mitigation area, but was of moderately low quality due to being dominated by non-native tamarisk trees, having soil disruption, and being affected by human activity. Cattails dominated the tall-herb layer which comprised an average of less than 10% of the three sub-sites sampled in the mitigation area. The shrub layer was dominated by arroweed and creosote bush which covered 20% and 10%, respectively, of the sub-sites in which they were located. The tree layer was dominated almost entirely by tamarisk which covered between 40% and 50% of each sub-site in the mitigation area. Organic matter accumulation at the site was low and consisted mostly of fine organic material and occasional amounts of coarse debris. Hydrology was supplied to the mitigation site by Three Fingers Lake and the greater Colorado River watershed. The general area around the mitigation site consisted of the refuge, including dirt roads and trails, and a boat launch. A campground and RV park was located south of the mitigation site.

5625-Extension of Ramona Drive over Tributary to Arroyo Conejo, Kaufman and Broad Project on Dai Ichi Kangyo Bank Property- Newbury Park, Thousand Oaks.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
5625	4	Los Angeles	1995	31.84	45.71	87.50	87.50

Ramona Drive was extended past its intersection with Ventu Park Road in Thousand Oaks. This extension involved the construction of the 50-foot-wide road between two segments of Ramona Drive across two undeveloped parcels by filling the existing natural drainage and replacing it with a reinforced concrete box culvert beneath the new road. This natural drainage was an unnamed tributary to Arroyo Conejo which has intermittent flows and jurisdictional waters habitat. Prior to filling, this drainage was sparsely vegetated with perennial and annual grasses. Riparian vegetation was limited to the downstream and upstream portions of the drainage, and thus was not directly impacted by this project. To mitigate for impacts to 0.14 acres of streambed habitat (0.10 acres of which were permanent) approximately 0.903 acres of riparian habitat were required to be enhanced. The permittees obtained approximately 0.230 acres of habitat through exotic-plant removal and regrading to pre-project contours, both onsite and offsite, within Stagecoach Inn Park. Just over half of the mitigation areas were waters of the US (0.155 acres) and the remaining portion was non-waters of the US (0.132 acres).

The onsite mitigation, comprising 0.0575 acres, was located downstream of the Ramona Drive bridge which crossed the impacted stream. The herb layers at this site were not extensive enough to measure. The shrub layer covered 15% of the site and was dominated by coyote bush. The tree layer covered 85% of the site and was dominated by arroyo willow and pepper trees. Most of this site was surrounded by a moderately high-quality buffer of close to 30 feet wide. Organic matter accumulation at all three mitigation sites was mostly abundant and consisted of materials ranging in size from fine to coarse-woody. The banks of the drainage were deeply incised. South Ventu Park Road was to the east of this mitigation area, the Ramona Drive extension to the South, and disturbed open space to the west and north.

The offsite mitigation was located at the Stage Coach Inn Park, just south of the impact site. This mitigation was approximately 0.230 acres, including 30% wetlands, 5% streambed open water, 25% riparian waters, 35% non-waters riparian, and 5% upland. A stream flowed northward though the park, toward the Ramona Drive extension, where it flowed into the underground culvert and into the onsite mitigation area. Two areas were established here as mitigation for the Ramona Drive extension project. The first mitigation site was located in the northeast section of Stagecoach Inn Park, while the second site was in the area just south of the parks entrance on the western edge. In the first area, the short-herb layer covered 10% of this site and was dominated by mustard. The tall-herb layer, covering 5% of the site, consisted of sweet fennel. The shrub layer, covering 30% of the site, was dominated by mulefat and coyote bush. The tree layer, covering 50% of the site, was dominated by arroyo willow, tree tobacco, and pepper trees. Buffer of an average of 45 feet wide surrounded close to 50% of the site and was of moderately poor quality due to the presence of invasive plant species, trash, and soil disruption. At the second site, the short-herb layer was dominated by grass, African daisy, yellow mustard, and sow thistle. The tall-herb layer at this site was not measurable. The shrub layer covered 30% of the site and was dominated by Japanese honeysuckle, periwinkle, and coyote bush. The tree layer which covered 40% of the site was dominated by coast live oak and pepper trees. About half of this site was surrounded by moderately high-quality buffer of about 60 meters wide. This second area was adjacent to a sports field. The general area surrounding Stagecoach Inn Park consisted of South Ventu Park Road, Lynn Road, and Ramona Drive, as well as the Stagecoach Inn Facility and parking lot, and sports fields. The greater area supported many dense housing developments, particularly to the east and northwest of the park.

5747- Landfill Stabilization Site 6B, March Air Force Base, Riverside.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
5747	8	Los Angeles	1995	115.00	70.37	100.00	N/A

In 1989, March Air Force Base was added to the National Priorities List, which identified sites that release or threaten to release hazardous substances, pollutants, or contaminants which may present a danger to the public or environment. Of concern for this project were several old quarries and landfills immediately south of Van Buren Boulevard. Heavy rains and rising groundwater mixed with waste deposits in Site 6b, which posed a particular public health hazard. Thus, this project involved the removal of waste debris, contaminated sediments, and groundwater from Site 6b. Rising waters in this old quarry pit resulted in the development of seasonally ponded areas and wetland, which consisted of cattails, sedges, willows, and mulefat. To clean up this quarry pit, they had to excavate the entire pit and thus remove the majority of the wetland vegetation. To mitigate for the 0.30 acres of temporarily wetland impacts resulting from this excavation, 0.60 acres of wetlands were required to be restored.

Following this excavation, the pit was deepened and enlarged. Organic soils were filled into the deepest areas of the newly reshaped pit, and wetland vegetation was replanted. The original wetland restoration area did not provide the required 0.60 acres of wetland mitigation, therefore a supplemental 0.25 acre wetland creation area was also implemented. The main wetland restoration area was located on the western side of the site, while the supplemental wetland creation was on the eastern end. Both mitigation sites were buffered by open space containing non-native grasses, black mustard, and turkey mullen.

During our site visit, we measured the wetland restoration area to be 0.50 acres of jurisdictional wetlands. This western end of the pit had open water and was surrounded by saturated soils and emergent vegetation. This mitigation area was dominated by black willow, cottonwoods, arroyo willow, mulefat, and black mustard. Other non-native plant species were also present, but not very abundant. The supplemental wetland creation area was 0.19 acres, and consisted of 80% wetlands and 20% riparian margin habitat. This site consisted primarily of narrow-leaf willow, mulefat, and spike rush. Some tamarisk was also found in this area. Much of the ground around the shrubs and trees was barren with very little groundcover or herbaceous plants. The soils at this site had compacted after plantings were completed, leaving shrub and tree roots exposed above ground and stressing the plants. There was no open water at this eastern end of the pit during our site visit.

5815- Route 4/Willow Ave. Off-Ramp and Reconstruction, City of Hercules, Hercules

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
5815	2	San Francisco	1995	66.67	42.90	66.70	65.00

The city of Hercules, Contra Costa County filled 0.42 acres of seasonal wetlands to reconstruct State Route 4/Willow Ave. To offset the impact 0.59 acres of seasonal wetland was created onsite. The mitigation occurred in two areas, on both sides of the newly constructed off-ramp. The construction avoided as much impact as possible, and the mitigation expanded an already existing wetland.

The northern mitigation wetland was fed by captured run-off from the road above and the sprinkler system of the adjacent apartment complex. There was a culvert and commercial plantings at the northern end of the wetland that identified the boundary of the mitigation area, as well as a fence and sound barrier encompassing the site on the other sides. Willows were planted all around the edge of the mitigation wetland. We used the vegetation as well as topography to determine the full extent of the assessment area. At the southern site, wetlands already existed prior to the project, and the center of a large area was graded to create new wetlands. The restored area appeared to be the old road before the new highway was built. Boundaries were decided based on maps from the mitigation plan, the slope of the area, vegetation, and stakes still in the ground from the mitigation activities. Buffer conditions at both mitigation sites were poor, with surrounding roads and residential areas. *Typha* sp. was one of the dominant species at the site, but biological structure scored quite low. The area did not meet its acreage requirements.

6159-Storm Drain Construction, Veterans Administration Medical Center Complex, JKBE Engineers, Los Angeles.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
6159	4	Los Angeles	1995	92.33	47.92	66.0	71.2

This project involved two phases of construction. The first phase was installation of a storm drain pipe along 2,500 feet within an unnamed tributary to the Sawtelle Channel located in the northeastern portion of the Veterans Administration Medical Center Complex. The second phase of the project involved placing and grading 134,000 cubic yards of soil to cover the storm drain and reduce the slope of the arroyo to prepare for potential future development at the site. At the time of our visit, the lower portion of the arroyo north of the eastern mitigation site had not been developed, but the upper portion of it had been converted to sports fields. To compensate for permanent impacts to 1.5 acres of waters of the US, 3 acres of habitat were to be mitigation. Mitigation was undertaken at two adjacent low-gradient riverine sites south of the impact area. The western mitigation site comprised 2.10 acres and the eastern site comprised 0.67 acres, thereby providing a total of 2.77 acres. The western site was bordered immediately to the west by a high-density residential area. Immediately north of both mitigation sites was a vegetated stream channel and further north was a recreational area with sports fields and a dog park. A paved maintenance road fenced off from public traffic bisected the two mitigation sites.

The eastern site was bordered on the east by sports fields and a parking lot. Just over half of the western site had about 50 meters of moderately low-quality buffer. Almost the entire perimeter of the eastern site had about 30 meters of moderately low-quality buffer. On a larger scale, both mitigation sites were located in a dense, urban area. Both mitigation sites were fed by water running off from urban commercial and residential areas located higher in the watershed in the foothills of the Santa Monica Mountains. The mitigation sites were located in one of the few remaining stretches of this unnamed drainage in the lower portion of the watershed that was unchannelized.

The eastern mitigation site began at the outfall of the new pipeline and comprised the created portion of the mitigation. Presumably due to the presence of the pipeline's outfall and associated erosion at the northern edge of this eastern mitigation site, there was an almost-vertical, approximately 10-foot drop-off in the topography transitioning from north of the outfall to where the water flowing out of this pipeline landed in the mitigation site. All 0.67 acres of this site are considered waters of the US, 0.402 of these acres being wetlands and 0.268 acres being non-wetland waters. The southern edge of this site entered a culvert through which water flowed under the maintenance road into the southern portion of the western mitigation site. The western mitigation site consisted of enhancement through revegetation of a riparian area that we considered to be upland non-waters of the US. This site did not have any standing water, unlike the eastern site, and consisted of a right bank that sloped steeply and smoothly into the stream channel. The left bank, which was at about half the elevation of the right bank, also sloped smoothly into the streambed. Both banks seemed to be reaching equilibrium conditions as they did not seem to be degrading nor aggrading rapidly.

All vegetation layers were represented at the eastern site and the western site contained short herb, shrub, and tree layers. The dominant short herb in the eastern site was castor bean and, in the western site, mustard and castor bean. The short-herb layers comprised 10% (eastern site) and 15% (western site) of the mitigation sites' absolute vegetation cover. The eastern site's tall herb layer which covered 30% the site was comprised entirely of arundo. All of the herb layers at both sites were dominated by non-natives. The dominant shrubs of the eastern site were mulefat and laurel sumac and the western site's shrub layer was dominated by toyon, laurel sumac, and native blackberry. These shrub layers comprised 20% (western) and 30% (eastern) of the mitigation sites and all the dominant plants in them were native. The dominant trees of the eastern site were arroyo and black willows and they covered 10% of the site. The dominant tree of the western site was eucalyptus which comprised 80% of the absolute vegetation cover of the site, thereby providing a dense canopy of shade over most of the site. Both sites were characterized by the accumulation of a moderate amount of fine and coarse, woody organic matter and contained more new material than old.

6002- Holly Seacliff Sherwood Park, Seacliff Partners, Huntington Beach.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
6002	8	Los Angeles	1995	92.81	65.70	100.00	N/A

This project involved the construction of the Sherwood Park Development Project in Huntington Beach. This development involved 285-unit residential area and 4-acre park. These activities permanently impacted 1.361 acres of wetland and jurisdictional riparian habitat. To mitigate for these impacts, Seacliff Partners were required to create 1.62 acres of wetland invert surrounded by 2.55 acres of planted slope onsite in the western drainage section of the project area. The mitigation area is located on a pre-existing drainage swale within the project area. Prior to the wetland creation, this site consisted of highly degraded riparian grasses.

This mitigation area was 3.87 acres, of which 60% was wetland and 40% was planted upland slope buffer. We performed a CRAM analysis on only the bottom of the depression and did not include the sloped buffer. The middle of the basin supported meandering open water with emergent and submergent vegetation, while closed canopy riparian wetland filled the rest of the depression. Dominant vegetation included arroyo willow, mulefat, bulrushes, cattails, spike rush, and duckweed. Some non-native plant species were present, though not abundant. Irrigation lines ran throughout the riparian wetland areas. A berm ran through the center of the depression bisecting the wetlands. The depression was surrounded to the northwest and southeast by the residential development, the southwest by Garnet Lane, the northeast by Ellis Avenue, and the east by the development’s park.

6280- McDonald Canyon Detention Basin, Ventura Country Watershed Protection District, Ojai

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
6280	4	Los Angeles	1995	95.00	47.09	80.80	80.80

To provide a 100-year flood protection for the community of Meiners Oaks, the Ventura County Watershed Protection District constructed an earthen debris dam, grouted rock rip rap barrier, and diversion channel in McDonald Canyon. A total of 0.09 permanent acres and 0.10 temporary acres of willow riparian and streambed habitat were impacted. The permittee was required to mitigate 0.20 acres of riparian habitat to offset these permanent and temporary impacts.

Temporary impacts to waters of the US caused by the access roads were mitigated through revegetation of these areas. To mitigate for permanent impacts to waters of the US, a mitigation area of 0.09 acres was created adjacent to the downstream face of the dam, consisting of sycamores, cottonwoods, oaks, and coyote bush plantings. Because the mitigation site was located above a concrete stream culvert, there was no connectivity to the actual stream channel. Therefore, this mitigation area was not considered jurisdictional waters. We determined that the site consisted of 60% non-waters riparian and 40% upland habitat. This site was buffered on its western and northern edge by natural riparian vegetation, on the southern edge by a private residence, riparian and ruderal vegetation, and a dam access road. The concrete dam aligned the eastern edge of the mitigation area, thus no buffer was present on that side. Aside from the shrub and tree plantings, little natural vegetation persisted in this mitigation area other than black mustard and non-native grasses. Much of the vegetation area was open, unvegetated soil, with boulders along the culvert.

6369- Extend Newport Coast Drive, Orange County Environmental Management Agency, Irvine.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
6369	8	Los Angeles	1995	104.75	63.19	100.00	N/A

The Orange County Environmental Management Agency extended Newport Coast Drive between the San Joaquin Hills Transportation Corridor and Bonita Canyon Drive. This project involved grading, tributary realignment, installation of culverts, and partially lining streambeds. Specifically, the Newport Coast Drive extension crosses Bonita Creek. This project impacted approximately 1.49 acres of jurisdictional waters of the US, including approximately 1.44 acres of wetland, in Bonita Creek and unnamed tributaries. These impacts were required to be mitigated through riparian and wetland revegetation on-site, and the creation of habitat in three distinct mitigation areas in the adjacent Bommer Canyon drainage, for a total of 5.69 acres. All three Bommer Canyon mitigation sites were within the City of Irvine Open Space Preserve.

It was difficult to determine the exact boundaries of the onsite mitigation area, though the required 0.29 acres of mulefat-scrub mitigation were apparent. We determined the site consisted of 70% wetland and 30% jurisdictional riparian habitat. This mitigation area appeared to start at a culvert adjacent to a residential development and continued upstream. Runoff from the adjacent development collected in this mitigation area. This site was predominantly arroyo willow, black willow, mulefat, and cattails. Additionally, 0.24 acres of mulefat-scrub mitigation were provided on the banks adjacent to the 0.29-acres of mulefat scrub.

The southern-most mitigation area in Bommer Canyon was approximately 2.60 acres and consisted mainly of oaks, sycamore, and elderberry plantings. Very few non-native plant species were found at the site. A streambed ran through the length of the site, but was dry during our visit. The stream banks were deeply incised in some places, while thick mulefat stands were present in other parts of the stream. The site consisted of approximately 20% vegetated streambed habitat and 80% non-waters riparian habitat. Although a wire fence surrounded the mitigation, minimally disturbed buffer was abundant around the whole site. This site appeared to be doing well without irrigation, although sections of localized plant mortality were present.

The central mitigation area in Bommer Canyon was 0.61 acres, with about 20% wetland, 20% riparian waters, and 60% non-waters riparian habitat. A stream flowed into the central mitigation area from a culvert under the adjacent paved Bommer Canyon road. Arroyo willow, black willow, sycamore, mulefat, cattails, and mugwort were dominant at this site. Very few non-native plant species were found in the mitigation site, although black mustard was prevalent in the buffered area. Wire fencing clearly defined this mitigation site. The stream banks were deeply incised in the southern end of the mitigation site.

The northern-most mitigation area in Bommer Canyon was 2.25 acres, of which 40% was wetland, 20% riparian waters, 35% non-waters riparian, and 5% upland. This site was right near the entrance of the City of Irvine Open Space Preserve and bordered the paved Bommer Canyon road on its western edge. The Shady Canyon Residential Development was just to the East of this site. Coast live oak, arroyo willow, red willow, sycamore, mulefat, cattails, bulrush, and mugwort were the dominant plants present. Very few non-native plant species were found in the mitigation site, although black mustard and thistles were prevalent in the buffered area.

6389-Channel Stabilization, County of Ventura Public Works Agency, Moorpark.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
6389	4	Los Angeles	1995	39.344	53.580	100.0	N/A

This project involved flood control improvements to the stretch of Arroyo Las Posas between the Moorpark Wastewater Treatment Plant and a private tree nursery located west of Hitch Boulevard and south of Los Angeles Avenue (Highway 118). These improvements were undertaken as part of a larger project to reduce sedimentation in Lower Calleguas Creek and Mugu Lagoon. Permanent impacts to 7.1 acres and temporary impacts to 5.8 acres of wetlands were supposed to be mitigated by removing exotic plants from 4.9 acres of riparian woodland habitat and planting of willow cuttings over 1.2 acres at the toe of each bank in the project area. Forty percent of this required mitigation acreage was provided. Half of the 2.4-acre mitigation site was considered an enhancement through planting of willow cuttings, and the other half was considered an enhancement through arundo removal. Both enhancements affected riparian non-wetland waters of the US.

The woody vegetation at the site was dominated by natives, whereas the herb layers were dominated by non-natives. The short-herb stratum covered 15% of the site and was dominated by a non-native water smartweed. Arundo dominated the tall-herb layer which covered 35% of the site. There was not a measurable shrub layer. The tree stratum comprised 70% of the absolute vegetative cover of the site and was comprised of two willow species. A moderate amount of fine and coarse, woody organic matter was accumulated at the site, comprised mainly of new material.

This stretch of Arroyo Las Posas was a low-gradient, soft-bottom, perennial stream that was about 25 feet wide. The dry portions of the stream channel extended at a very slight grade from 15-20 feet from the edge of the water to the toe of an ungrouted, rip-rapped bank that rose steeply to the treatment plant on the right bank and tree nursery on the left bank. The lower boundary of the mitigation site was marked by a steel-reinforced, spill-over dam that was about 25 feet tall. The upper boundary of the site was a bridge over the stream on Hitch Boulevard. Less than 25% of the mitigation site was surrounded by buffer of moderately high quality with moderate cover of non-native plants and moderately disturbed soils. The majority (75%) of the site was unbuffered due to the proximity of the rip-rap banks adjacent to the nursery and water-treatment plant. Rising waters in the stream seemed that they would have had somewhat restricted access to the adjacent uplands due to the presence of these rip-rapped banks. The mitigation sites are located in an intermediate section of the watershed south of an agricultural area with row crops and orchards and north of an open, little-developed area of Moorpark. The mitigation site was located downstream of the City of Simi Valley which likely affected the water quality in this stretch of the stream. According to an employee of the nursery adjacent to the mitigation site, another employee of the nursery developed a staph infection after rinsing off an abrasion in the water.

6451- Napa River Bridge Retrofit, Caltrans, Vallejo

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
6451	2	San Francisco	1996	81.54	59.68	82.00	56.40

Caltrans proposed to seismically retrofit State Route 37 Bridge over the Napa River. In doing so, there were temporary impacts to 0.65 acres of estuarine tidal marsh. The permitted mitigation was to excavate and revegetate the impacted area so the final marsh elevation would be consistent with the existing, adjacent elevations. The impact area primarily consisted of *Salicornia virginica* and was to be replaced to its original vegetative cover. The mitigation plan called for both natural recruitment and planting of wetland and upland species. The uplands were to be weeded to enhance native coastal scrub establishment.

We used maps from the mitigation plan and the extent of tidal flooding to define wetland boundaries. The excavated area did not appear to be low enough for tidal marsh plants to establish. We visited the site at both high and low tides. The area was ponded at high tide and an unvegetated flat at low tide. There was still evidence of equipment impacts at the site. Targeted wetland plants were not found. *Baccharis pilularis* was dominant in the uplands, however, no other planted species were found. Biotic and physical structure scored poorly for this site, and the obtained acreages did not match the required mitigation acreages.

6489- Robbins Meadows Unit #1, Farmers & Merchants Bank of Central California, Elk Grove

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
6489	5S	Sacramento	1996	100.00	67.81	100.00	N/A

The development of the Robbins Meadows Unit #1 project impacted 1.74 acres of wetlands. The project involved the construction of 76 residential units on a 13.3-acre parcel and was located in Elk Grove along Lucchesi Road approximately 0.6 miles east of Elk Grove-Florin Road. The wetlands on the project site were associated with a drainage swale that connected underground street drains from both north and south of the site. Mitigation requirements for the project were satisfied through the purchase of credits associated with 1.74 acres of perennial marsh and seasonal swale wetlands on the Sacramento/Yolo County Mosquito and Vector Control District's (District) property along Laguna Creek in Elk Grove. The District property is located next to Bond Road between Highway 99 and Elk Grove-Florin Road and is approximately 2.5 miles from the Robbins Meadows Unit #1 development. The wetlands were created above and beyond the District's mitigation responsibility as part of their 1992 facility expansion. Creation of the mitigation wetlands involved the construction of a secondary channel designed to transport flow between Upper and Lower Camden Passage lakes during winter and spring rainfall events. The grading of this secondary channel was designed to provide additional wetland habitat and led to 1.97 acres of wetlands above and beyond the District's responsibility.

Mitigation site boundaries were determined using maps obtained from the project file. Upper and Lower Camden Passage lakes and Laguna Creek provided adequate reference points, and changes in hydrology and vegetation were used to determine the transition from wetland to upland. The wetland complex was significantly ponded due to heavy rainfall the previous day. A single CRAM assessment was made for the area. The adjacent creek and lakes gave the site good connectivity to aquatic resources. The site was located within an open space area, but the much of the surrounding buffer consisted of non-native annual grass and a park lawn. Dense residential areas and District facilities surrounded the site. Physical and biotic structure was good overall, but the site lacked physical patch types like unvegetated flats, mounds and islands. Vegetation was dominated by *Juncus* spp., *Typha* spp. and *Scirpus* *californicus*. Non-native species were not present in significant numbers. Numerous bird species were observed including ducks, great blue heron, raptors, red-winged black birds, egrets, Canada geese and pheasant.

6668- Gelsar Housing Development, Gelsar, Hercules

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
6668	2	San Francisco	1996	110.01	51.07	88.20	86.60

This property is located in the city of Hercules, in West Contra Costa County at the interchange of State Route 4 and Interstate 80. It encompasses 106 acres of residential and commercial development, wetland preserves, and a riparian corridor of the relocated Refugio Creek. Sixty two acres were targeted for mixed development, and 44 acres of the site have been preserved as Public Open Space. The Public Open Space consists of: (1) The Eastern and Western Wetland Preserves that includes created and preserved brackish/freshwater marsh and seasonal wetlands; and (2) a riparian corridor that includes a created stream channel, riparian woodland, created seasonal wetlands, and a brackish/freshwater marsh. Additionally a 35-foot wide upland buffer zone was established as an interface between the mitigation area and the development areas. The mitigation plan required the creation of 14.08 acres of jurisdictional habitat. According to the consultant's (LSA) annual report the site has exceeded its acreage requirements by establishing 15.49 acres. The seasonal/depressional wetlands were constructed in stages from 2001- 2003, and Refugio Creek was regraded with created meanders in 2000.

We divided the site into sections, and sampled a subset of the created wetlands using CRAM. We sampled the seasonal wetland preserves and the riparian corridor separately and used maps from the mitigation plan to navigate and to group similar wetlands based on their age and location. We eliminated the assessment of one newly created wetland by the main road due to complexities, yet sampled within all other depressional areas (12). We used aerial photographs to identify three different sections of the riparian corridor (low, middle and high), and within each section, we randomly chose one stretch of the riparian corridor (from one bend to another) to sample.

The seasonal wetlands in the riparian corridor were 5.61 acres and 3.84 in the Eastern and Western Preserves. We found the following non-native or invasive species to be the dominant short herbs in the seasonal wetlands: *Lotus corniculatus, Lepidium latifolium, Cotula coronopifolia, Cynodon dactylon, Picris echioides*, and *Horduem brachyantherum*. When tall herbs were observed in the seasonal ponds, *Typha* sp. was consistently dominant. The majority of the Eastern area was dry, with partially saturated soils in some locations. Native wetland vegetation was not well established here, and non-natives dominated the area. Considering that our site visits were in the summer, it is difficult to say how much water the wetlands receive or if hydrology was a substantial limiting factor for wetland plant establishment. Also, some of these sites were relatively new, having been constructed in 2003. The Western Preserve was better established and was wet in a few of our assessment areas. The vegetation here was much taller than in the Eastern Preserve. In the Western area, the wetlands were connected to each other while in the Eastern area there was a greater distance between wetlands, and water could not flow through as easily.

The riparian corridor was created by meandering Refugio Creek. In doing so the size of the creek increased as well as the area surrounding the Creek. This area was seeded with native herbaceous plant species and planted with native trees and shrubs. According to the monitoring report the survival rate of plants in the riparian corridor was 85%. This included replanting and voluntary establishment. However, *Salicornia virginica* and *Lepidium latifolium* were the dominant species in the riparian corridor, rather than more common riparian tree and shrub species. A large number of willow wattles and willow poles were used to establish the riparian habitat. Our survey found all the willows to be dead or missing at the site. We found many areas where they had been planted, but nothing had survived. In addition to the woody riparian plants, *Nassella pulchra* was planted along the southern banks, however, we did not find this species in our survey. The physical structure of the new creek had very few patch types and hardly any physical or biotic patch richness. In the upland areas, there were plantings of *Rosa californica, Grindelia stricta, Sambucus mexicana, Baccharis pilularis, Quercus agrifolia,* and *Quercus lobata.* These plants have been irrigated and seemed to be doing well. The acreage requirements had been met and the area is beginning to establish.

6709- Hidden Pond Housing Development, Malcom Sproul, Martinez

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
6709	2	San Francisco	1996	48.00	38.11	65.60	65.00

The Hidden Pond project is located west of Reliez Valley Road and south of Donegal Way, south of the city of Martinez. Hidden Pond Road bisects the site. One stock pond that encompassed approximately 0.25 acres was filled in order to construct this housing development. In addition, portions of an ephemeral stream that drains the pond were filled and rerouted. Approximately 75 feet of stream immediately below the pond was filled, 80 feet of drainage was riprapped, and a 390-foot portion was filled and re-routed. The mitigation consisted of planting native riparian trees at a 3:1 ratio along the 390-foot re-routed drainage area. The area was to be maintained for three years with an 80% survival rate of all planted trees. This project was required to create 0.75 acres of wetland to offset the total impacts of 0.44 acres. Vegetation in the impacted stock pond included *Typha latifolia* and *Eleocharis macrostachya.* The surrounding upland was dominated by non-native grassland. There were also coast live oaks (*Quercus agrifolia*) and valley oaks (*Quercus lobata)*, along with poison oak (*Toxidendron diversilobum)* and California buckeye (*Aesculus californica)* in the upland. The mitigation site was dominated by barley and ryegrass with scattered plantings of coast live oaks, maples, and buckeyes.

The extent of the mitigation area was identified by the concrete ditch, which was created to reroute the stream. There was a clear lateral boundary of the mitigation area based on wetland versus upland plantings. The upstream boundary was an impoundment with *Typha* sp. at the northern end of the ditch, and downstream there was a culvert at the southernmost point. Given that our survey was completed in June, the grassy areas in between tree and shrub plantings were dry. We could not confirm if reseeding occurred and failed, or if it never occurred. The only supported wetland parameter at the mitigation site was the artificial hydrology. The water flows down a concrete slab with a small buffer that is regularly mowed. The site had a very low overall CRAM score and did not meet the mitigation acreage requirement.

6789- Austin Road Landfill, Jones & Stokes Association, Stockton.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
6789	5S	Sacramento	1996	85.61	53.82	N/A	N/A

Littlejohns Creek was relocated to the north of its original location and filled to surrounding ground level, to expand the Austin Road Landfill facility by 222 acres. The Austin Road landfill has since been sold to Forward Landfill, Allied Waste Management. The stream relocation filled 2.895 acres of the north branch of the south fork of Littlejohns Creek, which included 0.859 acres of wetland and 2.036 acres of streambed open water. To mitigate for these impacts to jurisdictional waters, the permittee was required to create 44.05 acres within and surrounding the relocated stream, including 1.07 acres of wetland, 3.58 acres of streambed open water, and 39.40 acres of riparian habitat.

During our site visit we measured this mitigation site to be 37.71 acres and consisted of approximately 25% wetland, 5% streambed open water, 5% riparian waters, 45% non-waters riparian, and 20% upland. The mitigation site consists of a meandering low flow channel and associated floodplain within the straight relocated channel. The relocated creek is 3% longer than the original and flows through an inlet under Austin Road and flows east then bends southward out under New Castle Road. The created streambed contains a clay lined streambed, without stones or boulders, to avoid liquids leaching into or out of the mitigation site. Two low flow crossings over the relocated stream are actively used by earthmovers and other equipment.

In an attempt to functionally assess the large mitigation area, we performed and averaged four CRAM evaluations at this site. The streambed was heavily vegetated with layers of vegetation, including woody riparian, emergent, and submergent plants. Dominant plants at this site include arroyo willow, mulefat, button willow, yellow waterweed, cattails, and smartweed. The planting design was in blocks, thus providing interspersion of vegetation and patch types. Irrigation lines ran though the riparian area. The mitigation site is buffered by thin strips of ruderal lands on all sites. These buffered areas are cut short by wire fencing, construction roads, and the landfill. The general surrounding area includes the landfill, the Northern California Youth Center, and agricultural lands.

6845-Reconstruct Rip Rap and Concrete Apron in Arroyo Simi, Simi Valley Department of Public Works, Simi Valley.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
6845	4	Los Angeles	1996	100.00	63.86	95.00	92.90

This project involved the reconstruction of a damaged rock riprap structure and concrete apron downstream from an existing sheet-pile stabilizer across the Arroyo Simi which protects a 12-inch sewer line and 233-inch sewer trunk line. Total impacts of 0.4 acres, 0.17 of which were permanent, were mitigated by enhancing the banks of the arroyo downstream of the apron through willow plantings. A total of 0.17 acres of mitigation were provided, 0.102 acres of which involved waters of the US; 0.034 acres of this acreage was wetland waters, 0.068 was riparian non-wetland waters. This site was bordered on the west by a mobile housing development, an industrial complex, and an extensive open-space area to the northwest. It was bordered on the east by another industrial development. The general vicinity of the site was an urban area located downstream of Simi Valley’s sewage treatment plant, perhaps explaining the extensive coverage of macroalgal mats in this portion of stream. Most of the site was surrounded by moderately low-quality buffer of an average of at least 75 feet wide. A continuous riparian corridor with thick willow canopies extended south of the mitigation site for at least several hundred feet.

The downstream banks where the mitigation occurred were dominated by native woody plants and non-native herbs. The short-herb layer covered 10% of the site and was comprised entirely of mustard. A tall-herb layer covered 20% of the site and was dominated by giant reed. Mulefat and willow dominated the shrub layer which comprised 50% of the site. Willow also dominated the tree layer which comprised 50% of the site. Organic matter accumulation at the site was moderately abundant and ranged in size from fine organic material to coarse, woody debris. The area under the thick willow canopy on the right bank was apparently being occupied by people camping. On the left side of the stream, the bank was about 20 feet wide and abutted by a steep, eroding slope. This slope rose about 25 feet above the stream banks to the open-space area west and northwest of the site which was bordered on the east by a small foot-trail. The banks of the stream transitioned gradually into the streambed such that rising waters were likely able to spill over readily into these areas which comprised the mitigation sites.

6855- Crescent City Landfill Closure, Del Norte Solid Waste Authority, Crescent City

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
6855	1	San Francisco	1996	102.00	86.55	100.00	90.00

The closure of the Crescent City Landfill resulted in the fill of one acre of wetlands. The impacted wetlands existed within the coastal zone and the Lake Earle Wildlife Management Area. The wetlands exhibited high biotic diversity, both plant and animal, and the northern red-legged frog has been documented in the area. The applicants were required to construct 3 acres of wetlands onsite, in a borrow area within the existing interdunal complex. The mitigation area consisted of a single large depression excavated to the level of the water table.

During our field assessment, a map from the project's mitigation plan as well as a landfill employee aided us in locating the mitigation wetland. Changes in vegetation were used to determine the boundaries between the wetland and the adjacent uplands. A single CRAM assessment was made for the area. At the time of assessment, the wetland was saturated throughout and slightly ponded in the center. At the landscape level, the wetland had good connectivity to other wetlands and good buffer condition. Physical structure was very complex, both topographically and in terms of physical patch types. Vegetation cover in the wetland was high with high species diversity. Species observed included *Eleocharis* spp., *Scirpus* spp. and *Ranunculus* spp. Invasive species were not observed in significant numbers. A total of 3.06 acres of wetlands were created, slightly exceeding the 3.0 acres that were required.

6949- Trails End Planned Unit Development, Trails End Associates, South Lake Tahoe

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
6949	6T	Sacramento	1996	100.00	70.60	87.50	N/A

The Trails End project impacted 0.006 acres of jurisdictional wetlands that were a tributary to Squaw Creek, which is a tributary of Truckee River in South Lake Tahoe, for the purpose of installing a ten foot wide by twenty five foot long sewer line to service a single family home subdivision. Mitigation requirements were to restore 0.006 acres of wetland vegetation onsite along the trench line by harvesting and replanting wetland vegetation from the surrounding existing jurisdictional wetlands and create an additional 0.003 acres of wetland area adjacent to the existing wetlands.

To locate the mitigation project, we utilized information in the 401 permit and followed the Trails End Planned Unit Development Map. A depressional wetland area was located 30 feet south of parcel 9, the last house on Indian Trail Road, on the map. With the information provided in the 401 permit, we were able to identify the location of the trench and the associated sewerline that was installed during the wetland impact. We assumed through file review that this area was indeed mitigation for the project, and therefore CRAM was used to evaluate this mitigation site. The wetland was surrounded by a forest of *Pinus contorta* and adjacent homes to the north. The five native species present in the wetland included *Juncus* sp., *Eleocharis* sp., *Hemizonia* sp., *Salix* sp., and *Pinus contorta*. Only one non-native species, *Lythrum hyssopifolia*, was recorded at the site with 5 % cover. We concluded that the applicant was in compliance of permit conditions for restoring 0.006 acres of wetlands because the impact site was heavily vegetated with native species mentioned above. We found a 0.003 acre depressional pocket, just west of the 0.006 acre restoration site. The native species found here were predominantly *Juncus* sp. and *Eleocharis* sp. Overall, vegetation at the site seemed healthy and vigorous. The CRAM scores for this site were very high for landscape context, hydrology, and biotic structure, and an average score for physical structure due to a moderate amount of physical patch types present. This site was one of the few optimal sites assessed by the USF group.

6970-State Route 41 North Freeway Project, California Department of Transportation, Fresno

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
6970	5F	Sacramento	1996	25.59	70.70	100.00	64.30

This project involved widening State Route 41 from a two-lane conventional highway to a four-lane freeway from Audubon Drive to 0.30 miles north of Avenue 12. The Route 41 expansion resulted in impacts to waters of the US at three locations: San Joaquin River, Root Creek, and vernal pools near the intersection of State Route 41 and Avenue 12. Permanent impacts totaling 4.21 acres of waters of the US affected 3.61 acres of wetland waters and 0.60 acres of open-water habitat. To mitigate for these impacts, the permittee was required to establish 4.65 acres, including 4.25 acres of wetlands and 0.40 acres of riparian habitat. Only 1.19 acres were actually mitigated, including 0.732 acres waters of the US and 0.458 acres of non-waters of the US habitat. The required 0.25-acre-vernal-pool mitigation was not completed. Three mitigation areas, all located in a park/nature preserve near the San Joaquin River and Highway 41, were established: depressional, a riparian-bank, and depressional-swale area. This general mitigation site was bordered by a mobile-home park to the east, the San Joaquin River and its associated habitat to the south, Route 41 to the west, and an upland Elderberry area to the north. Walking paths and educational postings were present throughout this park.

The depressional area was 0.85 acres, of which 50% was wetland 20% was open water, and 30% was non-jurisdictional riparian habitat. This was a distinct wetland with a long-duration hydrologic regime which and was ponded during our visit. Buffer surrounded most of the perimeter of this site, averaged close to 100 meters in width, and was of moderately high quality due to human activity and soil disruption. The depressional mitigation site was vegetated mostly by short herbs and trees. The short-herb layer, dominated by duckweed, covered 30% of the site. The tall-herb layer, dominated by goldenrod, mugwort, and giant wild rye, covered 5% of the site. Native California blackberry and wild rose dominated the shrub layer which comprised 10% of the site. Cottonwood and arroyo willow dominated the tree layer which covered 50% of the site. Organic matter accumulation was abundant and consisted of materials ranging in size from fine organic material to coarse, woody debris.

The riverine mitigation area was located on the bank sloping into the perennial, low-flow east branch of the San Joaquin River. It was 0.23 acres, including 25% wetland, 25% jurisdictional riparian, and 50% non-jurisdictional riparian habitat. Buffer surrounded most of the perimeter of this site, averaged close to 100 meters in width, and was of moderately high quality due to human activity and soil disruption. The riverine mitigation site was vegetated mostly with trees. The short-herb layer covered 10% of the site and was dominated by saltgrass, mugwort, and stinging nettle. The tall-herb layer, dominated by mugwort and stinging nettle, covered 5% of the site. The shrub layer, dominated by California blackberry, covered 15% of the site. The tree layer comprised 80% of the site and was dominated by cottonwood, white alder, narrow-leaf willow, and Oregon ash. Organic matter accumulation was abundant and consisted of materials ranging in size from fine organic material to coarse, woody debris.

The depressional swale area was 0.11 acres, consisting of 20% wetlands, 30% non-jurisdictional riparian, and 50% upland. The depressional areas were both distinct wetlands. The first, which was ponded when we visited it, had a long-duration hydrologic regime and the second, which was dry when we visited it, had a medium-duration hydrologic regime. Buffer surrounded most of the perimeter of all three mitigation sites, averaged close to 100 meters in width, and was of moderately high quality due to human activity and soil disruption. The depressional-swale site was also vegetated mostly with trees. The short-herb layer was dominated by saltgrass, giant wild rye, and goldenrod. The tall-herb layer covered 5% of the site and was also dominated by goldenrod. Mexican elderberry dominated the shrub layer which covered 10% of the site. The tree stratum, dominated by cottonwood and arroyo willow, covered 55% of the site. Organic matter accumulation at the site was moderately abundant and consisted of materials ranging in size from fine organic material to coarse, woody debris.

7014-Grade Forest Lawn Memorial Park, Michael Brandman Associates, City of Covina Hills

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
7014	4	Los Angeles	1996	100.00	N/A	100.00	50.00

This project involved expanding the existing Forest Lawn Memorial Park which resulted in permanent fill impacts to 0.10 acres of unvegetated streambed (waters of the US) and 1.40 acres of upland (non-waters of the US) gnatcatcher habitat. These impacts were mitigated, as required, by enhancing 2.80 acres of upland non-waters of the US through hydroseeding with a coastal-sage-scrub seed mix.

7059-Bridge Replacement Project over Los Berros Road Creek, San Luis Obispo County, Nipomo.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
7059	3	Los Angeles	1996	100.00	70.07	N/A	93.30

This project involved the replacement of a bridge and stabilization of the downstream slope of a small stream canyon in a low-population-density, rural section of San Luis Obispo County bordered by a large open-space area several miles east of the 101 freeway. To offset temporary impacts to 0.10 acres of non-wetland waters of the US, 0.10 acres of enhancement mitigation were provided in the impact area through revegetation of the disturbed slopes upstream and downstream of the bridge. Of these 0.10 acres of waters of the US, 0.025 acres were wetland waters and 0.075 acres were non-wetland waters. The site was buffered extensively on all sides by high-quality buffer. The stream channel was narrow (less than 10 feet wide) and surrounded by steep, eroding banks about 20 feet high. The slope stabilization was installed mostly on the left bank downstream of the bridge because the stream turns to the right just past the bridge, thereby putting erosion pressure on the left bank. There were several boulders, possibly fragments from the old bridge's footings, in the streambed just upstream and downstream of the bridge.

The mitigation site was densely vegetated with 185% absolute vegetative cover, almost all of which consisted of native plant species. The short-herb layer, covering 20% of the site, was dominated by mugwort. The tall-herb layer, covering 5% of the vegetative cover at the mitigation site, was dominated by sweet fennel. California native blackberry dominated the shrub layer which covering 80% of the vegetative cover of the site. Eighty percent of the site was covered by a tree layer dominated by sycamore and arroyo willow trees which provided heavy shading of the mitigation area and its vicinity. Organic matter accumulation in the area was characterized by an abundance of material in all size ranges, from fine organic material to coarse, woody debris.

7117- Parking and Viewing Area, Modoc National Wildlife Refuge and Caltrans, Alturas

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
7117	5R	Sacramento	1996	100.00	57.38	100.00	62.50

Caltrans, with the cooperation of the Modoc National Wildlife Refuge (US Fish and Wildlife Service), built a parking and viewing area on the west side of Highway 395 in Modoc County adjacent to the Refuge in Alturas. The pre-project wetlands included a mosaic of seasonally wet grassland communities dominated by invasive facultative annual grasses. The parking lot construction placed fill on 0.6 acres of wetlands. As mitigation for the impact to wetlands, a 4 acre pond was to be created in the same soil type with a variety of depths and wetland habitats. The mitigation was planned to be onsite, southwest of the new overlook. The wetland was to be constructed primarily by employees of the Modoc National Wildlife Refuge.

In the field evaluation, the mitigation site was found to be heavily ponded. The assessment area for the created wetland was determined to be the band of wetland vegetation around the shoreline of the pond and around the perimeter of a small island in the middle of the pond. Lack of access to the island made it difficult to assess the entire wetland area. The wetland buffer, which on three sides included sizable expanses of contiguous natural areas, contained a mix of native bunch-grasses and invasive weeds such as *Foeniculum vulgare*. The primary water source for the pond was irrigation from a Refuge reservoir which draws water from the Pit River System. While the site did have a mix of vegetated areas and unvegetated flats, the physical structural complexity of the wetland was poor. The vegetation was dominated by the native bunch grass, *Elymus triticoides*, and *Distichlis spicata*. Overall, the vegetation had limited diversity with a fairly homogenous spatial distribution. While, the size of the pond was determined to be larger than the required 4 acres, the excessive ponding limited wetland establishment to a small fraction of the area. The transportation corridor along nearby Highway 395 was considered a primary stressor to the site.

7154- Rancho San Carlos/Santa Lucia Housing Development, Rancho San Carlos Partners, Carmel

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
7154	3	San Francisco	1996	102.46	68.55	92.60	92.20

Rancho San Carlos Partners implemented the development of a residential community located within 20,000 acres of the Santa Lucia Preserve in Monterey County, south of the Monterey Peninsula and south of Carmel Valley Road. The preserve is in the Santa Lucia Mountain Range, southeast of the city of Carmel and south of the Carmel River Valley. The project proposed the construction of single family homes, operational facilities, employee housing, recreational activities, a golf course, a hotel, and commercial businesses. The project filled 2.43 acres of jurisdictional wetlands and 0.41 acres of jurisdictional waters to construct a road crossing and golf course. All impacts were to be mitigated at a 3:1 ratio. The mitigation required 8.52 acres of wetlands and occurred at two locations, Moore’s Lake and Cienega Pond. A total of 4.3 acres of wetland habitat was created in seven areas around Moore’s Lake and 3.5 acres in five areas around Cienega Pond. In addition, 1.2 acres of “other waters” were created through an expansion of Moore’s Lake surface area.

We sampled four of the five mitigation wetlands around Cienega Pond. The boundaries were distinct based on the excavated depressions and plantings surrounding the edges. All the depressions were mainly dry but received runoff from the irrigation system used for the trees surrounding the wetlands. The wetlands scored high in most areas, except for biotic structure metrics and especially for vertical biotic structure. These sites scored poorly in native plant species richness, and invasive plant species scores were highly variable throughout the site.

At Moore’s Lake we randomly selected a lacustrine area (area 3) and a depressional area (area 9) to assess. We were unable to access the newly created island in the lake, and it was impossible to determine boundaries for a few of the depressional sites. Moore’s Lake is a man-made lake, and the mitigation was to expand the lake and create additional acreage. The southern boundary for area 3 was a distinct change of vegetation that represented the newly created wetland, and the northern boundary was the bend in the lake, as identified on the plan map. The AA included a 30-foot wide streambed, about 120 feet long that extended to the open water. This area did not score well for biotic structure. There were only two native species and a high percentage of invasive plants (33%). The vertical biotic structure had no yet established in the area, and there were only three physical path types found. The depressional wetland, area 9, scored similarly to the sites at Cienega Pond.

7270- Dowd Subdivision (Windsor Industrial Park No. 3), Don Dowd Co., Windsor

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
7270	1	San Francisco	1996	100.00	60.01	0.00	N/A

Construction of an industrial park filled 0.06 acres of seasonal wetlands and 0.28 acres of a drainage ditch on a 19-acre parcel in the town of Windsor on the Santa Rosa Plain. The impact site was bounded on all sides by existing or proposed development and was degraded due to prior agricultural activities. The applicants were required to construct 0.4 acres of seasonal wetlands at the Sonoma County Airport Consolidated Mitigation Area (SACMA). The SACMA, which is adjacent to the airport, consists of several acres of depressional wetlands that were used as mitigation for a number of projects. Unlike a mitigation bank, however, the acreage requirements for specific projects are assigned to specific depressions within the SACMA.

During our field assessment, a map obtained from the consultant who constructed the mitigation area was used to differentiate the wetlands created for this project from wetlands that were created for other projects. The boundary between the wetland depressions and the adjacent uplands was identified based on the presence or absence of wetlands vegetation. A single CRAM assessment was made for the project sub-site, which consisted of several distinct depressions. The SACMA site consists of a mix of wetlands, non-native grassland, and oak woodland. Redwood Creek borders the site on the eastern side. As a whole, the created wetlands at the SACMA site were found to have fair connectivity to aquatic resources and a fairly good buffer. The depressions were dry at the time of evaluation. The hydroperiod for the depressions that corresponded to this particular project had a hydroperiod that was indicative of natural patterns, but the physical structure of the wetlands had very low complexity. Several non-native species (*Taeniatherum caput-medusae*, *Hypochaeris radicata*) as well as several native rush species (*Juncus* spp., *Eleocharis* spp.) dominated the site. A total of 0.33 acres of wetlands were created, significantly lower than the 0.4 acres that were required.

7371- Construct 1st Street Crossing and Long Canyon Development, Glen Lukos Associates, Simi Valley.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
7371	4	Los Angeles	1996	88.48	61.58	78.30	72.50

Glen Lukos Associated developed a 652-unit residential community, open space, and an 8-acre neighborhood park in a 1,850-acre wood ranch in Simi Valley. This project involved the construction of the First-Street crossing and debris basin rural-culvert across the Oak Canyon stream course, and the placement of the development in Long Canyon Oak Canyon stream course. These activities impacted 0.58 acres of waters of the US, including 0.03 acres of permanent wetland impacts, 0.14 acres of temporary and 0.44 acres of permanent impacts to jurisdictional riparian habitat. Long Canyon, a tributary of Oak Canyon, flows west to east through the project property. Prior to these impacts, Long Canyon was an eroded drainage that was vegetated mostly with non-native plant species, except a small wetland near the confluence with Oak Canyon. Prior to these impacts, Oak Canyon was vegetated mostly with dense, undisturbed riparian forest. Dominant vegetation included coast live oak, willows, mulefat, Mexican elderberry, toyon, creeping snowberry, honeysuckle, sycamore, climbing penstemon, and walnut. On-site jurisdictional wetlands supported diverse emergent and submergent vegetation. The lower portion of Oak Canyon, in the northeastern section, was disturbed by livestock

To offset impacts to these jurisdictional waters, the permittee was required to create 0.52 acres of riparian scrub and enhance 0.73 acres of adjacent oak woodland, within the Oak Canyon drainage. The oak woodland mitigation area, measured at 0.776 acres, was not designed to be jurisdictional habitat, thus we did not perform a CRAM evaluation on this part of the mitigation. The riparian scrub mitigation was located immediately adjacent to the existing wetland in Oak Canyon. We measured this mitigation site to be only 0.330 acres, consisting of approximately 30% wetland, 60% riparian waters, and 10% non-waters riparian habitat. We found a dominance of black willow, cottonwoods, mulefat, cattails, nettle, and watercress. The vast majority of this site supported a dense tree canopy and layered vegetation. We did not find non-native plant species in the mitigation area during our site visit. The stream had undercut the banks in some areas and significant wrack was caught among the understory vegetation. Water flowed into the site through an underground culvert at the south of the mitigation area and a concrete drainage at the northern end provided runoff to the site. The site was buffered to the north and east by the oak woodland mitigation area, a riparian corridor to the northwest, and a dirt access road to the west. The southern end of the mitigation area abutted the large concrete culvert.

7385- Agricultural Fill of Seasonal Wetlands, Ryan’s Landing Limited Partnership, Chico

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
7385	5R	Sacramento	1996	95.42	64.54	78.60	80.00

This project entailed improvements to agricultural productivity by filling of drainage swales and seasonal wetlands resulting in impacts to 6 acres of waters of the United States in Chico. It was determined by the Fish and Wildlife Service (USFWS) that 0.11 acres of impacted wetlands served as potential habitat for the listed crustaceans, *Lepidurus packardi* (vernal pool tadpole shrimp) and *Branchinecta lynchi* (vernal pool fairy shrimp). The project initially violated the Clean Water Act resulting in a $50,000 fine being levied by USFWS, which was ultimately paid to the Nature Conservancy. USFWS also required that the applicants purchase 0.22 acres of vernal pool preservation credits and 0.11 acres of vernal pool creation credits. The applicants were also required to create 6 acres of permanently or periodically inundated wetlands. Three different mitigation plans were submitted, the final of which entailed the construction of seasonal marsh habitat at an off-site location southwest of the Chico Municipal Airport.

During our site evaluation, the four constructed wetlands were identified using the consultant's map and the wetlands were delineated using a combination of the topographic basin and the edge of wetland vegetation. Randomized sampling was utilized to select two of the wetlands for evaluation. The wetlands were bordered on three sides by expansive uplands with compacted soils dominated by yellow star thistle and on one side by a tall levee containing Sycamore Creek to the south. A pipe through levee appeared to allow water flows from the creek into the wetland complex; however, at the time of the site visit, all of the constructed marshes were dry. The physical structure of larger wetland was relatively complex with various elevation gradients scarred by ruts and deep cracks. The larger marsh was dominated by the native species *Eleocharis* sp., *Eryngium* sp., and *Eremocarpus setigerus*, while the smaller marsh was dominated by invasives, *Hordeum marinum* and *Lotus corniculatum*. It was determined that the constructed wetlands exceeded acreage requirements. However, at the time of this writing, the applicants had yet to purchase the required vernal pool creation and preservation credits.

7404- McDonald's Restaurant (Old Redwood Highway & Windsor River Road), McDonald's Corporation, Windsor

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
7404	1	San Francisco	1996	100.00	50.82	100.00	N/A

Construction of a McDonald's restaurant filled 0.37 acres of seasonal wetlands on a 0.93 acre parcel at the intersection of Old Redwood Highway and Windsor River Road in the town of Windsor in Sonoma County. The impacted wetlands can best be described as several shallow man-made depressions, swales, and/or ephemeral rainpools. The wetlands had been altered and disturbed over the years by livestock grazing and agricultural activities. Mitigation requirements for the project were satisfied through the purchase of 3.7 shares (equal to 0.37 acres) of seasonal wetlands from the Wikiup Mitigation bank. The Wikiup Mitigation Bank, currently under the jurisdiction of The California Department of Fish and Game (CDFG), consisted of 6 acres of wetlands on a 12-acre parcel. The bank was established in 1995 and lies within the town of Windsor. Residential areas border the site on three sides, while vineyards border it on the fourth side. The bank consists of three distinct, 1 to 2-acre wetland depressions buffered by uplands areas characterized by oak woodland and non-native annual grassland.

A representative of CDFG assisted us in locating the Wikiup Mitigation bank and the individual wetland areas within the bank. A single CRAM evaluation was done for each of the three wetlands, and all three evaluations had similar results. The residential areas and vineyards immediately adjacent to the bank on all sides resulted in low scores for landscape connectivity and buffer width. The depressions were dry at the time of evaluation, which was appropriate for the season. Physical structural had low complexity, due to the absence of potential patch types like unvegetated flats, sediment mounds and islands. *Eleocharis palustris* was the most abundant species in each of the wetland areas followed by the non-native, *Mentha pulegium*. *Cyperus eragrostis* and *Juncus* spp. were also present. Runoff from both the adjacent residential areas and the vineyards was seen as a potential stressor to the wetlands.

7456- Shiloh Commercial Center, Shiloh Partners, Windsor

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
7456	1	San Francisco	1997	99.12	70.28	88.60	88.60

The Shiloh Commercial Center construction project filled 0.73 acres of shallow seasonal wetlands, 0.81 acres of vernal pools / swales, and 0.14 acres riparian thicket on a 34.6 acre site. Most of the adjacent area had already been filled, leveled, and graded in the mid-1970s for a proposed industrial park. The applicants were required to create 1.6 acres of swales / vernal pools and 0.1 acres of riparian thicket and preserve 1.7 acres of swales / vernal pools. The mitigation was implemented off-site on a 14 acre parcel in Sonoma County.

During our field assessment, a map from the project's mitigation plan was used to distinguish the created from the existing vernal pools / swales and to determine the location of the thicket planting. The site was quite large including over 15 individual pools. To evaluate the created pools, the site was divided into three geographical areas, and a pool was randomly selected from each area for sampling. Non-native annual grasses which dominated the expansive upland buffer were threatening to invade the pools. Two goats and a horse were found grazing onsite, presumably to control the spread of the grasses. The pools were dry at the time of the evaluation. The physical structure of the pools was fairly complex with various patch types including soil cracks, mounds, and burrows present. The riparian thicket area was inappropriately located 30 meters outside of the high-water mark of the creek. Plantings included *Acer macrophyla*, *Rosa californica*, and *Crataegus suksdorfii*, and while survivorship rates were high, some individuals appeared stressed. The thicket area was dominated by non-native annual grasses and *Lactuca serriola*. Given the August field visit date, it was impossible to evaluate mitigation performance criteria related to the establishment of the special status vernal pool species, Sebastopol Meadowfoam, which dies in the spring. At the date of assessment, the pools were dominated by various non-natives, including *Mentha pulegium* and *Polypogon monspeliensis*, as well as later blooming species typical of vernal pools, such as *Eryngium armatum*, and *Pogogyne douglasii*. The measured acreage of created wetlands was substantially less than permit requirements.

7497- Reconfigure Duck Ponds, Irvine Ranch Water District, Irvine

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
7497	8	Los Angeles	1997	100.00	77.59	100.00	N/A

The Irvine Ranch Water District reconfigured duck ponds that were previously used for nitrogen removal as part of the Wetlands Water Supply Project. Specifically, they reconfigured twelve existing duck ponds into five larger habitat ponds, which permanently impacted 1.0 acre of woody riparian wetland habitat, 11.60 acres of herbaceous wetland habitat, and 2.0 acres of ruderal wetland habitat. Additionally, 61.50 acres of duck pond were impacted, although this was considered non-jurisdictional habitat. To mitigate for impacts to 14.60 acres of jurisdictional habitat, the permittee was required to create 14.60 acres of jurisdictional habitat including 11.10 acres of wetlands, 2.50 acres of non-streambed open water, and 1.00 acre of riparian habitat.

In total, 14.60 acres were mitigated, with approximately 2.50 acres of wetland, 11.10 acres of open water, 1.00 acre of jurisdictional. The hydrology of the site is maintained by the water district and is intended to simulate seasonal fluctuations. In fact, they raise and lower the pond levels to provide multiple depths of water for various habitat types. Vegetation consisted primarily of black willows, cottonwoods, sycamores, mulefat, sagebrush, bulrush, mugwort, and phacelia. Very few non-native plant species were found at the site. Many animals were also present at the site, including small and large mammals, lizards, fish, ducks, and passerine birds. Because this site is located within the San Joaquin Wildlife Sanctuary, the northwestern and northeastern sides of the mitigation area are buffered by thriving habitat. The southwestern side is bordered by Campus Drive, and the southeastern side by Riparian Way and the San Diego Creek.

7521-Replace Pipelines in Sweetwater River, Sweetwater Authority, Chula Vista

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
7521	9	Los Angeles	1997	100.00	55.14	N/A	75.00

This project involved replacing and lowering two existing pipelines within the Sweetwater River. This project temporarily impacted 0.34 acres of wetland habitat. Prior to these activities, the project area contained a dominance of mature willows, mulefat, evening primrose, ragweed, and hoary nettle with generally little understory vegetation. In addition to its heavy infestation of *Arundo donnax*, the project area was also infested with celery, cocklebur, castor bean, wild radish, curly dock, cheeseweed, plantain, black mustard, and Bermuda grass. To mitigate for impacts to this habitat, the permittee was required to enhance 0.68 acres, including 0.34 acres of wetland and 0.34 acres of riparian habitat. Mitigated included enhancing 0.34 acres of waters of the US onsite at the impact area and 0.34 acres of non-waters of the US offsite in the Sweetwater River Mitigation Area.

The onsite mitigation was 0.34 acres, consisting of 15% wetland, 5% streambed open water, 50% jurisdictional riparian habitat, and 30% non-jurisdictional riparian waters. The onsite mitigation area was vegetated heavily, as it had 135% absolute vegetative cover, and mostly with native plant species. The short-herb stratum covered 30% of the first mitigation site and was dominated by cocklebur (native) and sowthistle. The tall-herb stratum covered 40% of the site and was dominated by sweet white clover and cattails (native). Mulefat dominated the shrub stratum which covered 30% of the site. Arroyo and black willow dominated the tree layer which covered 35% of the site. The buffer was about 100 meters wide, on average, while the buffer at the offsite mitigation area was slightly fewer than 100 meters wide, on average. Organic matter accumulation was abundant and consisted of material ranging in size from fine organic material to coarse, woody debris. This site was bordered to the south by a Kaiser Permanente facility, and to the west, north, and east by Sweetwater River riparian areas. The greater area included Bonita Road, Willow Street, a gold driving range, a gold course, and the Sweetwater River Mitigation Area.

The Sweetwater River Mitigation area was located directly adjacent to the impact site and onsite mitigation, just to the north and west. The offsite enhancement was undertaken in a non-waters riparian area downstream of the impact site by transplanting willows from the impact site. The offsite mitigation area was vegetated mostly by the tree layer which covered 95% of the site and was dominated by narrow-leaf and black willows. The shrub and herb layers covered 20% of the site overall and were dominated by hooker’s evening primrose, sowthistle, mulefat, and narrow-leaf willow. Buffer covered most of their perimeters and was of moderately high quality. Organic matter accumulation at this site was abundant, though slightly more abundant offsite than onsite, and consisted of material ranging in size from fine organic material to coarse, woody debris.

7528- Calton Homes, MLB Windsor Creek Limited Partnership, Windsor

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
7528	1	San Francisco	1997	100.00	60.32	100.00	N/A

Construction of the Windsor Creek subdivision filled 0.5 acres of seasonal wetlands (five winter-ponded depressions) and 0.08 acres of streambed. The impact site was generally characterized by grassland and oak woodland, with scattered seasonal wetlands and vernal pools. Windsor and East Windsor creeks bound the impact site. The applicants were required to construct 0.7 acres of seasonal wetlands at the Sonoma County Airport Consolidated Mitigation Area (SACMA) and plant 60 willows and alders along the creeks. The SACMA, which is adjacent to the airport itself, consists of several acres of depressional wetlands that were used as mitigation for a number of projects. Unlike a mitigation bank, however, the acreage requirements for specific projects are assigned to specific depressions within the SACMA.

The SACMA site itself is a mix of depressional wetlands, non-native grassland and oak woodland. Redwood Creek borders the site on the eastern side. During our field assessment, a map obtained from the consultant who constructed the mitigation area was used to differentiate the wetlands created for this project from wetlands that were created for other projects. The boundary between the wetland depressions and the adjacent uplands was identified based on the presence or absence of wetlands vegetation. A single CRAM assessment was made for the project, which consisted of several distinct depressions. As a whole, the created wetlands at the SACMA site were found to have fair connectivity to aquatic resources and a fairly good buffer. The depressions were dry at the time of evaluation. The hydroperiod for the depressions that corresponded to this particular project was indicative of natural patterns, but the physical structure of the wetlands had very low complexity. Several non-native species (*Taeniatherum caput-medusae*, *Hypochaeris radicata*) as well as several native rush species (*Juncus* spp., *Eleocharis* spp.) dominated the site. A population of *Pogogyne douglasii*, required by the project to be relocated to the mitigation site, was observed. A total of 0.43 acres of wetlands were created, far lower than the 0.7 acres that were required. The plantings of willows and alders along Windsor and East Windsor creeks at the impact site were not evaluated.

7640- Seismic Retrofit Willows Road Bridge, San Diego County Department of Public Works, Alpine

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
7640	9	Los Angeles	1997	100.00	74.06	N/A	91.70

The Willows Road Seismic Retrofit project included the excavation around the columns, placement of steel jackets around existing columns, arc welding, pumping grout, cleaning and painting the steel casing, and back filling to initial contours around the columns. These activities temporarily impacted 0.12 acres of Army Corps jurisdictional waters and 0.66 acres of California Department of Fish and Game jurisdictional waters, including southern riparian scrub and unvegetated stream and bank habitat in Viejas Creek.

To offset these impacts, the permittee was required to recontour the stream to its original condition, remove non-native plant species, and revegetate onsite with willows and native understory seed mix in a 0.12-acre area. The required mitigation acreage was obtained and consisted of approximately 5% wetland, 10% streambed, 45% riparian waters, and 40% non-waters riparian habitat. Although shading from this bridge inhibited plant growth among the bridge piling, the rest of the streambed was heavily vegetated with overlapping layers of both native and non-native plant species. Dominant vegetation in the mitigation area included red willow, coast live oak, Himalayan blackberry, greater periwinkle, nettle, and watercress. We found evidence of heavy use of this site by the homeless. This area of Viejas Creek is a relatively natural stream course with abundant, thriving riparian habitat, and is surrounded by open space and rural housing. Other than the influence of the Willow Street Bridge, this mitigation site had ample natural buffer available.

7646- Oracle Corporation Headquarters Expansion, Oracle Corporation, Redwood City

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
7646	2	San Francisco	1997	150.00	48.39	90.10	90.10

The Oracle Corporation headquarters expansion filled 0.71 acres of seasonal wetlands formed through the subsidence and compaction of existing fill material. Existing vegetation at the impact site consisted mostly of *Salicornia virginica*, *Cotula coronopifolia* and *Polypogon monspeliensis*. The applicants were required to construct 0.8 acres of tidal wetlands and 0.7 acres of seasonal wetlands onsite, adjacent to Belmont Slough and contiguous with the existing tidal wetlands. A buffer area was also required to separate the created wetlands from the corporate office complex.

During our field assessment, a map from the project's mitigation plan was used to distinguish the created wetlands from the existing wetlands and to distinguish the created tidal wetlands from the created seasonal wetlands. A small low berm planted with *Limonium californicum* in particular was used to distinguish the existing tidal wetlands from the created tidal wetlands. A single CRAM assessment was made for each area. At the time of assessment, the tidal area was dry, while the seasonal area was slightly ponded. The results of the assessments of the two areas were very similar. The proximity of the office complex served to lower the overall landscape context assessment. The hydroperiod was characterized by natural patterns, but the overall physical structure was poor. Plantings in the seasonal wetland were dominated by *Salicornia virginica,* but *Limonium californicum* was also present. The tidal wetland had an even higher cover of *Salicornia virginica* than the seasonal, while *Limonium californicum* and *Spartina foliosa* were also present but very low in cover. Non-native species were not present at significant levels. A total of 2.25 acres of wetlands was created, far exceeding the 1.5 acres that was required.

7678-Stevinson Ranch Estates, James J. Stevinson Corporation, Stevinson.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
7678	5F	Sacramento	1997	65.31	64.64	50.00	52.30

This project involved construction of 8 residential lots and related infrastructure on 54 acres near the Stevinson area of Merced County. Approximately 6.0 acres of wetland, including seasonal marsh habitat, were located on the project site. These wetlands were depressions of somewhat rolling range. Prior to these impacts, much of the area was dry and dominated by saltgrass, ripgut grass, Mexican rush, yerba mansa, and creeping wildrye. As a result of this residential development, permanent impacts totaling 1.90 acres affected 0.74 acres of wetland waters of the US and 1.22 acres of streambed non-wetland waters of the US. These impacts were mitigated by creating 1.92 acres of upland non-waters of the US. There were two mitigation sites, both of which were complexes of vernal pools with short-duration hydrologic regimes located near the golf course. One was located near a turkey-farm area to the northeast of the residential development and the other was located just west and to the south of the residential development. On average, buffer surrounded almost the entire perimeter of the sites, was close to 100 meters in width, and of moderately high quality.

Vegetative coverage at the first mitigation complex was 100%. Dominant plants were saltgrass, telegraph weed, fitch's spikeweed, rush, and an unidentified grass. All but the grasses were native plant species. Vegetative cover at the second complex of pools was 85-90%. Dominant plants at the second complex were fitch's spikeweed, tumbleweed, saltgrass, salt heliotrope, and a rush. Organic matter accumulation at the first mitigation complex was abundant and ranged in size from fine organic material to coarse, woody debris. At the second mitigation complex, organic matter accumulation was moderately abundant and ranged in size from fine organic material to coarse, woody debris. While this created vernal pool area did have mild topographic complexity, they did not possess significant mima mounds. The general surrounding area included the golf course, the residential development, a turkey farm, open space, and State Highway 140.

7827- Road Development at Landfill, Solano Garbage Company, Inc. and Potrero Hills Landfill, Inc., Fairfield

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
7827	2	San Francisco	1997	100.00	49.86	82.50	82.50

Solano Garbage Company applied for after-the-fact authorization of 1.4 acres of wetland fill associated with the construction of Potrero Hills Lane, as well as the retention of 0.5 acres of wetland fill for an access road and emergency turnout. As mitigation for these impacts, it was required that 7.7 acres of seasonal wetlands be created in the eastern portion of the site, as well as 1.9 acres of tidal salt marsh in the western area of the site. The seasonal wetland was designed to provide ponding between 30 and 90 days during a normal year, with a maximum winter salinity of less than 0.3 ppt for a minimum of 30 consecutive days and less than 0.6ppt for the period of mid-December through March. This area already supported Contra Costa Goldfields, and the mitigation plan called for an increasing trend in terms of distribution and population size. In addition, the plan called for the continued presence and likely reproduction of Conservancy fairy shrimp, vernal pool fairy shrimp, and tadpole shrimp in the seasonal wetland and existing drainage ditch

At the site, maps and information from the site contact was used to identify the project location and to identify existing from restored wetlands. Vegetation differences were used to identify the wetland/upland boundary. The central part of the area includes a tidal wetland, with restored seasonal wetlands on the east side of Potrero Hills Lane. Some of the existing wetland at the site had been filled with cement, and this material was removed as part of the restoration. A large salt marsh preserve was adjacent to the site and connected via a channel, although some siltation in the channel has reduced tidal flows to the site. Contra Costa Goldfields were present at the site although, during the site visit only dry remains of plants were found. We could not evaluate the presence of the rare invertebrates given the timing of our sampling. The overall buffer condition for this project was moderate, with a road dissecting the buffer area. Tidal hydrology at the site was restricted by the channel and siltation that has occurred. The seasonal wetland scored higher in terms of hydrology. Both the tidal and seasonal restored wetlands scored poorly for physical and biotic structure, with few patch types or other heterogeneity, and little plant diversity. The tidal site had no non-natives, while the seasonal site had two non-native dominants, *Polypogon monspeliensis* and *Hordeum murinum*. Based on the GPS survey of the site, the restored acreage met the permit requirements.

7883- Brittany Hills Detention Basin 57, Contra Costa County DPW, Martinez

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
7883	2	San Francisco	1997	101.96	54.29	65.80	67.90

Mitigation for the Brittany Hills detention basin project occurred at two locations: (1) Basin 57 on Morello Creek, a tributary to Pacheco Creek just to the northeast of Brittany Hills development site; and (2) along Morello Creek just upstream of the detention basin. Morello Creek is on the southeast edge of Martinez, roughly 1.5 miles west of Interstate 680 and 1 mile north of Highway 4, near Morello Avenue. Viano Vineyards border the site to the south and Atchison-Topeka-Santa Fe railroad to the north. The development project created a new, smaller outlet structure from the basin to reduce flood flows downstream. The project also created a new creek through the basin to connect the existing creek to the new outlet. A portion of the channel downstream was riprapped from the new basin outlet. A total of 0.29 acres of seasonal wetlands was filled for this project. Mitigation and wetland enhancement consisted of creating 0.43 acres of new seasonal habitat, 0.08 acres of jurisdictional riparian habitat and replanting a 220 foot riprap creek channel. The enhancement occurred within the 3.5-acre detention basin. According to the monitoring report a chemical spill from an undisclosed place, such as the adjacent the vineyards, railroads, or residential construction, occurred in the area around August 2000. *Typha* sp. was able to recover yet almost all trees and shrubs in the north side of the mitigation area died. Prior to the spill, the woodland species had been exceeding the performance standards (tree height of 20 feet). The trees and shrubs were replaced but would not meet the final performance criteria based on their current condition.

The boundaries for the mitigation site were determined using maps, pictures and monitoring reports from the project files, as well as the extent of wetland vegetation in the field. The edge of the riparian mitigation was designated by a newly created split in the creek. We identified the riparian assessment area by following the new creek to the culvert downstream. No willow plantings were found in the downstream location, and there was no evidence of any plantings. In the riparian area the absolute percent cover of trees was 40% with two dominants: *Salix* sp. (85%) and *Populus deltoides* (15%). Riverine hydrology was established throughout the site, and it remained wet even in late June. Although species such as *Eleocharis macrostachya*, *Distichlis spicata*, *Juncus balticus* and *Leymus triticoides* were part of the seasonal wetland planting pallet, this area was dominated by *Typha* sp. The site received a good CRAM score for non-native plants but a low score for native plant species richness, as it lacked native plant diversity. Even thought there was a significant buffer width, the buffer was dominated by non-native invasive species. In our evaluation the obtained wetland acreage was 0.37 acres of seasonal wetland and 0.15 acres of riparian habitat. The overall required acreage for the site was 0.51. On the whole, the site was in compliance with the overall requirement, yet not by habitat type.

7902- Arroyo de la Laguna Dredging, Zone 7 Water Agency, Pleasanton

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
7902	2	San Francisco	1997	100.00	N/A	100.00	100.00

The Zone 7 Water Agency in Alameda County removed approximately 24,000 cubic yards of accumulated silt from about 1700 feet of Arroyo de la Laguna in the city of Pleasanton, as part of a flood control project. Prior to this activity, the reach was last desilted in 1972. The project became an urgent issue after a heavy storm in February 1998, in which one of the maintenance roads adjacent to the Arroyo was covered by flood water. A residential subdivision on the other side of the maintenance road, at almost the same grade, was also at risk of potential flooding. The channel maintenance desilting project temporarily impacted 5.3 acres of wetland vegetation found in the river channel including native species, such as *Typha latifolia* and *Scirpus acutus*. The mitigation requirement was to plant native trees along the western side of the channel such that the trees would provide afternoon shading of the channel, with a survival rate of 70% after the fifth year monitoring; however, the exact tree species to be planted was not mentioned in any permits.

This project site was determined to be a compliance only file because mitigation requirements were to plant trees and not to restore or create wetland habitat. During the field assessment, photo-documentation of the tree plantings from annual monitoring reports was utilized to locate and evaluate riparian tree plantings. A total of 19 Coast Live Oak (*Quercus agrifolia*) and 22 Moraine Ash trees (*Fraxinus holotricha*) was counted. All plantings showed to be healthy and vigorous. After our field assessment and fifth year monitoring report review, we determined that the applicant did comply with planting and survival rates. However, it is important to note that because mitigation was conducted at least 200-300 feet upslope, along a graded road, and approximately 30 feet from Highway 680, the chances of the riparian planting receiving any influence from the channel appeared to be slim. If the intended purpose of the plantings was to provide channel shade, it is highly unlikely due to the distance from the channel.

7932- Medical Center Expansion, Mount Shasta Medical Center, Shasta City

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
7932	5R	Sacramento	1997	86.07	72.47	90.70	96.20

The expansion of the Mount Shasta Medical Center impacted 0.94 acres of wetlands and drainage channels. The medical facility is located at the 900 block of Pine Street in Mount Shasta City in Siskiyou County. The site drains to unnamed tributaries of Cold Creek. According to the mitigation plan, initial construction of the hospital facility began in the 1960’s and has involved extensive excavation, filling and draining of wetlands throughout the years. The entire project site was originally part of a large wetland complex, which extended from northeast of the project site and southwest to Cold Creek. Wet meadows, forested wetlands and man-made watercourses all exist within the site, totaling 10.1 acres of wetlands. Impacts to wetlands were mitigated through onsite wetlands creation, restoration and type conversion. Specifically, 0.84 acres of wet meadow were restored, 2.14 acres of new wetlands were created, and 0.36 acres of wetlands were converted to ponds. Meadow restoration involved the planting of native vegetation and the conversion of existing irrigation ditches to meandering streams, combined with the periodic removal of invasive species like teasel. Wetlands creation involved the removal of fill material and the re-contouring the soil surface to within 18 inches of the water table. The 1.24-acre Kay parcel comprised 58% of all wetlands creation. Otherwise, mitigation areas were generally small and spread throughout the site. Target plant species in both wetlands restoration and creation areas included species such *Carex* sp., *Juncus* sp., *Cyperus* sp., and *Scirpus* sp.

Using the map included in the project mitigation plan, we categorized mitigation wetlands as being associated with ponded areas or stream courses. Based on this categorization, we randomly selected one pond area and one stream course area for evaluation. We also decided to perform an additional CRAM evaluation for the Kay parcel due to its disproportionate size. For the randomly chosen pond area (Pond #1), assessment area boundaries were easily determined based on the obvious depression. For the randomly chosen stream-associated wetland (R-5), significant meanders in the stream course served as upstream and downstream boundaries. Wetlands at this site were determined to have good connectivity at the landscape level, since they were integrated within a larger wetland complex. The buffer suffered from a prevalence of invasive species and the close proximity of the medical center complex. However, in all three cases, the wetlands were free of significant populations of invasive species. There were no signs of an altered or unnatural hydroperiod. The water source for the wetland complex was determined to be mostly natural with limited alteration or contamination since the area exists at the base of Mount Shasta. Organic matter content was also very good at all three assessment areas. Most of the expected physical patch types were present including swales, boulders and variegated shorelines. The pond area was dominated by *Carex* spp., *Juncus* spp., *Typha latifolia* and *Salix lasiandra*, while *Cyperus* sp., *Birch* sp. and *Alder* sp dominated the stream area. *Typha latifolia, Juncus* spp. and *Salix* spp dominated the Kay parcel.

7936-North Hills Debris Basin Drainage Channel Project, Valencia Company, Santa Clarita

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
7936	4	Los Angeles	1997	100.00	61.70	100.00	83.30

This project involved installing a 90-inch-diameter reinforced concrete pipeline along an existing drainage and filling the drainage with 125,000 cubic yards of soil to create lots for a residential development. Permanent impacts to 0.48 of jurisdictional riparian habitat were offset by enhancement of 0.78 acres of riparian non-wetland waters of the US along the eastern bank of San Francisquito Creek. Mitigation of the degraded riparian area was to include removal of arundo and plantings of willow and cottonwood trees. The mitigation site was located about 29,800 feet upstream from the confluence of the Santa Clara River.

The mitigation site was vegetated sparsely as 50% of the site was covered by vegetation and it lacked both a tall-herb and shrub layer. The short-herb layer, comprising 25% of the vegetative cover at the site, was dominated by goldenrod and two unidentified, dead grasses. The other 25% of vegetative cover was provided by cottonwood trees that were planted as part of the mitigation. Little organic matter, consisting mostly of dead grasses and other short herbs, was accumulated at the site.

The stream channel of San Francisquito Creek was wide, soft-bottom, and surrounded on both sides by housing developments. The mitigation site was bordered on the eastern edge by a bike path and a landscaped area abutting a new housing development. On the western edge, it was bordered by the active stream channel and a couple hundred feet of floodplain also bordered by an urban area. The site was buffered on all sides by moderately high-quality habitat that was less than 30 meters wide on average.

7942-Bridge Replacement at the Tijuana River, City of San Diego, San Diego

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
7942	9	Los Angeles	1997	100.00	70.16	N/A	N/A

This project involved replacing a temporary one-lane bridge with a permanent, two-lane bridge and placing 4,300 square feet of rip-rap for the bridge abutments and slope protection along the Tijuana River in San Diego. These construction activities permanently impacted 0.50 acres of southern willow scrub and temporarily impacted 0.10 acres of southern willow scrub, 0.01 acres of freshwater marsh, and 0.17 acres of streambed habitat. To mitigate for impacts to these jurisdictional habitats, the permittee was required to create and enhance 2.85 acres of riparian habitat. Half of the mitigation was done offsite in a mitigation bank and half was done onsite atop buried rip-rap along the banks of the Tijuana River upstream and downstream of the new bridge. The majority of the mitigation involved enhancement (2.25 acres) and the rest involved creation (0.60 acres).

The onsite mitigation site was 0.60 acres, consisting of 30% jurisdictional riparian habitat and 70% non-jurisdictional riparian habitat. The shrub and tree layers comprised the vegetative cover here. The shrub layer, dominated by mulefat and coyote bush, covered 100% of the site. The tree layer, dominated by cottonwood, covered 20% of the site. Buffer surrounded most of the site, and was about 60 meters wide on average, and was of moderately low quality. The surrounding area included the Tijuana River riparian corridor, Hollister Road, private residences, and a horse farm.

The offsite mitigation bank area was also 0.60 acres and consisted of 10% wetlands and 90% non-jurisdictional riparian habitat. Within the mitigation bank, the exact location of the mitigation site for this project could not be determined. Thus, we performed and averaged two CRAM evaluations within this bank. The first site was vegetated densely by shrubs and trees. The shrub layer was dominated by mulefat and covered 80% of the site. Black and narrow-leaf willow dominated the tree layer which covered 60% of the site. The short-herbs and shrubs provided most of the vegetative cover at the second site. The short-herb layer, dominated by mustard, rabbitfoot grass, and thistle, covered 45% of the site. Sweet fennel and hooker’s evening primrose dominated the tall-herb stratum which covered 5% of the site. The shrub stratum, which covered 80% of the site, was dominated by mulefat and sagebrush. The tree layer was dominated by arroyo willow and covered 20% of the site. Organic matter accumulation at all the sites consisted of moderate amounts of material ranging in size from fine organic to coarse-woody. Buffer at the sites sampled in the mitigation bank surrounded most of the mitigation site and was extensive (over 100 meters wide on average), but of moderate quality.

8044- Roseville Railyard, Union Pacific Railroad, Roseville

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
8044	5S	Sacramento	1997	100.00	64.39	N/A	N/A

The Union Pacific Roseville Yard reconstruction project was located in Placer County along Vernon Street between Roseville Road and Douglas Boulevard. The project proposed to construct two new bridges and office buildings, to reconstruct an existing bridge, and to construct about 80 miles of tracks and 250 switches. As a result, 2.2 acres of wetlands were filled. Existing wetlands consisted of upland swales, drainage ditches and channels established as a result of surface runoff from the railyard. Wetlands onsite were small and isolated and were assessed to have poor functional value. Purchases were made at Wildlands Sheridan Mitigation Bank for 0.390 acres of seasonal emergent marsh habitat, 0.980 acres of perennial emergent marsh habitat, 0.040 acres of vernal pool creation habitat, and 1.150 acres of riparian scrub/woodland habitat.

Wildlands Sheridan Mitigation Bank is located north of Roseville and was established in 1994. Although there are many habitat types found within the bank, we assessed three: riparian, depressional and vernal pools. The site was created in four phases. In the first three phases there was a total construction of 28.78 acres of vernal pools, 24.46 riparian acres, 4.91 seasonal wetland acres, 89.81 acres of emergent marsh, and 45.99 acres of perennial marsh. Phase four created 28.06 acres of vernal pools, 7.22 acres of riparian habitat, and 77.73 acres of seasonal, emergent and perennial marsh. Phase four was not completed at the time of our assessment, and acreage had not been approved for credits to be purchased. Therefore, we focused our evaluation on phases one to three. We were joined in the field by Riley Swift, president and owner of Restoration Resources, which manages Sheridan Mitigation Bank, and Valerie Layne, Senior Conservation Biologist for Wildlands Inc. The area is surrounded by orchards; however, they advised us that there has been no evidence of pesticides or fertilizers impacts from these adjacent orchards. The hydrology of the site is managed to maintain target wetness levels for each wetland area. The main distribution of water for the site is synchronized with a back-up well receiving runoff from adjacent irrigation systems and recycled waters within the bank. The hydrology has been designed for gravity flow from ditches in the easternmost section of the site to other areas throughout the bank. They use overflow weirs where areas need to be inundated for longer periods of time. Mr. Swift also mentioned that skunks, voles, beavers, jack rabbits and coyotes are the main disturbances to the mitigation bank. During our assessment we found wildlife and evidence of wildlife to be abundant.

The riparian area was created by redirecting water from the adjacent agricultural fields into the mitigation bank. The creek receives water from overflow weirs and is regulated to be a perennial, low-gradient and low-flowing stream. The riparian corridor is entirely man-made with artificial irrigation and is completely straight. We selected a representative section of the corridor as our assessment area. We used the wrack line and the ordinary high water mark which included the drip line of the vegetation and rooted trees to delineate the streamside area. Overall the riparian corridor scored well for the CRAM assessment. Buffer and landscape context scores were high. The riparian area also scored well for hydroperiod, but did worse for water source. Within the physical structure attribute, the area scored well, except for physical patch richness. Vegetation cover within the area was high, with 65% within the tree stratum. *Populus fremontii* and *Salix* sp. dominated the area, and *Acer negundo* was also prominent. *Baccharis salicifolia* dominated the shrub stratum, *Scirpus californicus* was dominant in the tall herb stratum, and *Avena* sp. was dominant in the short herb stratum.

The depressional areas, or as Wildlands refers to the areas, seasonal wetlands, were highly variable in terms of levels of inundation. We randomly selected two assessment areas that included an isolated ponded area (area 17) and a muddy low land (area 1). The freshwater marsh at area 17 appeared to have an altered hydrologic regime and remained inundated for a long-duration of time. Area 1 had saturated soils but no surface water. Area 17 was surrounded by open water, other wetlands and bordered by a riparian area. The CRAM scores for these areas were similar, except that the second site had slightly higher scores for physical and biotic patch richness, vertical biotic structure, and native plant species richness. The short herb stratum dominant species for both sites were *Paspalum dilatatum* and *Eleocharis macrostachya*. Tall herb stratum dominants were *Scirpus californicus* and *Typha angustifolia*. *Salix* sp. and *Populus deltoides* were only found in area 1.

To evaluate the created vernal pools we sampled individual pools and pool clusters. We randomly selected the clusters based on age of creation, then on location within the bank. The three assessment areas all had distinct boundaries based on grading and vegetation. We choose area 18 which encompasses 5.3 acres of vernal pools, as well as area 12 and area 6. The entire area had been inoculated with collections from neighboring vernal pools to assure the establishment of native vernal pool species. The pools were dry at the time of the evaluation. The physical structure of the pools was fairly complex with various patch types present, including soil cracks, mounds, and burrows. According to Mr. Swift, the area is mowed regularly to alleviate problems with invasive non-natives, especially star thistle. All three areas that we assessed received the same CRAM scores for three out of four attributes. There was slight variation among the areas for biotic structure characteristics, mainly due to plant species richness, interspersion, and zonation. Native species found in the pools were *Eryngium vaseyi, Eleocharis macrostachya, Hemizonia* sp., and *Psilocarpus brevissimus.* The dominant species for all pools were native, yet there were few species present. In addition, there were some unidentifiable species, mainly grasses, in the pools due to the time of our assessment.

8061-Develop Towne Center, Vestar Development Company, San Diego

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
8061	9	Los Angeles	1997	67.45	72.46	N/A	87.90

This project involves the construction of the mixed commercial use Rancho San Diego Towne Center and roadway improvement to the intersection of Campo Road and Jamacha Road. This project permanently impacted 1.74 acres of riparian waters, 0.14 acres of wetland, and 0.30 acres of unvegetated channel along Campo Creek, as well as temporarily impacted 0.16 acres of riparian waters and 0.11 acres of wetland. To offset these impacts to jurisdictional waters, the permittee was required to create 5.96 acres of riparian habitat on-site through the removal of non-native plant species and revegetation of an old horse area.

This mitigation area was located to the southeast of the Rancho San Diego Towne Center, along the margins of the active Sweetwater River floodplain. The mitigation area was 4.02 acres, which was short of the 5.96-acre requirement. The extension of Campo Creek though the mitigation site was not included in this measurement. The mitigation site consisted of 20% wetland, 40% riparian waters, and 40% non-waters riparian. Prior to implementation, the mitigation area was used as an equestrian trail and consisted of riparian trees, bare areas, and non-native species. During our visit, we found the shrub and short herb layers were the most prominent, while trees only covered 20% of the site. Vegetation in the site consisted primarily of black willow, narrow leaf willow, arroyo willow, arrow weed, mulefat, mugwort, Mexican rush, and rabbits root grass. Very few non-native species were found at this site. Hydrology at the site is supported by the Sweetwater River watershed and runoff from the commercial development. The site was fairly flat with a mild slope to the south. Moderately disturbed habitat buffer was present to the north of the mitigation area and fairly unmodified riparian habitat to the west, south and east. Future mitigation areas border to the northeast and west of this site.

8125- Cirby-Linda-Dry Creek Flood Project, City of Roseville, Roseville

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
8125	5S	Sacramento	1997	100.00	59.65	N/A	93.20

The City of Roseville, for the purpose of flood control, modified areas upstream from Cirby-Linda Creek confluence, terminating at Linda Creek, 300 feet upstream from Old Auburn Road. Additional modifications to a portion of Cirby Creek from the Cirby-Linda Creek confluence to Sunrise Avenue were also implemented. The project involved the removal of scattered riparian scrub, riparian oak woodland, and freshwater marsh habitat. Out of the approximately 12 acres of wetlands within the project area, 0.84 acres of jurisdictional wetlands were disturbed by the project, including 0.61 acres of temporary impacts to open waters, 0.19 acres permanent impact to freshwater marsh habitat and 0.04 acres permanent impact to riparian scrub and oak woodland. Mitigation requirements for impacts were to restore 4.5 acres of freshwater marsh habitat and 0.25 acres of riparian scrub. Temporary impacts to open water were to be restored in place after the completion of the flood-control project.

During our field assessment, we utilized maps from the mitigation plan to identify two mitigation areas along Cirby-Linda Creek. The first wetland was located adjacent to Sunrise Avenue. The entire freshwater marsh was dominated by alien grasses and shrubs. The only dominant native species present was *Typha latifolia*, and it was in healthy condition. Riparian areas adjacent to the freshwater marsh were planted with three oak species and two willow species. All tree species were healthy and vigorous. However, the mitigation site scored poorly for native plant richness within the assessment area along the stream, and for percent invasive species present at the site. The overall CRAM score for this site was sub-optimal.

The second wetland mitigation area was located adjacent to Champion Oaks Drive. The site was very similar to the first wetland we evaluated with CRAM. The only difference was in the dominant native species present at the site which were *Quercus wislizenii* and *Carex* sp. CRAM scores were predominantly the same. After evaluating the acreages for the mitigation sites, we concluded that the permitee complied with acreage requirements of 4.5 acres freshwater marsh habitat and 0.25 acres riparian scrub.

8156&8159- Cannon Road Reach 1, City of Carlsbad, Carlsbad

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
8156&8159	9	Los Angeles	1997	112.93	68.14	N/A	98.10

This project involved the extension of Cannon Road in Carlsbad and was divided into two reaches during the permitting process. The 401 permit selected was for Reach 1 but the other401 permit for Reach 2 was included in our assessment because both the Corps and Fish and Game had incorporated both reaches into single respective permits and it was impossible to distinguish the mitigation for the two 401 permits.

Reach 1 started at approximately Car Country Drive and ended at the current Faraday Avenue. This reach crossed the Agua Hediona Lagoon mesa and the Macario Canyon near its confluence with the lagoon. Reach 2 started where Reach 1 ended at Faraday Avenue and continued to the El Camino Real, crossing the Agua Hedionda Creek. To extend Cannon Road, bridges had to be constructed over Macario Canyon and Agua Hedionda Creek. Prior to the construction of these bridges, southern willow scrub, including arroyo willow, black willow, and mulefat, occurred along these waterways. In addition, brackish marsh habitat also occurred in the project area, which supported picklweed, brassbuttons, sedge, rush, cattail, and salt-grass. The location of the Agua Hedionda Creek where the bridge was built was open water supporting only submergent and/or floating vegetation. To construct these bridges, a total of 3.32 acres of willow riparian scrub, brackish marsh, and open water were impacted. Specifically, 3.07 acres of willow riparian scrub were impacted, including 2.39 acres of permanent impacts and 0.68 acres of temporary; 0.11 acres of brackish marsh were permanently impacted; and 0.14 acres of open water habitat were permanently impacted. To mitigate for impacts to these habitats, 6.34 acres of wetland, streambed, and riparian habitat were required to be created and/or enhanced. To accomplish this mitigation, 4 main areas were established, including area A, C, D, and the Macario Canyon Bridge mitigation area. In addition, a 28-acre pampas grass removal area was established to the southeast of the installed Macario Canyon Bridge.

Mitigation area A consisted of northern and southern wetland creation sites, as well as an additional enhancement site. These sites were located to the east of the Macario Canyon Bridge and were situated in a northwest to southeast direction. The additional mitigation enhancement area was located adjacent to the southern mitigation site, on its northeastern edge. This additional area was a substitute for an Area B that was originally planned to be located just to the east of the new Cannon Road Extension and south of the El Camino Real. The north and south sites totaled 3.05 acres. The northern site was approximately 20% wetland and 80% non-jurisdictional willow scrub habitat. The southern site was 75% wetland and 25% non-jurisdictional riparian habitat. We performed low-gradient riverine CRAM analysis on the north and south site separately, then averaged their scores. The dominant plant species found in these sites were black willow, arroyo willow, mulefat, cattails, fennel, mugwort, and spike rush. In general the vegetation was more thick and overlapping in the northern site, compared to the southern site. Within the southern site the western part had thicker vegetation, especially near the stream, while the southeastern section was more open and singly layered with spike rush and shrubs. The additional enhancement site was 0.25 acres of non-jurisdictional riparian habitat dominated by mulefat. Irrigation was in place throughout these three mitigation areas. Buffers were also established to the northeast of these areas. These buffers consisted mainly of black mustard and fennel. In general, these mitigation areas were surrounded by disturbed open space habitat that is currently undergoing modifications to become a golf course.

Mitigation area C was located to the west of the new Cannon Road extension and just south of the El Camino Real. It consisted of a marsh and a riparian restoration mitigation area in a topographic low between Crestview Drive, El Camino Real, and Cannon Road. The marsh was 0.43 acres of wetland habitat, dominated by alkali sea health, cattails, pickle weed, watercress, and sedge. This site was very open with only low growing vegetation and cattail stands. A few tall snags were present in the site. Irrigation lines were in place throughout the marsh. The riparian area was 1.02 acres, containing approximately 50% wetlands and 50% jurisdictional riparian habitat. The majority of this site was a cattail stand. This site was dominated by arroyo willow, mulefat, cattails, and watercress. Non-native plants, such as fennel, castor bean, and black mustard were present at this site. The riparian mitigation area was adjacent to a riparian flood plain. Both sites were amply buffered by other wetland and riparian habitats, although these buffers could not be very wide between the suburban streets.

Mitigation area D was the western most site, located at the end of Kelly Ranch Road, along Park Drive. This site consisted of a salt marsh and a riparian restoration mitigation area. The salt marsh was 0.34 acres of wetland habitat, dominated by arroyo willow, alkali sea heath, spikerush, and pickleweed. This site was very open with only low growing vegetation.

The riparian area was 0.20 acres, containing approximately 60% wetlands and 40% jurisdictional riparian habitat. This site had thicker vegetation, with more layering than the marsh section. It was dominated by arroyo willow, black willow, narrow leaf willow, coast live oak, mulefat, alkali sea heath, coyote bush, bulrushes, pickleweed, and spike rush. Both sites were buffered by other wetland and riparian habitats, as well as by Park Drive to the north. A small park with a riparian corridor was located directly to the east, and a recreational park to the north of these mitigation areas. Residential developments were throughout the greater areas to the east, north, and west. The southern end of the mitigation site adjoined the greater Agua Hedionda Lagoon system.

The Macario Canyon Bridge mitigation area was located beneath and adjacent to the Macario Canyon Bridge. This site consisted of the compensatory enhancement mitigation for the Macario Canyon Bridge, as well as the revegetated access road. The main bridge mitigation area was 1.32 acres, consisting of 35% wetland, 5% streambed open water, and 60% non-waters riparian habitat. The dominant plant species were black willow, arroyo willow, mulefat, coyote bush, cattails, spike rush, ragweed, yerba mansa, and salt marsh fleabane. The revegetated access road was 0.55 acres, consisting of 40% wetlands, 10% streambed open water, 20% riparian waters, and 30% non-waters riparian habitat. The site was dominated by sycamore, arroyo willow, cottonwood, mulefat, blackberry, bulrush, and mugwort. These sites received flows from the Macario Canyon drainage and the Agua Hedionda Lagoon watershed. Although, there were patches of overlapping vegetation, much of this area was open and supported single vegetation layers. The revegetated access road was much more heavily vegetated than the main bridge mitigation site. These mitigation areas were surrounded and buffered by other wetland and riparian habitats, with minor disruption caused by the Macario Canyon Bridge. The general area supported a residential development to the east, agricultural land to the northwest, disturbed open space to the south and west, and the Agua Hedionda Lagoon to the north and west.

8177- Silverado Creek Subdivision, The O'Brien Group, Napa

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
8177	2	San Francisco	1997	221.43	65.35	92.50	92.50

The O'Brien Group proposed impact to 0.041 acres of perennial wetlands as part of the Silverado Creek residential subdivision in Napa. The onsite wetlands included cattails, willows, ricegrass, and smartweed. As part of the permit review, there was an evaluation of the site for California red-legged frogs; however, it was determined that no frogs were present at the site. The proposed mitigation for the site included the creation of at least 0.08 acres of seasonal wetlands, as well as the improvement of the adjacent upland area that serves as a wildlife corridor, and the planting of a 25-foot wide buffer strip along Silverado Creek with riparian and upland vegetation. It was proposed that the seasonal mitigation wetland be supported by direct precipitation and local water, and some soil modifications were implemented to enhance ponding of water at the site. Non-native Himalayan blackberry was removed from the mitigation area prior to planting with native wetland grasses and sedges.

The mitigation area was identified based on maps from the mitigation plan as well as onsite vegetation; it is between Silverado Creek and Salvador Channel, with riparian vegetation from these areas directly adjacent to the restored depressional/seasonal wetland. CRAM scores were recorded for both the despressional wetland and the riverine site. This project scored moderately high for buffer conditions, with some areas adjacent to native vegetation and others adjacent to pedestrian paths and residential areas. The site also did well in terms of hydrology, with little indication of artificial inputs. The score for physical structure was low-moderate, while scores for biotic metrics were highly variable, ranging from any A+ (depressional site, percent invasive species) to a D (riverine site, vertical biotic structure). Dominant species at the site in order of abundance included: *Eleocharis* sp. (native), *Lolium multiflorum* (non-native), *Hordeum brachyantherum* (native), *Juncus* sp. (native), and *Picris echioides* (non-native). Based on the GPS polygons from this site, it was determined that this project exceeded the required mitigation acreage.

8185- Fairbanks Highlands Project Develop Residences, Taylor Woodrow Homes, San Diego.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
8185	9	Los Angeles	1997	92.79	75.60	N/A	N/A

This project involved the construction of 93 single-family homes on approximately 386 acres within the Future Urbanizing Area of San Diego and included off-site road improvements and sewer and water alignments. The construction of Carmel Valley Road and the sewer/water line connection permanently impacted 0.22 acres of southern willow scrub and 0.09 acres of mulefat scrub. To mitigate for these impacts, the permittee was required to create or restore 1.11 acres of riparian habitat, including southern willow scrub and mulefat habitats. Two main mitigation areas were established to the east of the residential development and north of Carmel Valley Road. The mitigation site was adjacent to a freshwater pond that appeared to have a long-duration hydrologic regime, and was surrounded by extensive, high-quality buffer.

The first mitigation site was located in mulefat-scrub habitat. This site was 0.92 acres, consisting of 30% wetland, 40% riparian waters 20% non-waters riparian, and 10% upland habitat. The short-herb stratum covered 10% of the site and was dominated by mugwort and hooker's evening primrose. The tall-herb layer was dominated by hooker's evening primrose and covered 20% of the site. The shrub layer was dominated by mulefat and covered 40% of the site. The tree layer covered 40% of the site and was dominated by black, arroyo, and red willows.

The second mitigation site was located in willow-riparian habitat. It was 0.71 acres, consisting of 10% riparian waters, 70% non-waters riparian habitat, and 20% upland habitat. Like the first mitigation site, the short-herb layer was dominated by hooker's evening primrose and covered 10% of the site. Organic matter accumulation at both mitigation sites was abundant and ranged in size from fine organic material to coarse, woody debris. Hooker's evening primrose dominated the tall-herb layer which covered 40% of the site. The shrub stratum covered 30% of the site and was dominated by mulefat. The tree layer covered 40% of the site and was dominated by black and arroyo willows. Because of uncertainties regarding the exact location of this site and whether the site was modified by subsequent activities (extensive restoration activities are occurring in the vicinity of this site), the CRAM evaluation for this second mitigation site was excluded from our analyses.

8202- Bishops Rehabilitation Center, Western Care Construction, Bishop.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
8202	6V	Los Angeles	1997	35.11	56.95	92.90	N/A

This project involved the construction of the Bishop Rehabilitation Care Center on a 2.45 acre project site owned by the Northern Inyo County Local Hospital District. Prior to these construction activities, this land was used as pasture for livestock and was predominantly non-native grasses. This site also contained a total of 0.72 acres of Montane Freshwater Marsh and Modoc-Great Basin Cottonwood-Willow Riparian Forest. To construct this facility and associated parking lot, 0.28 acres of these wetlands were permanently impacted, while the remaining 0.44 acres of unimpacted on-site wetlands were degraded. To mitigate for these wetland impacts the permittee was required to enhance the remaining 0.44 acres of on-site wetlands, as well as create approximately 0.50 acres off-site wetland acreage at Fish Slough.

The on-site enhancement involved non-native plant removal, revegetation with wetland plant species, and removal of dredged stream channel material from the stream channel bank. During our site visit we found very few non-native plant species present at the mitigation site, with the exception of a small amount of giant reed. Dominant plants included cottonwoods, red willow, arroyo willow, Californian rose, red alder, bulrush, and grasses. Plantings were fairly young and uniform in age. The mitigation area was determined to be 0.33 acres, which did not meet the required 0.44 acres. A large propane tank had been installed within an area that was supposed to be part of the mitigation area. This obtained acreage was approximately 15% wetland, 5% streambed open water, 55% riparian waters, 20% non-waters riparian, and 5% upland. The site was bordered by the rehabilitation center and its parking lot to the south, parking lots and commercial buildings to the east, and degraded wetland and ruderal habitat to the north and west.

Before we visited the offsite mitigation at Fish Slough we visited the local Department of Fish and Game office, where we received confirmation that this off-site mitigation was paid for, but the actual mitigation has not been implemented yet. Therefore, we were not able to functionally assess this off-site mitigation.

8215- Construct Penitentiary on Castle Air Force Base Facility, US Department of Justice- Federal Bureau of Prisons, Atwater.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
8215	5F	Sacramento	1997	100.00	65.09	100.00	N/A

This project involved construction of a federal prison on the closed Castle Air Force Base in Atwater. This prison was constructed on the eastern portion of the base, where 1.84 acres of vernal pool, wetland habitat was permanently filled. To mitigate for these impacts, the permittee was required to create 2.50 acres of vernal pool habitat in a nearby open space, also on the base. This mitigation area was a large complex of created vernal pools, existing vernal pools, swales, and surrounding uplands, all contained and surrounded within tall fences. The obtained 2.50 acres of mitigation was wetland waters of the US. The mitigation for the penitentiary impacts consisted of a complex of vernal pools, five of which were sampled. On average, buffer of about 75 meters wide and moderately high quality surrounded most of the pools. The vegetation layer at all the pools consisted only of short herbs, as is characteristic of vernal pools. Coverage by these herbs ranged from 80 to 100% of the sites and dominants were wild radish, three dead and unidentified grasses, turkey mullen, vinegar weed, and coyote thistle. Two-thirds of the dominants were native species. Organic matter accumulation at the pools was moderately abundant and ranged in size from fine organic material to coarse, woody debris. While this created vernal pool area did have moderate topographic complexity, they did not possess significant mima mounds. The general surroundings included fox road to the east, the penitentiary to the west, a shooting range to the northwest, an orchard to the north, a penitentiary entrance to the south.

8217-Maintenance Dredging of Camarillo Hills Drain, Ventura County Department of Airports, Ventura

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
8217	4	Los Angeles	1997	100.00	N/A	42.50	N/A

This project involved removal of sediment and debris from the Camarillo Hills Drain to restore the design flow capacity. Temporary impacts to 9.3 acres of waters of the US were mitigated through the enhancement of 9.3 acres of waters of the US. The sediment removal occurred on the floodplain along the left edge of the low flow channel. A seemingly permenant dirt road now exists on the floodplain for the ongoing maintenance of the channel. Enhancement was achieved through the removal of exotic plants within the low flow channel, and through the seeding of the left bank slope with native grass species. The low flow channel was mostly devoid of the targeted exotics. However, the seeded slopes were largely dominated by non-native invasives, such as black mustard., This was a compliance-only file.

8248- Schooner Point Development, Gibson and Skordal, El Dorado Hills

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
8248	5S	Sacramento	1997	100.00	61.98	100.00	N/A

The Schooner Point project in El Dorado Hills, El Dorado County impacted 0.53 acres of isolated seasonal wetland, 0.50 acres of drainage canal, and 0.14 acres of waters of the US The required mitigation for the filled areas was at a 1:1 ratio with the exception of the eastern drainage (also referred to as the Southwest canal based on flow direction) which was to be replaced at a 1.5:1 ratio. The higher ratio was deemed necessary for the eastern drainage because of the higher habitat value of these wetland areas. This creek was the major habitat corridor for the project site. The mitigation requirements were determined to mitigate for the loss of the functions from both direct and indirect impacts. For the western drainage, the mitigation at a 1:1 ratio was 0.53 acres. The eastern drainage mitigation was 0.75 acres at 1.5:1, and indirect impacts required mitigation of 0.14 acres. The total mitigation for the project was 1.42 acres of seasonal wetlands credits to be purchased at Wildlands Inc.

Wildlands Sheridan Mitigation Bank is located north of Roseville and was established in 1994. Although there are many habitat types found within the bank, we assessed three: riparian, depressional and vernal pools. The site was created in four phases. In the first three phases there was a total construction of 28.78 acres of vernal pools, 24.46 riparian acres, 4.91 seasonal wetland acres, 89.81 acres of emergent marsh, and 45.99 acres of perennial marsh. Phase four created 28.06 acres of vernal pools, 7.22 acres of riparian habitat, and 77.73 acres of seasonal, emergent and perennial marsh. Phase four was not completed at the time of our assessment, and acreage had not been approved for credits to be purchased. Therefore, we focused our evaluation on phases one to three. We were joined in the field by Riley Swift, president and owner of Restoration Resources, which manages Sheridan Mitigation Bank, and Valerie Layne, Senior Conservation Biologist for Wildlands Inc. The area is surrounded by orchards; however, they advised us that there has been no evidence of pesticides or fertilizers impacts from these adjacent orchards. The hydrology of the site is managed to maintain target wetness levels for each wetland area. The main distribution of water for the site is synchronized with a back-up well receiving runoff from adjacent irrigation systems and recycled waters within the bank. The hydrology has been designed for gravity flow from ditches in the easternmost section of the site to other areas throughout the bank. They use overflow weirs where areas need to be inundated for longer periods of time. Mr. Swift also mentioned that skunks, voles, beavers, jack rabbits and coyotes are the main disturbances to the mitigation bank. During our assessment we found wildlife and evidence of wildlife to be abundant.

The depressional areas, or as Wildlands refers to the areas, seasonal wetlands, were highly variable in terms of levels of inundation. We randomly selected two assessment areas that included an isolated ponded area (area 17) and a muddy low land (area 1). The freshwater marsh at area 17 appeared to have an altered hydrologic regime and remained inundated for a long-duration of time. Area 1 had saturated soils but no surface water. Area 17 was surrounded by open water, other wetlands and bordered by a riparian area. The CRAM scores for these areas were similar, except that the second site had slightly higher scores for physical and biotic patch richness, vertical biotic structure, and native plant species richness. The short herb stratum dominant species for both sites were *Paspalum dilatatum* and *Eleocharis macrostachya.* Tall herb stratum dominants were *Scirpus californicus* and *Typha angustifolia*. *Salix* sp. and *Populus deltoides* were only found in area 1.

8337-Replace Bridge 270-9, Santa Fe Railroad Company, San Diego.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
8337	9	Los Angeles	1997	100.00	30.81	N/A	N/A

The Santa Fe Railroad company replaced an old timber pier bridge #270.9 with a new concrete structure. Newly constructed bridges adjacent to bridge 270.9 on both its eastern and western sides changed the hydrologic characteristics of Chollas Creek, resulting in excessive scour on the north side of bridge 270.9. The replacement bridge was designed to align with these adjacent bridges, thus reducing its length by 63 linear feet. To offset the permanent impacts to 0.042 acres of intertidal flat habitat as a result of these activities, the permittee was required to create 0.042 acres of intertidal habitat.

To create this mitigation site, the permittee graded adjacent unvegetated upland area to a tidelands elevation. The mitigation site met their required acreage and was comprised of 40% wetland, 20% bay inlet open water, and 40% sandy beach flat habitat. The site was mostly open, non-vegetated soil, with sparse vegetation consisting of only pickleweed. Some course woody debris had washed onto the mitigation site. The soil substrate was primarily sand with cobble stones and boulders at the north end of the site. Significant trash removal had clearly taken place since at the mitigation site since the impact project occurred. Most of the site was surrounded by the open water of Chollas Creek, except the rip rap and railroad line that ran along the northern edge. The general surrounding area included a navy base, railroad tracks, and a shipyard.

8390- Fill Wetland to Construct Greens Subdivision, Airport Business Center, Windsor.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
8390	1	San Francisco	1997	100.00	50.82	100.00	N/A

Construction of the Greens Residential Subdivision (Phase II) filled 1.32 acres of seasonal wetlands on a 74.6-acre parcel at 1580 Wilson Lane in the town of Windsor in Sonoma County. The project site is adjacent to the Windsor Golf Course and south of the Greens Residential Subdivision, Phase I. The purpose of the impact was to facilitate the construction of 283 residential lots, five public parcels, and three multiple-use parcels. The impacted wetlands have been described as shallow depressions, swales, ephemeral rainpools and man-made ditches. Much of the wetland habitat was the direct result of the past construction of earthen berms to prevent treated wastewater from flowing off-site and entering Pool Creek. Mitigation requirements for the project were satisfied through the purchase of credits equaling 1.35 acres of seasonal wetlands from the Wikiup Mitigation bank. The Wikiup Mitigation Bank, currently under the jurisdiction of The California Department of Fish and Game (CDFG), consisted of 6 acres of wetlands on a 12-acre parcel. The bank was established in 1995 and lies within the town of Windsor. Residential areas border the site on three sides, while vineyards border it on the fourth side. The bank consists of three distinct, 1 to 2-acre wetland depressions buffered by uplands areas, which are characterized by oak woodlands and non-native annual grasses.

A representative of CDFG assisted us in locating the Wikiup Mitigation bank and the individual wetland areas within the bank. A single CRAM evaluation was done for each of the three wetlands, and all three evaluations had similar results. The residential areas and vineyards immediately adjacent to the bank on all sides resulted in low scores for landscape connectivity and buffer width. The depressions were dry at the time of evaluation, which was appropriate for the season. Physical structural had low complexity, due to the absence of potential patch types like unvegetated flats, sediment mounds and islands. *Eleocharis palustris* was the most abundant species in each of the wetland areas followed by the non-native, *Mentha pulegium*. *Cyperus eragrostis* and *Juncus* sp. were also present. Runoff from both the adjacent residential areas and the vineyards was seen as a potential stressor to the wetlands.

8525-Newport Boulevard and Pacific Coast Highway Interchange Drainage Channel Improvements, City of Newport Beach Department of Public Works, Newport Beach.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
8525	8	Los Angeles	1998	100.00	68.77	100.00	88.90

This project involved replacing an existing unlined drainage channel between Newport Boulevard (State Route 55) and Old Newport Boulevard with a double reinforced box culvert for most of the length of the channel to prevent periodic flooding that occurred on Pacific Coast Highway at the Newport Boulevard overcrossing. The existing drainage channel was artificially constructed many years ago when Newport Boulevard was widened. Vegetation covered the sides of the majority of the channel and some of the bottom. Vegetation within this channel included cattails, watercress, African umbrella-sedge, alkali bulrush, and spike rush. Portions of this channel were lined with rubble and patches of asphalt concrete. Permanent impacts totaling 0.07 acres of waters of the US (0.03 acres of wetland waters and 0.04 acres of non-wetland waters) were mitigated by creating 0.189 acres of waters of the US (0.168 acres of wetland waters and 0.021 acres of non-wetland waters) and 0.21 acres of upland non-waters of the US.

The offsite mitigation was located among a City-owned existing/natural riparian mitigation area in the Mouth of Big Canyon in Newport Beach, adjacent to Upper Newport

Bay. The mitigation activities consisted of lowering the floodplain elevation on the right bank by excavating the area just beyond the ordinary high water mark, removing invasives, and planting with a mix of riparian species. These activities were combined with the mitigation needs of another project into a single larger project. It was impossible distinguish the aspects or acreage that was specific to this permit file.

The mitigation site was densely vegetated (205% absolute vegetative cover due to multiple overlapping layers) with an approximately equal mix of non-native and native plants. The short-herb layer of vegetation covered 90% of the site and was dominated by wild celery and Spanish sunflower. The tall-herb layer, covering 10% of the site, was dominated by stinging nettle, saltbush, celery, and cattails. The shrub layer, covering 10% of the site, was dominated by mulefat. The tree layer, covering 95% of the site, was dominated by black and arroyo willows. Organic matter accumulation at the site was abundant and ranged in size from fine organic material to coarse, woody debris. The drainage channel was low-gradient and perennial. Buffer of approximately 60 meters in width on average surrounded most of the site and was of moderately high quality. The surrounding area included residential developments to the north, east and southwest, Jamboree Road to the southeast, and Upper Newport Bay to the northwest.

8529-Mirada Project, City of Rancho Mirage, MCO Properties, Inc., Rancho Mirage.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
8529	7	Los Angeles	1998	50.99	64.39	N/A	81.80

The greater Mirada Project involved two phases. The first phase was the development of a Ritz Carlton, single-family custom estate homes, and a tennis center. The second phase involves additional single-family estate lots, townhomes, villas, and a commercial development. The 401 permit selected was for the second phase only. A total of 2.0 acres of jurisdictional waters were impacted during the construction of the single-family estate homes and townhomes. All of these impacts were permanent and affected 0.75 acres of desert-wash woodland and 1.25 acres of unvegetated wash. To mitigate for these impacts, the permittee was required to preserve 3.66 acres of jurisdictional waters habitat within a 312 acre deeded preservation parcel and 4.19 acres of jurisdictional waters habitat within a 1155 acre deeded preservation parcel. At the time of this study the 312 acre preservation area had not yet been established. In addition to these preservation areas, they were required to remove tamarisk from 0.70 acres of jurisdictional streambed habitat within the upper reach of the Cathedral Canyon Wash, within the larger preservation area. This tamarisk removal area was the site we assessed.

The Upper Cathedral Canyon Wash invasive removal area was 0.70 acres, including 0.49 acres of unvegetated streambed and 0.21 acres of vegetated streambed. This site was a high gradient riverine system with natural steep rock walls. The mitigation site was surrounded almost entirely by extensive buffer of moderately high quality (there were some invasive species and trash in the area). This site was vegetated sparsely. The short-herb layer covered 10% of the site and was dominated by rabbitfoot grass and saltgrass. Tall herbs were mostly absent from the site. The shrub layer covered 10% of the site and was dominated by saltbush and tamarisk and an unknown shrub. The tree layer was dominated by acacia which covered 5% of the site. Although tamarisk was present in this mitigation site, we did see clear evidence of removal efforts. Organic matter accumulation, likely due to the sparseness of vegetation at the site, was low and consisted of occasional small amounts of coarse debris and only traces of fine material. This surrounding area consisted of natural opens space with complex topography and sparse vegetation.

8558- Penn Mine, East Bay Municipal Utility District, Calaveras County, unincorporated, east of Camanche Reservoir

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
8558	5S	Sacramento	1998	135.71	65.07	0.00	84.60

The East Bay Municipal Utility District (EBMUD) restored the Penn Mine site and associated contaminated creek by removing mine wastes and acid rock drainage within the channels and by removing a dam and diversion channels. Impacts from the restoration included the reduction of creek acreage from 7.13 to 5.37 acres; however, according to the 404 permit, "the gain of restored improved quality waters (in the form of streams) offsets the net loss of waters (in the form of toxic ponds) and no additional mitigation is required." The project also impacted 842 sq. ft. (0.02ac) of a stock pond, and the 401 permit required compensatory mitigation for these impacts. According to the mitigation plan, EBMUD would create 2700 sq. ft. of wetlands by removing stock piles adjacent to the pond and would enhance 3500 sq. ft. of open water habitat by filling a portion of the pond and converting it to seasonal wetland.

Upon our visit to the site, we delineated the created wetlands using a mitigation plan map and the extent of wetland vegetation adjacent to the pond as our guide. The pond and adjacent wetland were located down slope from a landfill which contained mine waste indicating that heavy metal contamination was a possible stressor to the wetlands. The rest of the wetland buffer consisted of an expansive forested lands with little human presence. The vegetation in the created wetland was dominated by *Eleocharis* sp. and invasive annual grasses. The stock pond was only partially inundated by a shallow puddle where hundreds of frogs were found. About half of the pond was vegetated. According to our GPS measurements, the mitigation project had met both enhancement and creation acreage requirements.

8587- Develop Detached Residential Units & Stabilize for Erosion, Cal Pac Remediation Company, Fullerton.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
8587	8	Los Angeles	1998	100.00	40.56	67.00	N/A

This project involved constructing a 474 single family detached residence development on a 164-acre parcel of land on the former Imperial Golf Course site in Fullerton. As part of this project, 13 grade stabilizers and rock energy dissipaters were constructed in Gilman Park, downstream of the development. Specifically, 0.08 acres of wetland and 0.02 acres of streambed were permanently impacted within the former Imperial Golf Course and Gilman Park. Prior to these impacts, riparian and wetland vegetation were present in the project area. To mitigate for these impacts, the permittee was required to create 0.10 acres of mulefat riparian habitat within the development's "urban forest".

Although this mitigation site was not clearly defined in our file, we were able to find the development's urban forest, and thus determine the general location of mitigation site with relative confidence. The whole area was greater than the required 0.10 acres, so they were given full acreage credit. Although the mitigation area was designed to be a depressional wetland to collect runoff from the residential development, we determined that it was upland habitat. The site was largely dry during our visit but the plantings seemed to survive due to irrigation and heavy mulching throughout the mitigation area. The surrounding areas drained to an underground box culvert which ran directly under the depression. Thus the hydrology of the depressional mitigation site area was not appropriate.

The mitigation site consisted of mulefat, black willow, arroyo willow, deer grass, oaks, sycamore, and toyon plantings. Plantings were established in the bottom of the depression, as well as along the slopes. Although, there was pampas grass throughout the mitigation site, we did find evidence of heavy pampas grass removal efforts. The mitigation site seemed to double as a recreation area, as a cement pathway ran directly through the bottom of the depression. During our visit, we found people walking pets, jogging, and walking on this path.

8677- State Route 55 and Chapman Avenue Bridge Widening, California Department of Transportation, Orange and Anaheim.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
8677	8	Los Angeles	1998	100.80	54.16	100.00	N/A

This project involved the widening of the Route 55 and Chapman Avenue Bridges over Santiago Creek, a wide perennially flowing urbanized channel with a natural bottom. The Route 55 Bridge was widened approximately 6.5 meters on the southbound side and 7 meters on the northbound side. The south bank of Santiago Creek at Route 55 was excavated to minimize backwater influences and disruption to flood flows. A concrete block mat was then installed in this excavated area. The construction activities associated with the Route 55 Bridge permanently impacted 1.00 acres of streambed and temporarily impacted 1.60 acres of streambed habitat. The Chapman Avenue Bridge was widened approximately 11 meters on the north side and 9.5 meters on the south side. Part of Santiago Creek at Chapman Avenue was excavated and recompacted. The construction activities associated with the Chapman Avenue Bridge permanently impacted 0.70 acres of streambed and temporarily impacted 1.20 acres of streambed habitat. Additionally, a total of 0.80 acres of riparian habitat was permanently impacted between these two bridge widening projects. Prior to these impacts, the project areas consisted of riparian habitat, dominated by mulefat.

To mitigate for impacts to jurisdictional riparian habitat, Caltrans was required to pay the Orange County Public Facilities and Resources Department to remove on acre of *Arundo donnax*. We were not able to determine if this payment was made. In addition, Caltrans was required to plant seeds and mulefat cuttings within up to 0.25 acres of Santiago Creek, within the spaces of the block mat armoring. This area was approximately 10% riparian waters, 15% non-waters riparian, and 75% upland habitat. This mitigation area was located along the southern bank to the northeast of the Route 55 Bridge. During our visit, the concrete mat was in place, but the seeding efforts were hard to determine. This matted area was dominated by black mustard, with a few scattered and small shrubs. We measured 0.26 acres of mulefat cuttings that were in a strip along the lower portion of the block mat armoring. Dominant plants at the greater mitigation site included mulefat, eucalyptus, and black mustard. Another non-native, tree tobacco, was also in the mitigation area. Along with runoff from nearby roads and residential developments, Santiago Creek supplied the mulefat cuttings with ample hydrology, although the seeded mat area was above was very dry and had no water source other than precipitation. The streambed itself had many boulders and cobblestones, and supported extensive emergent vegetation. The mitigation area was surrounded by transportation corridors, residential developments, and disturbed habitat along the banks of Santiago Creek.

8704- Sinclair Horizon Development Project, Mission Peak Homes, Milpitas

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
8704	2	San Francisco	1998	100.00	41.57	100.00	N/A

This project entailed the filling of 0.021 acres of waters including 0.002 acres of permanent fill impacts to the bank of Berryessa Creek and 0.019 acres of temporary fill impacts to perennial and seasonal wetlands at the creek and Arroyo de los Coches channel in Milpitas. Mitigation requirements included the widening of Arroyo de los Coches by 5.6 feet along a 104 foot stretch, thereby creating an additional 0.002 acres of perennial and seasonal wetlands. In addition, a $750 donation to the Coyote Creek Riparian Station in Alviso was required for restoration and education.

The lack of a mitigation plan on-file made it impossible to accurately locate the exact boundaries of the mitigation area. The wording in the permits was used as a guide to roughly determine the boundaries along the creek beginning upstream of a culvert and ending at a bridge crossing. The buffer area was extremely narrow with the mitigation area tightly bound by a walled housing development on one side and a busy road on the other. It was concluded that the water source for the creek was primarily anthropogenic including urban runoff and the water of the creek was contained within highly channelized, steep banks. The site was dominated by *Equisetum telmateia*, *Polygonum persicaria*, and *Rorippa nasturtium-aquaticum*. The proximity of intensive urban development and the upstream culvert were considered primary stressors to the site. The unclear boundaries made it impossible to measure the mitigation area in the field in order to determine compliance with permit acreage requirements.

8793-Debris Basin Maintenance, Tract No. 51995-Condo III Development, Larwin Company, Val Verde.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
8793	4	Los Angeles	1998	100.0	81.805	100.0	N/A

This project involved removal of accumulated sediment and debris from a debris basin to maintain its flood-control capacity. The project involved permanent impacts to 1.42 acres of wetland and 0.85 acres of streambed. For mitigation, the permitte paid the Forestry Service for 1.4 acres of offsite A*rundo donnax* removal in the upper potions of San Francisquito Creek, within the Angeles National Forest. Ten percent of the mitigation area consisted of wetlands and 90% was non-wetland waters comprised of 25% streambed (5% open water, 10% unvegetated streambed, 10% vegetated streambed) and 65% riparian habitat. This stretch of the stream was low-gradient, soft-bottom, perennial stream that meandered slightly as it ran through the western portion of the mitigation area where it had unrestricted access to adjacent uplands. The floodplain and vicinity of the stream was undeveloped, except for a dirt road that led into the floodplain and the new San Francisquito Canyon Road which was being graded into the hillside several hundred yards from the western edge of the mitigation site. High-quality buffer surrounded the entire site and exceeded 100 meters in every direction.

Short herbs covered 50% of the site and were dominated by scarlet monkey flower, a native water smartweed, common cocklebur, and white clover. Shrubs covered 50% of the site and were dominated by arroyo willow. The tree layer covered 30% of the site and was dominated by mature cottonwoods. The vast majority of vegetative cover on the site was provided by native plant species. The near absence of tall Arundo from the site contrasted sharply with photographs of the area from several years before the *Arundo donnax*-removal project was undertaken (i.e., prior to March 1999) that the Forest Service Ranger, Nancy Hanson (who took us to the site), showed us. These photographs showed a floodplain and stream channel choked with arundo. Despite these efforts, resprouting Arundo was still common. Organic matter accumulated at the site was abundant and ranged in size from fine to coarse, woody debris.

8800- Thomas Ranch Residential Subdivision, New Cities Development Group, San Ramon

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
8800	2	San Francisco	1998	31.33	38.61	22.20	28.60

Construction of the Thomas Ranch residential subdivision resulted in the filling of 0.24 acres of seasonal wetlands and 0.16 acres of streambed. The subdivision is located on the western side of San Ramon, west of Interstate 680, near the intersection of Crow Canyon and Bollinger Canyon roads. The applicants were required to create 0.83 acres of seasonal wetlands at the project site. Creation of the seasonal wetlands was to be accomplished through minor grading and planting of herbaceous and riparian species in two distinct areas adjacent to existing drainages.

The mitigation area was located in an elevated area adjacent to a cul-de-sac in the subdivision. The California Department of Fish and Game had previously determined that wetland creation in one of the two mitigation areas failed. Our observations of hydrology and vegetation in the area confirmed this. The second mitigation area was very dry and lacked a clear depression. The site was characterized by a prevalence of non-native annual grasses and had low cover of wetlands species. The buffer area adjacent to the site contained numerous dead plantings of *Rosa californica.* The boundaries of the site were determined based on the presence of *Salix* spp. and *Juncus* spp. on the perimeter. Landscape and buffer scores were fairly high due to surrounding undeveloped areas. The site’s hydrology was poor, due to the lack of a significant topographic depression and confirmed by the low cover of wetland species. Very few physical or biotic patch types were observed. A total of 0.26 acres of wetlands were created, far lower than the required 0.83 acres.

8890-El Cariso Park Development Project, Wilshire Builders, Inc., San Fernando

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
8890	4	Los Angeles	1998	100.00	N/A	100.00	100.00

This project involved development of a 10-acre parcel for construction of 497 residential housing units west of the Pacoima Wash in the Pacoima Canyon area, near San Fernando. Development consisted of placing 35,069 cubic yards of fill material, constructing reinforced concrete culverts, placing a utility line crossing and replacing the existing Harding Street bridge in three unnamed tributaries to Pacoima Wash. This construction resulted in permanent impacts to 0.60 acres of streambed habitat (non-wetland waters of the US) and temporary impacts to 0.06 acres of riparian habitat (non-wetland waters of the US). As mitigation for these impacts, 0.560 acres of unvegetated streambed habitat (waters of the US) and 9.434 acres of riparian habitat (non-waters of the US) were preserved within an undeveloped portion of the subject property. This mitigation was provided by placing a deed restriction to protect these 10 acres as open space in perpetuity..

8924- Stoneridge 63 Housing Development, Actium Development Company, Roseville

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
8924	5S	Sacramento	1998	100.00	75.45	100.00	N/A

The proposed project was a low density residential development and a public park/open space development. The project site was located 2 miles northwest of downtown Roseville and was a 63-acre triangular parcel, north of the intersection of East Roseville Parkway and Olympus Drive and south of Miners Ravine. The site consisted of non-native grasslands and oak woodlands. Although the site had been grazed in the past, it had not been used for such purposes for several years. The area surrounding the site is rapidly urbanizing. Site grading and installation of infrastructure in the low density residential area involved impacts to 0.05 acres of wetlands and 0.35 acres of vernal pool. To mitigate for this loss, 0.80 acres of vernal pool preservation credits were purchased from Orchard Creek Conservation Bank and 0.40 acres of vernal pool creation credits were purchased from Wildlands Sheridan Mitigation Bank.

Wildlands Sheridan Mitigation Bank is located north of Roseville and was established in 1994. Although there are many habitat types found within the bank, we assessed three: riparian, depressional and vernal pools. The site was created in four phases. In the first three phases there was a total construction of 28.78 acres of vernal pools, 24.46 riparian acres, 4.91 seasonal wetland acres, 89.81 acres of emergent marsh, and 45.99 acres of perennial marsh. Phase four created 28.06 acres of vernal pools, 7.22 acres of riparian habitat, and 77.73 acres of seasonal, emergent and perennial marsh. Phase four was not completed at the time of our assessment, and acreage had not been approved for credits to be purchased. Therefore, we focused our evaluation on phases one to three. We were joined in the field by Riley Swift, president and owner of Restoration Resources, which manages Sheridan Mitigation Bank, and Valerie Layne, Senior Conservation Biologist for Wildlands Inc. The area is surrounded by orchards; however, they advised us that there has been no evidence of pesticides or fertilizers impacts from these adjacent orchards. The hydrology of the site is managed to maintain target wetness levels for each wetland area. The main distribution of water for the site is synchronized with a back-up well receiving runoff from adjacent irrigation systems and recycled waters within the bank. The hydrology has been designed for gravity flow from ditches in the easternmost section of the site to other areas throughout the bank. They use overflow weirs where areas need to be inundated for longer periods of time. Mr. Swift also mentioned that skunks, voles, beavers, jack rabbits and coyotes are the main disturbances to the mitigation bank. During our assessment we found wildlife and evidence of wildlife to be abundant.

To evaluate the created vernal pools we sampled individual pools and pool clusters. We randomly selected the clusters based on age of creation, then on location within the bank. The three assessment areas all had distinct boundaries based on grading and vegetation. We choose area 18 which encompasses 5.3 acres of vernal pools, as well as area 12 and area 6.

The entire area had been inoculated with collections from neighboring vernal pools to assure the establishment of native vernal pool species. The pools were dry at the time of the evaluation. The physical structure of the pools was fairly complex with various patch types present, including soil cracks, mounds, and burrows. According to Mr. Swift, the area is mowed regularly to alleviate problems with invasive non-natives, especially star thistle. All three areas that we assessed received the same CRAM scores for three out of four attributes. There was slight variation among the areas for biotic structure characteristics, mainly due to plant species richness, interspersion, and zonation. Native species found in the pools were *Eryngium vaseyi*, *Eleocharis macrostachya*, *Hemizonia* sp., and *Psilocarpus brevissimus.* The dominant species for all pools were native, yet there were few species present. In addition, there were some unidentifiable species, mainly grasses, in the pools due to the time of our assessment.

8947- Petaluma Golf Center, Dead Straight Corporation, Petaluma

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
8947	2	San Francisco	1998	134.00	43.94	57.40	57.40

Construction of a practice golf facility resulted in the filling of 1.0 acre of seasonal wetlands on a 21-acre parcel located on the east side of Stony Point Road (immediately west of the freeway) in northern Petaluma. The site, abandoned in the early 1980’s, had been graded and configured into a broad basin or amphitheater for operation as a drive-in movie facility. The affected wetlands included a broad grassy swale/meadow, a small depressional area, two man-made ditches and the historic amphitheater. The site is in the headwaters of the Petaluma River watershed and occurs approximately 700 to 1000 feet east of the upper section of the river. Vegetation in the impacted wetlands was generally dominated by weedy species including Italian ryegrass (*Lolium multiflorum*), Mediterranean barley (*Hordeum marinum*), and curly dock (*Rumex crispus*), with small areas of perennial rush (*Juncus* spp.). Mitigation requirements for the project were satisfied onsite through the creation of two flat or slightly depressional swales and a detention basin. The total acreage requirement for the mitigation project was 2.0 acres. The swales were designed such that they would “feed” into the detention basin, which sits between them. The wetlands were constructed at the south/southeast end of the property, just to the northeast of Stony Point road.

During our field assessment, a map from the project’s mitigation plan was used to locate the created wetlands. The boundaries between the wetlands and the adjacent uplands were determined based on obvious topographic depressions and the presence and absence of wetlands vegetation. A single CRAM evaluation was done for each of the three distinct created wetlands. A lack of surrounding natural areas and the presence of the golf facility, a trailer park and Stony Point road immediately adjacent to the wetlands all contributed to an unfavorable evaluation of the site in terms of its buffer and both landscape and hydrological connectivity. The wetlands were all dry at the time of evaluation, and soils were compacted. All of the created wetlands also showed poor physical structural complexity with physical patch types including hummocks, islands and variegated shorelines absent. Two species dominated the first swale, one native (*Xanthium stromarium*) and one non-native (*Lolium multiflorum*). Non-native species, such as, *Polypogon monspeliensis*, *Lolium multiflorum*, and *Picris echioides*, dominated both the detention basin and the second swale. Biological structural complexity was low in general for the three wetlands with only two or three of the 19 potential patch types present on average. Runoff from the nearby golf facility, road and trailer park was seen as a stressor of primary importance to the site. A total of 2.68 acres of wetlands were created, greatly exceeding the 2.0 acres that were required.

8980- Route 65 Road Work, City of Lincoln, Lincoln

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
8980	5S	Sacramento	1998	100.00	67.91	80.00	N/A

The city of Lincoln widened State Route 65 in the Caltrans right-of-way. The entire site encompassed about 5.99 acres of waters of the `The impacts related to this construction were the loss of 0.96 acres of vernal pools, 0.14 acres of seasonal wetlands, 0.17 acres of seasonal swale, and 0.30 acres of drainage channels. The vernal pools in the area included northern hardpan and volcanic mudflow vernal pools. Soil depths determined the vegetation within each pool. The seasonal swales were mixed with upland annual grasses and vernal pool species and were distinguished from the vernal pools based primarily on hydrology and drainage patterns. Vegetation that dominated the area was mediterranean barley, Italian ryegrass and hyssop loosestrife. The ephemeral drainage had a distinct bed and bank where storm water runoff was briefly collected. The area was sparsely vegetated with annual grassland species and did not maintain a significant soil saturation period. There were no indirect effects anticipated according to the US Fish and Wildlife Service, and the direct effects were mitigated for at an approved mitigation bank. The preservation ratio of 2:1 for vernal pool fairy shrimp habitat was mitigated for at Orchard Creek Preservation Bank with a purchase of 1.060 acres. The city of Lincoln also purchased 0.530 acres of vernal pool creation credits and 0.420 acres of seasonal wetland habitat credits from Wildlands Inc. in Sheridan.

Wildlands Sheridan Mitigation Bank is located north of Roseville and was established in 1994. Although there are many habitat types found within the bank, we assessed three: riparian, depressional and vernal pools. The site was created in four phases. In the first three phases there was a total construction of 28.78 acres of vernal pools, 24.46 riparian acres, 4.91 seasonal wetland acres, 89.81 acres of emergent marsh, and 45.99 acres of perennial marsh. Phase four created 28.06 acres of vernal pools, 7.22 acres of riparian habitat, and 77.73 acres of seasonal, emergent and perennial marsh. Phase four was not completed at the time of our assessment, and acreage had not been approved for credits to be purchased. Therefore, we focused our evaluation on phases one to three. We were joined in the field by Riley Swift, president and owner of Restoration Resources, which manages Sheridan Mitigation Bank, and Valerie Layne, Senior Conservation Biologist for Wildlands Inc. The area is surrounded by orchards; however, they advised us that there has been no evidence of pesticides or fertilizers impacts from these adjacent orchards. The hydrology of the site is managed to maintain target wetness levels for each wetland area. The main distribution of water for the site is synchronized with a back-up well receiving runoff from adjacent irrigation systems and recycled waters within the bank. The hydrology has been designed for gravity flow from ditches in the easternmost section of the site to other areas throughout the bank. They use overflow weirs where areas need to be inundated for longer periods of time. Mr. Swift also mentioned that skunks, voles, beavers, jack rabbits and coyotes are the main disturbances to the mitigation bank. During our assessment we found wildlife and evidence of wildlife to be abundant.

The depressional areas, or as Wildlands refers to the areas, seasonal wetlands, were highly variable in terms of levels of inundation. We randomly selected two assessment areas that included an isolated ponded area (area 17) and a muddy low land (area 1). The freshwater marsh at area 17 appeared to have an altered hydrologic regime and remained inundated for a long-duration of time. Area 1 had saturated soils but no surface water. Area 17 was surrounded by open water, other wetlands and bordered by a riparian area. The CRAM scores for these areas were similar, except that the second site had slightly higher scores for physical and biotic patch richness, vertical biotic structure, and native plant species richness. The short herb stratum dominant species for both sites were *Paspalum dilatatum* and *Eleocharis macrostachya.* Tall herb stratum dominants were *Scirpus californicus* and *Typha angustifolia*. *Salix* sp. and *Populus deltoides* were only found in area 1.

To evaluate the created vernal pools we sampled individual pools and pool clusters. We randomly selected the clusters based on age of creation, then on location within the bank. The three assessment areas all had distinct boundaries based on grading and vegetation. We choose area 18 which encompasses 5.3 acres of vernal pools, as well as area 12 and area 6. The entire area had been inoculated with collections from neighboring vernal pools to assure the establishment of native vernal pool species. The pools were dry at the time of the evaluation. The physical structure of the pools was fairly complex with various patch types present, including soil cracks, mounds, and burrows. According to Mr. Swift, the area is mowed regularly to alleviate problems with invasive non-natives, especially star thistle. All three areas that we assessed received the same CRAM scores for three out of four attributes. There was slight variation among the areas for biotic structure characteristics, mainly due to plant species richness, interspersion, and zonation. Native species found in the pools were *Eryngium vaseyi, Eleocharis macrostachya, Hemizonia* sp., and *Psilocarpus brevissimus.* The dominant species for all pools were native, yet there were few species present. In addition, there were some unidentifiable species, mainly grasses, in the pools due to the time of our assessment.

9193- Replace & Widen Bridges Along Route 126, California Department of Tranportation, Santa Clarita.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
9193	4	Los Angeles	1998	51.27	55.78	79.80	78.20

This project involved the modification of three bridges including Castaic Creek Bridge, San Martinez Grande Bridge, and Chiquito Canyon Bridge as a result of the overall widening of Route 126. Permanent impacts to jurisdictional wasters at Castaic Creek and San Martinez Grande Creek resulted from the actual widened bridge area, placement of rock-slope protection, while temporary impacts resulted from accessing the project site. The Castaic creek bridge widening permanently impacted 0.46 acres and temporally impacted 0.84 acres of riparian waters. The San Martinez Grande Bridge widening permanently impacted 0.18 acres and temporally impacted 0.74 acres. The Chiquito Creek bridge permanently impacted 0.065 acres and temporarily impacted 0.670. Mitigation for the Chiquito Creek impacts did not include jurisdictional habitat (some restoration of upland areas was required), thus we did not perform a functional analysis at this site.

To mitigate for these impacts at Castaic Creek, the permittee was required to create and enhance 1.34 acres of jurisdictional habitat. Castaic Creek is a tributary to the Santa Clara River with a wide drainage and intermittent flow patterns. Signs of mitigation efforts were not obvious. Although, because the mitigation was within the channel, heavy storm flows likely washed away these efforts. Prior to impacts at Castaic Creek, sedge, mulefat, arroyo willow and Fremont's cottonwood were dominant in the area, while the non-natives giant reed and tamarisk were also present. During our visit, we found the dominant vegetation to include arroyo willow, tamarisk, cottonwood, and giant reed. This site contained ample trash and evidence of off-highway vehicle use was common throughout the streambed. A newly created and planted side channel of 0.28acres was also considered as "gained acreage," thought we did not assess this site.

To mitigate for impacts to San Martinez Grande Creek, the permittee was required to revegetate and remove exotics from 2.10 acres on-site, and create 0.50 acres of riparian restoration offsite at the Fillmore Fish Hatchery. During out site visit we determined that the mitigation area consisted of 60% non-waters riparian and 40% upland. The San Martinez Grand creek is a small drainage with primarily intermittent flows that go directly into the Santa Clara River. Prior to the impacts at San Martinez Grand Creek, the creek bottom was only a layer of sandy soil with no vegetation. Vegetation on the banks was thick with mulefat, saltbush, coyotebush, willows, and tree tobacco. During out site visit, we found predominantly arroyo willow, mulefat, saltbush, and coyotebush. This site was highly disturbed even before the bridge widening due to the highway, agriculture, and a utility pipe crossing. The creek banks were deeply incised.

The off-site Fillmore Fish Hatchery mitigation was intended to be 0.50 acres of riparian restoration, although this site was completely disconnected from the closest water source, the Santa Clara River. The mitigation site consisted of a planted upland berm adjacent to an agricultural area, and was easily discernable. We walked this clear mitigation boundary and only measured 0.26 acres. Dominant vegetation at this site included arroyo willow, mulefat, and cottonwood. Vegetation was almost exclusively native where giant reed was removed.

9211- Soil Berm Construction- Storm Drain Improvements, Metropolitan Water District of Southern California, Riverside.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
9211	8	Los Angeles	1998	100.00	76.00	100.00	N/A

The Metropolitan Water District expanded the Henry J. Mills Water Filtration Plant in Riverside. This expansion involved the relocation of electrical and chemical storage facilities, construction of a soil berm, and installation of storm drain improvements. The electrical and chemical storage facilities were constructed over wetlands, permanently disturbing 0.07 acres of wetland and 0.06 acres of streambed. To mitigate for these impacts, the permittee contributed funds to the United States Forest Service, Los Angeles River Ranger District for removal of *Arundo donax* from 0.25 acres of riparian areas in the Big Tujunga Canyon.

Through communications with the Los Angeles River Ranger District, we were able to verify that the expected Arundo removal was done, though there was no specific 0.25 acre area: the fees were pooled with other funds for a larger Arundo effort in Tujunga Canyon. Still, we were informed of the approximate limits of Arundo removal and were able to assess the site. The enhancement area was within the Big Tujunga Creek (a wide boulder strewn perennial river/stream) and associated floodplain. A single round of Arundo removal was carried out in this reach wherein established stands were cut to near ground level. During our visit, most of these stands had resprouted and were fully reestablished. Dominant plant species found in this area included cottonwoods, narrow leaf willow, mulefat, willow herb, and cattails, in addition to Arundo. Other non-native plant species were present at the site including black mustard, clover, tobacco tree, and eucalyptus. This site was very rocky and vegetation was open, with very little overlapping layers. The site was largely buffered by open, minimally disturbed habitat, except that day use areas and a stretch of rural residential homes existed along the right side of the creek. A several homes on the left side of the creek were accessed via a low flow crossing just upstream of the Arundo removal site.

9392- Bridge Replacement, Route 33, Bridge #52-71, California Department of Transportation, Wheeler Gorge.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
9392	4	Los Angeles	1998	91.43	75.06	47.80	56.20

The California Department of Transportation replaced an old steel/wood combination bridge (52-71) over the north fork of Matilija Creek on Route 33, within the Los Padres National Forest. This new bridge was replaced along its current alignment and constructed of concrete box girder. To replace this bridge, an area 20 feet upstream and downstream from the edge of the existing bridge was impacted. Specifically, 0.35 acres of riparian waters were impacted, including 0.11 acres of permanent impacts and 0.24 acres of temporary impacts. The impacted habitat included the riparian zone of Matilija Creek within a gorge with sparse vegetation and steep banks. Vegetation included big leaf maples and white alders, with no shrub or short herb layer. To mitigate for impacts to this habitat, Caltrans was required to restore the temporarily impacted areas and restore another 0.35 acres of riparian habitat offsite. No evidence was found of restoration for the temporary impacts. This is a high energy/flow site and it is possible that plantings were lost.

The offsite mitigation area was located upstream, along Route 33 adjacent to Bear Creek, and adjacent to the Wheeler's Gorge campground. At this site, Caltrans combined the mitigation needs of two separate bridge replacement projects together. It was not possible to distinguish these mitigation actions/acreages. The mitigation site was 0.32 acres, consisting of 5% riparian waters and 95% non-waters riparian habitat. The dominant plants at the mitigation site included sycamore, coast live oak, black sage, mulefat, buckwheat, and wild oat. Non-native plant species were also found, including fennel, black mustard, tree tobacco, broom, and non-native grasses. Oak seedlings were within mesh casings, with erosion netting on top. Many of these oak seedlings had died. The site was buffered to the north, east, and south, while the western edge was adjacent to Route 33. A gated dirt road ran along the eastern edge of the mitigation site. The general area includes open areas of chaparral, oak woodlands, sycamore-alder forest, and Bear Creek.

9404-Flood Control Facilities Mantenance, City of Corona Public Works Department, Corona.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
9404	8	Los Angeles	1997	100.00	67.50	46.40	46.40

This project involved operating and maintaining existing flood-control and recreational facilities on lands leased by the USACOE to the City of Corona in the vicinity of the Corona Municipal Airport and wastewater treatment plant. Another goal of the project was to maintain three channels and a water-line crossing on City-owned land. Permanent impacts to 11.94 acres of waters of the US were mitigated by creating 9.27 acres of waters of the US, 7.99 acres of which was wetland and the other 1.28 acres of which was non-wetland waters. Riparian non-waters of the US comprised 2.67 acres of the mitigation area. There were three mitigation sites surveyed for this file and one additional mitigation site (Rincon Street) that we did not survey which accounted for 0.39 acres of mitigation. Two of the sites consisted of former percolation ponds which we considered depressional wetlands. These sites were both inundated partly with surface water when we surveyed them. The third site we surveyed involved mitigation on the left bank/floodplain of Temecula Wash. All of the sites were located just north of the Corona Municipal Airport and south and southeast of housing developments.

The first mitigation site, former percolation ponds 9/10, were surrounded by artificial berms on the southern, eastern, and western edges. A hill leading up to a housing development existed on the northern edge of the site. A culvert under the berm allowed water to flow into the site from the Temecula Wash. This site was densely vegetated densely with low growing vegetation, but with low tree cover. The short-herb layer covered 5% of the site and was dominated by mustard. The tall-herb layer covered 75% of the site and was dominated by poison hemlock and sweet alyssum. Therefore, the entire herb layer was dominated by non-native plants. The shrub stratum, which covered 35% of the site, was dominated by mulefat and black willow, both native species. The tree layer covered 15% of the site and was also dominated by a native willow (narrow-leaf). Organic matter accumulation in this site was abundant and ranged in size from fine organic material to coarse, woody debris.

The second mitigation site, formerly another percolation pond, was vegetated more densely than the first mitigation site (extensive shrub and tree cover) and was similarly dominated by a mix of natives and non-natives. We surveyed the site in two areas because it was so large. At the first sampling location, the short-herb and tall-herb layers covered 5% and 10% of the area, respectively, and were both dominated poison hemlock. The shrub layer covered 35% of the site and was dominated by mulefat and Mexican elderberry. The tree layer, covering 15% of the site, was dominated by arroyo willow and tamarisk. At the second sampling location, the short-herb layer covered 80% of the site and was dominated by sweet alyssum. There was not a measurable tall-herb layer at this second location. The shrub layer was dominated mulefat and covered 15% of the site. The tree layer covered 45% of the site and was dominated by eucalyptus and black willow. Organic matter accumulation was abundant at both sampling locations in the second mitigation site and ranged in size from fine organic material to coarse, woody debris.

The riverine (third) mitigation site was vegetated more densely than the first two sites and was dominated entirely by native species. Curly dock, a native species, dominated the short-herb layer which covered 20% of the site. Mulefat and willows, also both natives, dominated the shrub layer which covered 25% of the site. Willows and cottonwoods dominated the tree layer which covered 80% of the site. Organic matter accumulation at this site, like the first two sites, was abundant and ranged in size from fine organic material to coarse, woody debris.

Extensive buffer of over 100 meters in width, on average, surrounded virtually the entire perimeter of the first and third sites. At the first site, the buffer was of moderate quality; buffer at the third site was of high quality. Buffer at the second site surrounded about half the site and, where it existed, was extensive and of moderately high quality. The other half of the second site (the southern and western edges) was bordered by a two-lane road. Pictures from a flood event in the winter of 2005 (in the airport office) indicated that rising water in the Temecula Wash seems to have ready access to the adjacent mitigation sites we surveyed as they were all inundated with water after the storms.

Part of the mitigation for this project was trapping for brown-headed cowbirds to protect habitat of the endangered least bell's vireo. A chicken-wire, wood-framed enclosure was present just east of the third mitigation site and occupied by a couple dozen birds of several species when we visited.

9430-4th Street On/Off Ramp Project, FIRMA, Pismo Beach.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
9430	3	Los Angeles	1998	100.00	73.94	75.00	65.00

This project involved the construction of an on/off ramp to Highway 101 in Pismo Beach. Permanent impacts caused by 80 cubic yards of fill were to be offset by 0.207 acres of restoration through plantings and cuttings offsite in the nearby Pismo Lake Ecological Reserve. The mitigation site was buffered extensively on all sides by moderately high-quality buffer. The reserve is located in an urban area with residential and commercial land uses. The lake was natural and collected water from the surrounding uplands, as it was located in a basin about 50 feet lower than the road which borders the reserve to the west. The mitigation site was located among the low, flat portions of the basin near the foot of a gradual slope up to a commercial area and just south of the lake for which the reserve is named.

The mitigation site was densely vegetated with 205% vegetative cover, due to the presence of multiple layers of vegetation. The short-herb stratum which covered the entire site was dominated by ice plant (non-native) and goldenrod (native). Two non-native species, poison hemlock and bristly ox-tongue, comprised the tall-herb layer which covered 15% of the site. California native blackberry dominated the shrub stratum which covered 40% of the site. Arroyo willow dominated the tree layer which also covered 40% of the site. Organic matter accumulation at the site was characterized by an abundance of material ranging in size from fine organic material to coarse, woody debris.

9432- Riparian Fill, BRE Builders, San Diego.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
9432	9	Los Angeles	1998	128.57	32.23	N/A	91.70

BRE Builders developed the Pinnacle Carmel Creek project consisting of a 40-acre site with a 17 acre apartment complex, access driveways, parking areas, a recreation center, and landscaping. This site is located on an old sand mine and was characterized as disturbed habitat. However, an isolated patch of willow scrub that occurred where water collect from frequent truck washing activity associated with the sand mining was located just outside the northwestern edge of the development. This jurisdictional habitat consisted primarily of arroyo willow with a sparse understory of sagebrush, shore cactus, and mulefat. Non-native invasives such as pampas grass and acacia were also present. The lengthening and widening of the developments access road permanently impacted 0.04 acres of this southern willow scrub habitat. To offset impacts to this habitat, 0.21 acres of wetland creation within the development were required. Two onsite mitigation areas were established; Site A in the northwest portion of the project site and Site B to the south. Both sites were surrounded by fences to limit resident and pet access.

Site A was 0.14 acres, consisting of approximately 70% vegetated sandy basin bottom, and 30% upland. This site was a depression/detention basin with vegetated slopes, adjacent to a steep heavily eroding hillside. Regardless of irrigation, the site was sandy and dry. Sandbags used for erosion control near the adjacent eroding hillside had broken open, supplying the mitigation site with additional sand. The inflow culverts were filled or nearly filled with sand. A small outlet was present in the northeast of the mitigation site. The ground around plantings was barren with very little ground cover or herbaceous species. No overlapping vegetation layers were established. The dominant plant species in this mitigation area were arroyo willow, red willow, black willow, mulefat, sagebrush, spike rush, pampas grass, and other non-native grasses. The site was buffered by the eroding hillside to the west and southwest, and bordered by the residential development and associated parking lots to the east and southeast. The northern part of the mitigation site bordered a hill that sloped down to a riparian area. Overflowing water in the mitigation area would spill into this riparian area to the north.

Site B was 0.13 acres of upland habitat. This site was also a depression/detention basin adjacent to a steep, heavily eroding hillside. Regardless of irrigation, the site was also extremely sandy and very dry. No hydrologic connection was established for this site. Nearby runoff was diverted into a culvert before reaching the site. Sand from an adjacent and heavily eroding steep hillside was heavily influencing the site. A silt fence installed along the fence line had failed. The vegetation was patchy and stressed and mortality was evident. The northwestern plantings were healthier than the southern part of the site, where vegetation was particularly sparse and stressed. The dominant plant species at this site included arroyo willow, red willow, mulefat, California sagebrush, pampas grass, and non-native grasses. The site was buffered by the eroding hillside to the south, and bordered by the residential development, pet walking areas, and parking lots to the west, north, and east.

9448-Construct 48-unit Housing Development, Burbank Housing Development, Cotati

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
9448	1	San Francisco	1998	108.11	N/A	100.00	N/A

This project involved construction of a 48-unit housing development for senior citizens, including the construction of a span bridge over the Laguna. Permanent impacts of 0.036 acres to wetland waters of the US were mitigated by preserving 0.4 acres of wetland waters of the US. This acreage was preserved through the purchase of 4 credits ($25,000 total for 0.4 acres) for the mitigation of Sebastopol meadowfoam from Wright Preservation Bank operated by Sotoyome Resource Conservation District. The permittee was also required to create 0.31 acres of wetlands adjacent to existing on-site wetlands, but whether this mitigation had been undertaken could not be verified.

9510- Westwind Boulevard Commercial Development, Copperhill Development Corporation, Santa Rosa

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
9510	1	San Francisco	1998	100.00	50.93	100.00	N/A

The construction of four commercial buildings by the Copperhill Development Corporation resulted in the filling of 0.615 acres of seasonal wetlands on an 11.79-acre parcel located at 3500 and 3600 Westwind Boulevard in Santa Rosa near the Sonoma County Airport. The site had been graded in the past into several level areas that drain into a man-made ditch. The wetlands were created through ongoing use of the land for agriculture and the US Army's auxiliary facility, which served the neighboring airport during World War II. Mitigation requirements for the project were satisfied through the purchase of 0.65 acres of seasonal wetlands from the Wikiup Mitigation bank. The Wikiup Mitigation Bank, currently under the jurisdiction of The California Department of Fish and Game (CDFG), consisted of 6 acres of wetlands on a 12-acre parcel. The bank was established in 1995 and lies within the town of Windsor. Residential areas border the site on three sides, while vineyards border it on the fourth side. The bank consists of three distinct, 1 to 2-acre wetland depressions buffered by uplands areas, which are characterized by oak woodland and non-native annual grassland.

A representative of CDFG assisted us in locating the Wikiup Mitigation bank and the individual wetland areas within the bank. A single CRAM evaluation was done for each of the three wetlands, and all three evaluations had similar results. The residential areas and vineyards immediately adjacent to the bank resulted in low scores for landscape connectivity and buffer width. The depressions were dry at the time of evaluation, which was appropriate for the season. Physical structural had low complexity, due to the absence of potential patch types like unvegetated flats, sediment mounds and islands. *Eleocharis palustris* was the most abundant species in each of the wetland areas followed by the non-native, *Mentha pulegium*. *Cyperus eragrostis* and *Juncus* sp. were also present. Runoff from both the adjacent residential areas and the vineyards was seen as a potential stressor to the wetlands.

9597-Telegraph Canyon Creek Channelization, City of Chula Vista, Chula Vista.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
9597	9	Los Angeles	1999	97.67	63.12	100.00	78.90

This project involved the channelization of Telegraph Canyon Creek to increase its flood-control capacity in an effort to protect homes lining the creek from damage due to high flows. This channelization project involves the section of Telegraph Canyon Creek between J and L streets in Chula Vista. In total, 1.18 acres of jurisdictional streambed and 0.45 acres of wetland habitat were permanently displaced by the creation of this 18 - 28 feet wide and 8 feet deep concrete channel. This project connected with a pre-existing concrete channel at the downstream end. To mitigate for these impacts, the permittee was required to create and enhance 3.0 acres of wetland habitat. The mitigation area was to occur within a natural stretch of the Otay River and consist of lowering the floodplain elevation and extensive restorative plantings. I the end, shortcomings in mitigation success and acreage resulted in additional acreage credits being applied at another site (Olympic Parkway site) where the permittee was carrying out an unrelated mitigation project.

The Otay River mitigation area consisted of two separate mitigation parcels associated with the channelization of Telegraph Canyon Creek. The first site was located to the east near Interstate 805 and the second area was to the west. A stand of mature eucalyptus trees was located to the southeast of this mitigation area. This Otay River mitigation area was surrounded by moderately disturbed open space and Rancho Drive, with residential areas and Interstate 805, nearby.

This first area was approximately 1.53 acres, consisting of approximately 90% wetlands and 10% jurisdictional riparian habitat. Buffer of moderately low quality surrounded most of this mitigation site and was close to 100 meters in width, on average. This site was vegetated relatively densely with 110% absolute vegetative cover. The short-herb layer covered 10% of the site and was dominated by spike rush. The shrub stratum covered 60% of the site and was dominated by mulefat and arrow weed. Narrow-leaf, shining, and arroyo willows dominated the tree layer which covered 40% of the site. Organic matter accumulation at the site was low and consisted of small amounts of coarse debris.

The second Otay River mitigation site was at a western basin and comprised about 0.4 acres of habitat, consisting of 90% wetlands, 5% riparian waters, and 5% non-waters riparian habitat. Extensive (over 100 meters wide, on average) buffer of moderately low quality surrounded just about three quarters of the site. This site was vegetated relatively densely with 120% absolute vegetative cover. The short-herb layer covered 10% of the site and was dominated by umbrella sedge and cocklebur, both native species. The tall-herb layer covered 5% of the site and was dominated by bulrush and hooker's evening primrose. Mulefat and California wild rose dominated the shrub stratum which covered 25% of the site. The tree layer covered 90% of the site and was dominated by arroyo and black willows. Organic matter accumulation at this site was moderately abundant and consisted of materials ranging in size from fine organic to coarse-woody. A third site, excavated along the right bank of the river had very low vegetation cover, evidence of offroad motorcycle and mountain bike activity, and was considered a failure.

The second mitigation site was just off Olympic Parkway where 1 acre of mitigation credits within a larger detention basin were used by the permittee for this project. The site contained approximately 90% wetlands, and 10% riparian waters of the US. Water entered and exited the site through large concrete spillways. A primary low flow channel bisected the basin bottom, but a separate meandering low flow channel had been created to the left of the primary channel to increase the wetted area. Extensive (over 100 meters wide, on average) buffer of moderately high quality surrounded just over half of the site. This site was vegetated relatively sparsely with 65% absolute vegetative cover. The short-herb layer covered 15% of the site and was dominated by spike rush, cattail, goldenrod, and brass buttons (non-native). The tall-herb layer, dominated by cattails, covered 15% of the site. Mulefat and California native blackberry dominated the shrub layer which covered 20% of the site. The tree layer was dominated by black and arroyo willow which covered 15% of the site. Organic matter accumulation at the site was low, though higher than at the first mitigation site, and consisted of small amounts of coarse debris. This site was bordered by the Olympic Parkway to the north, open space to the south, and access roads and other depressional habitat to the east and west of this site. Residential developments were located just north of the Olympic Parkway.

9671- Mather Field Family Housing Project, Bill Mellerup, Rancho Cordova

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
9671	5S	Sacramento	1999	100.00	61.98	100.00	N/A

The project site was located at Mather Field, within the community of Rancho Cordova. The approximately 373-acre project site was occupied by abandoned and dilapidated base housing. A total of 0.193 acres of jurisdictional waters were located onsite, and all waters were small, isolated and degraded. According to the delineation by consultants Jones and Stokes, it appeared that most, if not all of the waters, had been formed as a result of drainage ditch construction. The impacts to jurisdictional waters were as follows: 0.026 acres of seasonal wetland, 0.027 vernal swale and 0.102 acres of vernal swale-ditch, totaling 0.155

acres. Due to the nature of the impacted wetlands, the mitigation was completed at a 1:1 ratio, with the purchase of credits at Wildlands Inc.

Wildlands Sheridan Mitigation Bank is located north of Roseville and was established in 1994. Although there are many habitat types found within the bank, we assessed three: riparian, depressional and vernal pools. The site was created in four phases. In the first three phases there was a total construction of 28.78 acres of vernal pools, 24.46 riparian acres, 4.91 seasonal wetland acres, 89.81 acres of emergent marsh, and 45.99 acres of perennial marsh. Phase four created 28.06 acres of vernal pools, 7.22 acres of riparian habitat, and 77.73 acres of seasonal, emergent and perennial marsh. Phase four was not completed at the time of our assessment, and acreage had not been approved for credits to be purchased. Therefore, we focused our evaluation on phases one to three. We were joined in the field by Riley Swift, president and owner of Restoration Resources, which manages Sheridan Mitigation Bank, and Valerie Layne, Senior Conservation Biologist for Wildlands Inc. The area is surrounded by orchards; however, they advised us that there has been no evidence of pesticides or fertilizers impacts from these adjacent orchards. The hydrology of the site is managed to maintain target wetness levels for each wetland area. The main distribution of water for the site is synchronized with a back-up well receiving runoff from adjacent irrigation systems and recycled waters within the bank. The hydrology has been designed for gravity flow from ditches in the easternmost section of the site to other areas throughout the bank. They use overflow weirs where areas need to be inundated for longer periods of time. Mr. Swift also mentioned that skunks, voles, beavers, jack rabbits and coyotes are the main disturbances to the mitigation bank. During our assessment we found wildlife and evidence of wildlife to be abundant.

The depressional areas, or as Wildlands refers to the areas, seasonal wetlands, were highly variable in terms of levels of inundation. We randomly selected two assessment areas that included an isolated ponded area (area 17) and a muddy low land (area 1). The freshwater marsh at area 17 appeared to have an altered hydrologic regime and remained inundated for a long-duration of time. Area 1 had saturated soils but no surface water. Area 17 was surrounded by open water, other wetlands and bordered by a riparian area. The CRAM scores for these areas were similar, except that the second site had slightly higher scores for physical and biotic patch richness, vertical biotic structure, and native plant species richness. The short herb stratum dominant species for both sites were *Paspalum dilatatum* and *Eleocharis macrostachya.* Tall herb stratum dominants were *Scirpus californicus* and *Typha angustifolia*. *Salix* sp. and *Populus deltoides* were only found in area 1.

9691- Construct Route 101/154 Interchange, Santa Barbara County Association of Governors, Buellton.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
9691	3	Los Angeles	1999	100.00	26.73	75.00	N/A

This project involves the reconstruction of the Route 101 and Route 154 interchange in Buellton, replacing a dangerous turning lane/cross traffic connection with a grade-separated interchange including onramps and offramps. The construction required the modification of Zaca Creek, including the installation/extention of underground culverts. Prior to these activities, the project area contained ruderal vegetation, non-native grassland, native grassland, oak savannah, coyotebush scrub, freshwater wetlands, and riparian woodland. These activities permanently impacted 0.10 acres of jurisdictional wetland habitat, approximately 800 feet of Zaca and Upper Zaca Creeks, of which approximately 250 feet of Upper Zaca Creek was ephemeral drainage.

To mitigate for these losses, the permittee was required to create 0.9 acres of wetlands. The mitigation site was located within a large basin created as a result of the elevated offramps/roads. The bottom of the basin was planted with mulefat and coyote brush. The mitigation site obtained the required acreage, but consisted of 20% non-waters riparian and 80% upland habitat. The site receives some runoff water, but was not deemed a wetland due to high compaction, lack of organic matter input, and well drained soils. It is lower in elevation than the drainage inlet and outlets, but the soil is too well drained except for very bottom of basin where water is able to pond for longer periods of time. There was no evidence of plantings in this bottom are; the plantings were around its permeter. The dominant plants in the mitigation area were arroyo willow, coyotebush, buckwheat, and non-native grasses. Many non-native plant species were found in the mitigation site. Hay roll erosion control matting was in place around the site. There were tire tracks though the basin bottom. Other than the highway intersection, the greater area consisted of cattle grazing land, a private residence, and other transportation corridors. The mitigation requirements also included the planting of a large number of Oak trees along the elevated slopes and at an offsites area. These oak plantings were not counted but our observations were that growth and survivorship were moderate to low.

9857- Boulder Ridge Golf Course, Garcia Development Company, San Jose

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
9857	2	San Francisco	1999	120.59	42.52	86.80	86.80

The golf course construction for this project in San Jose resulted in the fill of 0.17 acres of isolated seasonal wetlands and ephemeral drainages. Mitigation requirements entailed the creation of 0.34 acres of perennial wetland habitat. The mitigation plan called for the created wetlands to be located onsite in five distinct areas.

On our site visit, we found the five wetland areas situated on the periphery of a large artificial pool located in the middle of the golf course. One of the wetlands was substantially larger than the others, and they all shared virtually identical biotic and hydrologic characteristics. The buffer area included the surrounding golf course, and while the area was large, the non-native monocultured vegetation and the heavy human visitation compromised the quality of the buffer. The hydrologic regime was considered inappropriate given that the artificial pool resulted in perennial ponding rather than being seasonal wet. In addition, the constructed wetlands exhibited a lack of physical complexity. The assessment area exhibited negligible influence from exotic species; however, *Typha angustifolia* occupied 99% of the vegetation cover, resulting in poor biotic structural complexity. Obvious stressors at this site included golf course runoff and the associated chemicals from pesticide and fertilizer applications. According to monitoring reports, the acreage of wetland creation surpasses permit requirements.

10274- Dock Construction on Georgiana Slough, Debbie Cummings, Isleton

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
10274	5S	Sacramento	2000	100.00	60.77	100.00	N/A

This project temporarily impacted 0.027 acres of streambed and 60 feet of riparian habitat in order to construct a private recreational dock and access way along Georgiana Slough. The impacted area was on Terminous Road in Isleton. The impact was offset by a purchase of 0.027 acres of shallow water marsh habitat at Kimball Island Mitigation Bank. The bank is owned and operated by Wildlands Inc. The purchase was to ensure a no net loss of delta smelt habitat and Sacramento splittail habitat.

We visited Kimball Island by boat with a consultant from Wildlands Inc. Prior to restoration, the mitigation area had been leveled and used for agriculture. To restore the site, a levee was breached, allowing tidal action, but tidal flow appeared to be muted based on water and levee elevations. We randomly selected areas to subsample as this large bank. The tides were a factor in being able to navigate through the island. In addition, the island is surrounded by non-native and invasive plants, including *Rubus* sp., which limited our access. It was difficult to reach the sites on foot; therefore, much of our assessment was done from boat or from climbing trees. The hydrology at the site was good although there appeared to be some restrictions to tidal flow. Buffers scored well, except for the presence of non-native species. Dominant plants were primarily *Scirpus* spp., with some *Typha* sp. also present.

10304- Sonoma Valley Oaks Housing Project, Kyle Stephen, Sonoma

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
10304	2	San Francisco	2000	100.00	60.06	100.00	N/A

The project permanently impacted 0.14 acres of isolated seasonal wetlands to construct 56 residential lots. The site was located at 20405 Fifth Street East in the city of Sonoma. To compensate for the loss, two mitigation credits (0.2 acres) were purchased at Burdell Ranch Mitigation Bank.

The Burdell Ranch Bank is located north of Novato and serves projects that are located in the San Pablo Bay watershed. The bank is adjacent to the Sonoma County airport and a wildlife refuge area. We visited the site with the bank coordinator. There were about 26 depressions categorized as brackish, alkaline marsh ponds. Most of the areas had saturated soils with some surface water. There was a levee to the north and east of the bank separating the Petaluma River and to the south and east of the site were natural wetlands. We divided the site into three regions and randomly selected one pond within each region to assess, ponds 1, 10, and 21. The buffer conditions were uplands characterized by compacted and disrupted soils and a prevalence of invasive species. The hydrology was regulated with gates which allowed all the ponds to receive water and establish hydric soils. Pond 1 was in the southeast corner of the bank, adjacent to the east levee. It was 50% vegetated with 95% percent cover of non-native *Cotula coronopifolia*. Pond 10 was centrally located in the bank with 40% vegetative cover, 80% of which was *Cotula coronopifolia*. Pond 21 was the smallest area sampled and was in the northwestern portion of the bank. Ponds 10 and 21 had slightly less vegetation cover but more species than pond 1; however, the vegetation, especially native vegetation, was not well established in any ponds at the site. The three ponds that we assessed had very similar scores for all CRAM metrics, except for interspersion/zonation.

10329-Develop Residential Subdivision on 10 acres, Hartford Land Management, Sacramento

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
10329	5S	Sacramento	2002	100.00	N/A	100.00	N/A

This project involved construction of a single-family residential subdivision on 10 acres. Lot grading filled approximately 0.06 acres of a wetland swale (wetland waters of the US) along the east boundary of the project area. To mitigate for these impacts, 0.06 acres of preservation credits were purchased from the Sacramento County Wetlands Restoration Trust Fund. Temporary impacts were to be restored to pre-project contours and conditions upon completion of construction activities, but whether this condition was met could not be verified.

10347-Single Family Residential Unit East Highlands Ranch, Planning Areas 30, 32, and 33, Spring Pacific Property, Highland.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
10347	8	Los Angeles	2000	150.00	53.24	91.70	64.60

This project involved three separate residential developments on 105.5 acres located north of Highland Avenue and west of Church Street in Highland, as part of the East Highland Ranch Planned Unit Development Project. The 401 permit selected involved the construction of an earthern crossing (at Elder Gulch) associated with the development and filling of an additional unnamed gully. Prior to these impacts, the Elder Gulch riparian woodland community was dominated by sycamore, cottonwood, white alder, willows, mulefat, tree tobacco, and grape. In wetland areas, cattails, duckweeds, cocklebur, and sedge were present. A total of 0.05 acres of jurisdictional riparian habitat were permanently impacted due to these developments. To mitigate for these losses, the permittee was required to create 0.12 acres of riparian habitat. There were to be two main mitigation areas: a 0.07acre creation area in a low-gradient, ephemeral drainage and 0.06 acres of exotic species removal upstream and downstream of the newly installed crossing at Elder Gulch. Additionally, a preservation area was also established immediately to the southwest of the creation mitigation site. The project was to include temporary impacts upstream and downstream of the new crossing/culvert, but these impacts were avoided. However, the placement of the culvert caused significant downcutting of the stream channel (6 foot incision) just upstream of the crossing inlet. The new crossing slope has also experienced substantial erosion.

The creation area was 0.03 acres, consisting of 75% jurisdictional riparian habitat and 25% non-jurisdictional riparian habitat. This site was in a remnant gully fed by a 6 inch drain pipe, with a concrete/rock wall on the east side and a steep earthen bank to the west. A near monoculture of mulefat was found in the area, though a small patch of cactus occurred there as well. The mulefat planning still had wire cages around them which were impacting the plants. Organic matter accumulation was moderately low and consisted of small amounts of fine organic material and occasional coarse, woody debris. Although, this site was designed with an irrigation system and supplemental hydrology from the development's runoff, it was very dry during our visit. A concrete ditch was located along the mitigation area between the mulefat plantings and the concrete wall to the east. Buffer of moderately high quality and fewer than 30 meters wide on average surrounded this site. Orchards bordered the site to the west and east, a small preservation area and dirt access road to south, and a landscaped slope leading to the residential development to the north.

The second mitigation site at Elder Gulch, consisted of a low to medium gradient, perennial stream. This area was 0.11 acres, consisting of approximately 13% wetland, 2% streambed open water, 10% riparian waters of the US, 55% non-jurisdictional waters, and 20% upland habitat. We performed CRAM analysis on the upstream and downstream sides of the bridge separately. The short-herb layer covered about 20% of each of the two sub-sites surveyed at the second mitigation area and was dominated by water smartweed, duckweed, cocklebur, and umbrella sedge. The tall-herb layer, which existed only at the second sub-site sampled, covered 10% of the site and was dominated by cattails. The shrub layer which covered 5% of the sites was dominated by mulefat, arroyo willow, California native grape, and California native blackberry. Cottonwoods and sycamores occurred on both sides of the crossing. Organic matter accumulation at the second site was moderately abundant and ranged in size from fine organic material to coarse, woody debris. Because of acreage shortcomings, the permittee requested mitigation credit be given for native species planted along the slopes of the new earthen crossing. Thus, this area was considered in our assessments. The general surrounding area consisted of residential developments, Highland Avenue, open space to the north, and a park to the south.

10356-Install Box Culvert Part of State Route 30 San Antonio Project, California Department of Transportation, Claremont

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
10356	4	Los Angeles	2000	100.00	N/A	100.00	N/A

This project involved replacing a portion of the concrete-lined San Antonio Creek Channel with an underground box culvert. Impacts to streambed (non-wetland waters of the US) were limited to the two ends of the box culvert where they were to connect to the existing channel since it was only those locations where the fill was to be placed in the active channel. Temporary impacts to streambed habitat totaled 0.090 acres. Permanent impacts included 0.009 acres of streambed habitat and 3.031 acres of alluvial fan scrub habitat in San Antonio Wash. These impacts were mitigated by purchasing 6.93 acres of alluvial scrub mitigation credits for $152, 460 from the Cajon Creek Conservation Bank. The mitigation bank site was not assessed because it was supposed to be non-waters habitat. This was a compliance-only file.

10399- Hideaway Down Canyon Townhouse Development, The Hideaway Company, June Lake.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
10399	6V	Los Angeles	2000	66.34	28.09	68.80	N/A

The Hideaway Company developed a 10-unit townhouse complex, with four detached buildings, on a ¾ acre parcel of land. Development of this townhouse complex and its associated utility lines and parking lot impacted 0.095 acres of jurisdictional wetlands. The project site was a wet meadow and is approximately 360 feet from a nearby creek. Prior to these impacts, the site was undeveloped and covered by indigenous grasses and scattered aspen and pine trees. The original topography sloped 5% to 7% toward the creek.

To mitigate for impacts to jurisdictional wetland as a result of this development, the permittee was required to create 0.101 acres of wetland onsite. To do this, they were supposed to distribute soil and vegetation from the impacted wetland over 13 contiguous areas within the development. These thirteen areas were clearly mapped and were easily discernable during our visit. They consisted of interconnected grassy and landscaped areas between buildings within the backyards of the units. Mowed grass and scattered cottonwood plantings made up these areas. Three of the 13 areas were not vegetated, but were gravel. Two of these 13 parcels were being used for additional parking. We measured only 0.067 acres of mitigation which was completely upland habitat. Sprinklers were present to maintain the mowed grassy areas and other plantings.

10409- Todd Road Interchange, Caltrans, Santa Rosa

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
10409	1	San Francisco	2000	95.00	43.71	95.00	N/A

The California Department of Transportation (Caltrans) widened SR 101 from two to three lanes in both the north and southbound directions between the Wilfred Avenue interchange and the SR 12/101 separation in Sonoma County. The project resulted in permanent impacts to 0.37 acres of wetlands and 0.09 acres of non-wetland waters. Temporary impacts to 0.1 acres of non-wetland waters also occurred. Mitigation requirements for the project involved the creation of 0.5 acres of wetland habitat through the widening of drainage ditches at the Todd Road overcrossing on SR 101. Widening of the drainages was implemented through the excavation of the adjacent uplands. The two ponds are located within the Todd Road northbound off-ramp and southbound on-ramp on the east and west sides of SR 101, respectively.

The mitigation wetlands were easily identified using maps and aerial photos included in one of the project's monitoring reports. The topographic basins of the two depressions were distinct, and the transition from wetland to upland was identified based on changes in vegetation. Commercial and residential areas as well as the highway off-ramps surrounded the two wetlands, and each wetland had a small wooded area adjacent to it. Physical and biotic patch richness was average for both wetlands. Both areas contained swales and unvegetated flats, but lacked islands, mounds and variegated shorelines. Both areas had significant populations of *Typha* spp., *Paspalum distichum* and *Alisma plantago-aquatica*. Non-native species were not a problem at either depression. The eastern site had saturated soils, while the western site had soils that were dry and compacted. Vegetation was generally less healthy (dry, with yellow leaves) at the western site. A population of Pacific tree frogs was observed at the east site. A total of 0.47 acres of wetlands was created, slightly lower than the 0.5 acres that was required.

10453- Roseville Technology Park, Longmeadow Development Corporation, Roseville

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
10453	5S	Sacramento	2000	100.00	69.80	100.00	100.00

Longmeadow Development Corporation constructed a light industrial park with parking lots and access roads along Blue Oaks Boulevard in the city of Roseville. The project permanently impacted 0.52 acres of wetlands, including seasonal wetlands, drainage swales and intermittent drainage. To compensate a purchase was made from Wildlands Sheridan Mitigation Bank in the amount of 0.32 acres of vernal pool creation credits and 0.23 acres of seasonal wetland habitat credits. In addition, 1.08 acres of vernal pool preservation credits were purchased from Orchard Creek Preservation Bank. The project also appropriated and maintained in perpetuity the Roseville Technology Park Open Space Preserve (7.04 acres). According to the mitigation plan, the Open Space Preserve consists of non-native annual grassland with several drainage swales and intermittent drainages that included 0.22 acres of land with federally listed vernal pool crustacean species.

Wildlands Sheridan Mitigation Bank is located north of Roseville and was established in 1994. Although there are many habitat types found within the bank, we assessed three: riparian, depressional and vernal pools. The site was created in four phases. In the first three phases there was a total construction of 28.78 acres of vernal pools, 24.46 riparian acres, 4.91 seasonal wetland acres, 89.81 acres of emergent marsh, and 45.99 acres of perennial marsh. Phase four created 28.06 acres of vernal pools, 7.22 acres of riparian habitat, and 77.73 acres of seasonal, emergent and perennial marsh. Phase four was not completed at the time of our assessment, and acreage had not been approved for credits to be purchased. Therefore, we focused our evaluation on phases one to three. We were joined in the field by Riley Swift, president and owner of Restoration Resources, which manages Sheridan Mitigation Bank, and Valerie Layne, Senior Conservation Biologist for Wildlands Inc. The area is surrounded by orchards; however, they advised us that there has been no evidence of pesticides or fertilizers impacts from these adjacent orchards. The hydrology of the site is managed to maintain target wetness levels for each wetland area. The main distribution of water for the site is synchronized with a back-up well receiving runoff from adjacent irrigation systems and recycled waters within the bank. The hydrology has been designed for gravity flow from ditches in the easternmost section of the site to other areas throughout the bank. They use overflow weirs where areas need to be inundated for longer periods of time. Mr. Swift also mentioned that skunks, voles, beavers, jack rabbits and coyotes are the main disturbances to the mitigation bank. During our assessment we found wildlife and evidence of wildlife to be abundant.

The depressional areas, or as Wildlands refers to the areas, seasonal wetlands, were highly variable in terms of levels of inundation. We randomly selected two assessment areas that included an isolated ponded area (area 17) and a muddy low land (area 1). The freshwater marsh at area 17 appeared to have an altered hydrologic regime and remained inundated for a long-duration of time. Area 1 had saturated soils but no surface water. Area 17 was surrounded by open water, other wetlands and bordered by a riparian area. The CRAM scores for these areas were similar, except that the second site had slightly higher scores for physical and biotic patch richness, vertical biotic structure, and native plant species richness. The short herb stratum dominant species for both sites were *Paspalum dilatatum* and *Eleocharis macrostachya.* Tall herb stratum dominants were *Scirpus californicus* and *Typha angustifolia*. *Salix* sp. and *Populus deltoides* were only found in area 1.

To evaluate the created vernal pools we sampled individual pools and pool clusters. We randomly selected the clusters based on age of creation, then on location within the bank. The three assessment areas all had distinct boundaries based on grading and vegetation. We choose area 18 which encompasses 5.3 acres of vernal pools, as well as area 12 and area 6. The entire area had been inoculated with collections from neighboring vernal pools to assure the establishment of native vernal pool species. The pools were dry at the time of the evaluation. The physical structure of the pools was fairly complex with various patch types present, including soil cracks, mounds, and burrows. According to Mr. Swift, the area is mowed regularly to alleviate problems with invasive non-natives, especially star thistle. All three areas that we assessed received the same CRAM scores for three out of four attributes. There was slight variation among the areas for biotic structure characteristics, mainly due to plant species richness, interspersion, and zonation. Native species found in the pools were *Eryngium vaseyi, Eleocharis macrostachya, Hemizonia* sp., and *Psilocarpus brevissimus.* The dominant species for all pools were native, yet there were few species present. In addition, there were some unidentifiable species, mainly grasses, in the pools due to the time of our assessment.

10495- Rancho Larios Subdivision, Larner Company, San Juan Batista

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
10495	3	San Francisco	2000	64.17	62.01	82.20	82.20

The Larwin Company had previously filled 1.2 acres of wetlands and 426 linear feet of channel for a large residential development (702 acres), and they intended to fill an additional 0.3 acres of seasonal wetlands and 121 linear feet of channel to complete this development. The project occurred at Rocks Road and Highway 156. As mitigation, the permittee was required to create 3.0 acres of wetlands and to restore portions of the creek/channel that were filled or disturbed. The restored and enhanced wetlands were to provide habitat for California red-legged frogs, and one of the five created ponds was targeted specifically for California red-legged frogs. The required creek mitigation consisted of enhancing two intermittent drainages with plantings of willow springs.

We only completed a CRAM analysis for the restored depressional wetlands, with a separate CRAM completed for each of five depressional wetlands; however, based on our observations and the annual monitoring reports, it appeared that the riparian plantings had been completed. This mitigation site scored well in terms of buffer and landscape context, as much of the adjacent area consisted of oak- and willow-dominated habitats. The project also scored well for hydrology. The mitigation area did worse for physical structure and biotic structure, with consistently low-moderate scores for these metrics. The most abundant herbaceous species at the site were non-natives, including *Bromus hordeaceus* and *Hordeum murinum*. Some natives were also abundant, including *Agrostis exarata*. Although no evidence of California red-legged frogs was found, a number of wildlife was seen at the site, including owls, hawks, and a bobcat (adjacent to the CRAM assessment area).

10530- Pleasant Grove Wastewater Treatment Plant, City of Roseville, Roseville

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
10530	5S	Sacramento	2001	100.00	66.92	100.00	100.00

The city of Roseville constructed a pipeline for the Pleasant Grove Wastewater Treatment Plant junction box and outfall structure to flow into Pleasant Grove Creek. This project involved a permit for laying the second series of pipelines. After the construction, the site was graded back to its original contours and revegetated to offset temporary impacts. The project temporarily impacted 0.634 acres of wetland and 0.18 acres of Pleasant Grove streambed. Permanent impacts included 0.490 acres of vernal pool wetlands. A purchase of 0.21 acres of created seasonal wetlands credits and 0.624 acres of created vernal pool credits was made from

Conservation Resources, Laguna Creek Mitigation Bank. Also, 2.156 acres of vernal pool preservation credits were purchased from Conservation Resources, Arroyo Secco Mitigation Bank. An additional 0.18 acres of mitigation was required for the temporary streambed impacts.

Laguna Creek is a mitigation bank located in Sacramento County, at the eastern edge of the county at the intersection of Ione and Meiss Roads. The total bank acreage is 780 acres with 170 acres of restored wetlands and 25 acres of created wetlands. The habitat establishment work was completed in fall 1997, and the bank was established as an official bank on December 31, 1998. The bank is a complex of 45 created vernal pools intermingled with natural vernal pools and 18 created seasonal depressional wetlands. We visited the site with a Conservation Resources consultant from ECORP. The entire area was heavily grazed by cattle and heavily impacted with hoof prints; however, the hoof prints added some topographic complexity to the pools. The pools were dry during our assessment, but we were informed that the area is usually wet about 5 months of the year.

The complex of seasonal wetlands is located along the terrace of the dry Laguna Creek in the southwest section of the bank. This area of the bank has been so heavily impacted by cattle that there was no vegetation over two inches. There also was dung in the wetlands, and the soils were highly compacted. We randomly selected seasonal wetlands 3 and 10 for our sampling and delineated boundaries mainly based on vegetation. Seasonal wetland 3 was slightly less impacted than wetland 10. Both areas scored poorly in physical and biotic structure, with few patch types present. Dominant species for both areas were *Eleocharis macrostachya, Cynodon dactylon* and vernal pool species, *Eryngium vaseyi*.

We sampled vernal pool numbers 6, 21, and 30 and found the same dominant species in individual vernal pools as for vernal clusters. *Eleocharis macrostachya* and *Eryngium vaseyi* were the only two dominants, and they were found at all three sample sites. Overall, pool clusters scored high in landscape context and hydrology. However, individual pools scored poorly in physical patch richness.

10843- Construct Self Storage Units, Robert Wells/Stephenson Family Trust, Murrieta.

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
10843	9	Los Angeles	2002	235.77	41.31	83.30	82.70

This project involved the construction of the Clinton Keith self-storage sites on a 10-acre parcel of land, the widening of Clinton Keith Road, and the construction of Elizabeth Lane. Prior to these impacts, a tributary to Murrieta Creek entered the project site through a culvert under Clinton Keith Road and exited the western boundary of the project site. This channel was mostly replaced by an underground culvert; this was initially done without a permit. One small stretch of realigned stream was retained just upstream of the building site and the Elizabeth lane. A total of 0.041 acres of waters of the US were impacted, including streambed and riparian habitats.

To mitigate for these impacts, the permittee was required to create 0.123 acres of riparian habitat in the northern portion of the site, within the realigned channel. The earthen channel was lined with buried flexblock matting, and vegetated with riparian species. During our site visit we found predominantly mulefat, arroyo willow, narrow leaf willow, sagebrush, cattails, and California poppy. Water enters the site through a 15” outlet inlet pipe and exits though a 15” outlet pipe, thus flow is regulated. We determined the mitigation site was 25% wetland and 75% non-jurisdictional riparian habitat. The banks were still largely barren, as plantings had not spread yet. Erosion control matting, hay bales, and sand bags were in place on the banks and around the mitigation site. The general project site is bordered to the north by residential development, to the west by undeveloped lands, and the east and south by rural residential homes. The mitigation channel is directly bordered by barren, compacted soil that is seemingly used as a parking area.

10938- Aspen Meadows Housing Subdivision, M.A.M, LLC, Lincoln

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
10938	5S	Sacramento	2001	100.22	75.45	100.00	100.00

Aspen Meadows was a 20-acre single family residential subdivision proposed for the city of Lincoln, north of Virginiatown Road and East of McCourtney Road. The project constructed 83 single-family residential units. The impacted area was comprised of substantially disturbed non-native annual grassland and was an abandoned rural residential property. The impacted wetlands included 0.151 acres, of which 0.064 acres were vernal pools and 0.086 were depressional seasonal wetlands. The vernal pools were shallow depressions inundated in the winter and early spring and vegetated with *Lasthenia fremontii, Deschampsia danthonioides, Eryngium vaseyi,* and *Plagiobothrys stipitatus*. The onsite despressional wetlands were similar to the vernal pools in hydrology and topography, but they were highly disturbed. The plant community was dominated by species that are more characteristic of generic seasonal wetlands than vernal pools. Both the vernal pool and depressional seasonal wetlands were potential habitat for vernal pool fairy shrimp and vernal pool tadpole shrimp. According to the latest 401 documents, the applicant purchased vernal pool and seasonal wetland preservation credits at a 2:1 ratio and creation credits at a 1:1, totaling 0.302 acres of preservation and 0.151 acres of creation credits. The 404 permit stated that 0.151 acres were to be filled in the adjacent ravine but did not mention any mitigation. However, Fish and Wildlife Service determined that there was an incidental take and that construction began prior to authorization. Therefore, as a penalty, the purchase amount was increased to 0.903 acres of preservation bank credits and 0.453 acres of creation bank credits. The agreed upon compensation responsibilities were creation credits purchased from Wildlands Sheridan Mitigation Bank and preservation credits from Orchard Creek Conservation Bank.

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The depressional areas, or as Wildlands refers to the areas, seasonal wetlands, were highly variable in terms of levels of inundation. We randomly selected two assessment areas that included an isolated ponded area (area 17) and a muddy low land (area 1). The freshwater marsh at area 17 appeared to have an altered hydrologic regime and remained inundated for a long-duration of time. Area 1 had saturated soils but no surface water. Area 17 was surrounded by open water, other wetlands and bordered by a riparian area. The CRAM scores for these areas were similar, except that the second site had slightly higher scores for physical and biotic patch richness, vertical biotic structure, and native plant species richness. The short herb stratum dominant species for both sites were *Paspalum dilatatum* and *Eleocharis macrostachya.* Tall herb stratum dominants were *Scirpus californicus* and *Typha angustifolia*. *Salix* sp. and *Populus deltoides* were only found in area 1.

11208- Highway 50 Interchange Construction, Shingle Springs, Shingle Springs Rancheria

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
11208	5S	Sacramento	2002	100.00	61.98	0.00	N/A

The project involved the construction of an interchange from US Highway 50 north to the Shingle Springs Rancheria. The interchange constructed was to provide an access route for an economic enterprise to be developed in Shingle Springs, El Dorado County. The area was between a Caltrans right-of-way and an Indian Reservation Road. The project was located in the foothills of the western slope of the Sierra Nevada Mountains. Aquatic habitats in the project region included seasonal and perennial drainages, groundwater seeps, seasonal wetlands, wetland swales, and man-made ponds. The project filled 0.088 acres of unvegetated streambed as part of the construction. The mitigation was offset by a purchase of 0.088 acres of seasonal wetland habitat from Wildlands Inc.

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11224- Stormwater Outfall Construction, Calpine Corporation, south San Jose

File #	Region	Corp District	Cert. Year	% Acreage Met	CRAM	401	Mitigation Plan
11224	2	San Francisco	2002	100.00	47.55	61.40	100.00

Calpine Corporation applied for a permit for the construction of a stormwater outfall into Fisher Creek at the Metcalf Energy Center in south San Jose. The construction of the outfall structure resulted in the placement of rock/cobble on 0.007 acres of existing creek banks. In addition, there was a temporary impact to 0.028 acres of creek bank and bed for the construction of a coffer dam associated with the outfall structure. As mitigation, 4.3 acres of riparian habitat were to be enhanced along Fisher Creek. According to the mitigation plan for this project, the 100-foot setback from the creek was to be reclaimed and planted with native riparian vegetation. The mitigation plan called for a total of 320 native trees to be planted, as well as fencing to prevent cattle access to Fisher Creek and the tree planting areas. Plantings were to include elderberry, valley oak, sycamore, live oak, and coffee berry.

Because this is a energy facility, it was only possible to visit the site with an escort from the Calpine Corporation. They provided us with detailed maps of planting areas and showed us the impact and mitigation sites at the Energy Center. The existing riparian habitat was of medium-high quality; however, the newly planted areas were on adjacent banks that were at much higher elevations than the existing riparian vegetation. It appeared highly unlikely that these sites would ever be flooded by Fisher Creek, as they were at the same elevation as the adjacent Energy Center. It was clear that extensive planting had been completed at the site, with all of the target species above being found. The project scored moderately for buffer and landscape context, as one side of the creek was mostly undisturbed while the other was only narrowly separated from the adjacent Energy Center. It scored very poorly for hydrology, given the almost complete separation from the adjacent creek. The site also scored poorly for physical and biotic structure, as it was very uniform and had been planted only recently. The site had not developed much complexity in terms of vegetative structure. However, the vegetation at site appeared to be actively managed, and few non-natives were found at the site. We could not GPS the entire boundary of this site; however, based on the detailed maps provided, we assumed that the project met the mitigation acreage requirement.

13. Digital Images of Sites