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

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Final Report

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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 resulting compensatory mitigation projects seldom result in wetlands with optimal condition.

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. Ultimately, 143 permit files were assessed; 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, we established categories of wetland condition (optimal, sub-optimal, marginal and poor) based on 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 determined 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 U.S." 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

Of the 143 permit files assessed in this study, 129 had compensatory mitigation sites that could be assessed in the field (the mitigation requirements for the other 14 permit files could be assessed for compliance, such as fee payments to preservation or conservation banks, but there were no compensatory mitigation projects to assess). 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). Many of these 129 permit files had multiple mitigation actions (e.g., wetland creation plus riparian enhancement) that needed to be evaluated separately; a total of 204 discrete mitigation sites were surveyed and evaluated. Of these 204 mitigation projects, 62% were onsite (i.e., within the greater boundaries of the permitted project area) and the rest were offsite. Seventy-five percent of these 204 sites involved permittee-responsible mitigation linked to specific permits files, while 25% involved third-party strategies (mitigation banks or in-lieu fee payments) or were part of larger mitigation projects used by permittees for multiple permits.

We looked at compliance in two ways. First, we assessed the degree of compliance with each condition, with the potential scores for each of these conditions ranging from 0 to 100%, and then we took the average of these compliance scores across all conditions; this is called the "average compliance score." For the 124 files with assessable 401 conditions, the average compliance score for 401 conditions was 84%. Second, we assessed compliance as the percentage of permit conditions that were met completely (100% score) for a particular file (hereafter, percent-met score). The average percent-met score was 73% (Table AB-1). Forty-six percent of the files fully complied with *all* permit conditions. 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. We found high compliance for third-party mitigation requirements (mean score 99%) and relatively low compliance for monitoring and submission requirements (mean score 59%). The mean scores for other compliance categories ranged from 76-85% (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, although these were more commonly included in other permits or the mitigation plan.

CRAM evaluations were conducted at each of the 204 discrete mitigation sites. 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 based on the criteria we established from reference wetlands across the state. Mitigation sites had an overall mean score of only 59% (Figure AB-2). On average, sites scored better for biotic structure (e.g., plant community metrics) than for the hydrology attribute (Figure AB-3). 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). We did not assess function at impacted sites, nor did we assess function at the mitigation sites before the mitigation action was taken; therefore, it was not possible to compare directly the functions lost through permitted activities to those created through compensatory mitigation.

The 143 Section 401 permits 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 and restoration mitigation (true gains), our results showed that "no net loss" *of acreage* is being achieved (1) overall, (2) for jurisdictional "waters of the U.S." 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 overall acreage losses and gains does not provide the full picture of "no net loss" of wetland acreage (much less wetland function, discussed below). A simple accounting assumes no existing wetland acreage was present at the mitigation site prior to any mitigation activity (not always the case) and it does not address whether the habitat types mitigated were appropriate given the corresponding impacts. 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 U.S." 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 U.S." while in mitigation planning, a broader definition of riparian has often been applied that includes the entire zone of transition to fully terrestrial habitats, including non-jurisdictional habitat.

In comparing results from permit compliance, acreage requirements and wetland condition, we found little relationship between these different aspects of mitigation. For example, meeting acreage requirements was not related to 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). Given the low ecological condition of most mitigation wetlands, it seems likely that many mitigation projects did not replace the functions lost when wetlands were impacted, and hence that the goal of "no net loss" of wetland functions was not met, but this study cannot provide a definitive conclusion on this issue. To understand the net loss (or gain) in wetland function resulting from mitigation, functional assessments would be needed at the impact site before and after the impact occurred to determine the loss of functions, and at the mitigation site before and after the mitigation project was completed to determine the gain in functions. Linking gains to losses is difficult in a retrospective study such as this, and we have not attempted to do so. However, the low CRAM scores for most mitigation projects indicates that many of these projects are not functioning well as wetlands, and in the context of the likely condition of the original wetlands before they were impacted, it seems probable that a net loss of wetland function did occur for the wetlands included in this study.

The functional deficiencies of the mitigation projects and the likely failure of many projects to compensate for the loss of wetland functions 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 with conditions or criteria that are too heavily focused on the vegetation component of wetland function, with inadequate emphasis on hydrological and biogeochemical conditions and their associated functions and services (e.g., flood attenuation, water quality improvement).

Recommendations

The results of this study have informed a large number of recommendations (Table AB-5). The recommendations are separated into five main categories.

First, we present recommendations aimed at improving mitigation requirements. These recommendations mainly concern 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. Retrieving specific permit files was problematic during this study. Of the 429 files we sought, we could locate only 257 despite extensive efforts to do so. 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 State Water Resources Control 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. Compliance varied across condition categories with relatively high scores for third-party mitigation requirements and relatively low scores for monitoring and submission requirements. 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 (although some monitoring reports may have been submitted by permittees but not placed in permit files). 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 a similar study for the Los Angeles Regional Water Quality Control 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. The average compliance score was calculated by assessing the degree of compliance with each condition, with the potential scores for each condition ranging from 0 to 100%, and then averaging these compliance scores across all conditions. 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%. The average percent-met score was calculated based on the percentage of permit conditions for a particular file that were met completely (100% score). Compliance was assessed for conditions included in the 401 permit and for all conditions included in the corresponding mitigation plan.

	N	Score	Successful	Partially Successful	Failure
Average 401 compliance score	124	84.3%	76%	20%	4%
Average 401 percent-met score		73.3%	57%	30%	13%
Average mitigation plan compliance score	81	80.7%	68%	32%	0%
Average mitigation plan percent-met score		67.6%	48%	35%	6%

Table AB-2. Section 401 compliance for different compliance condition category (N=143 files). All conditions were grouped into general categories to look for patterns in compliance with different types of permit conditions. Condition scores that could not be determined were labeled ND (Not Determinable). N/A indicates not applicable.

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

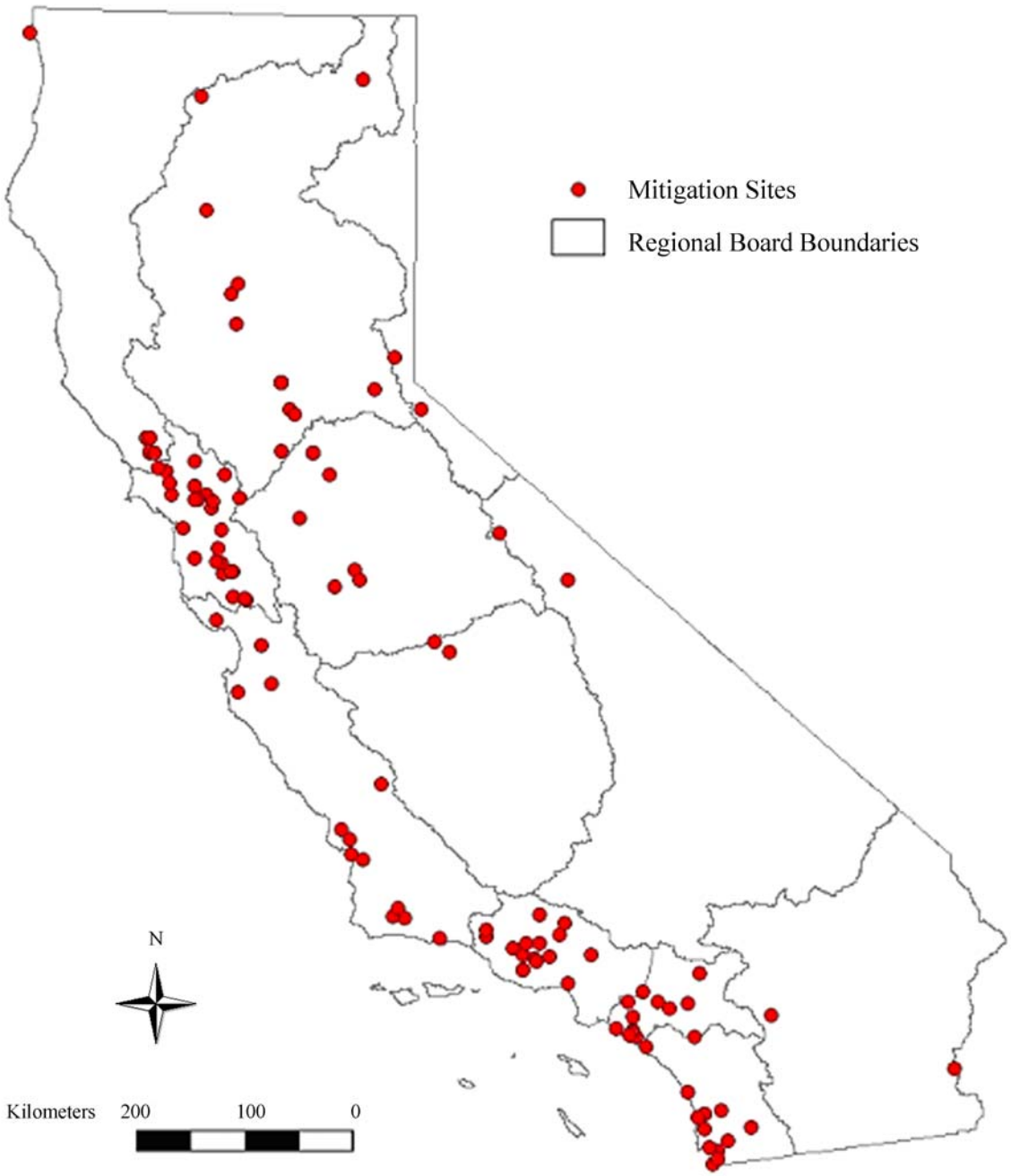

Figure AB-1. Statewide distribution of the assessed mitigation sites associated with the 143 permit files. Several of these sites, especially those in the central valley (Region 5) involved a collection of shared mitigation banks which resulted in fewer than 143 mitigation sites. Points represent each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

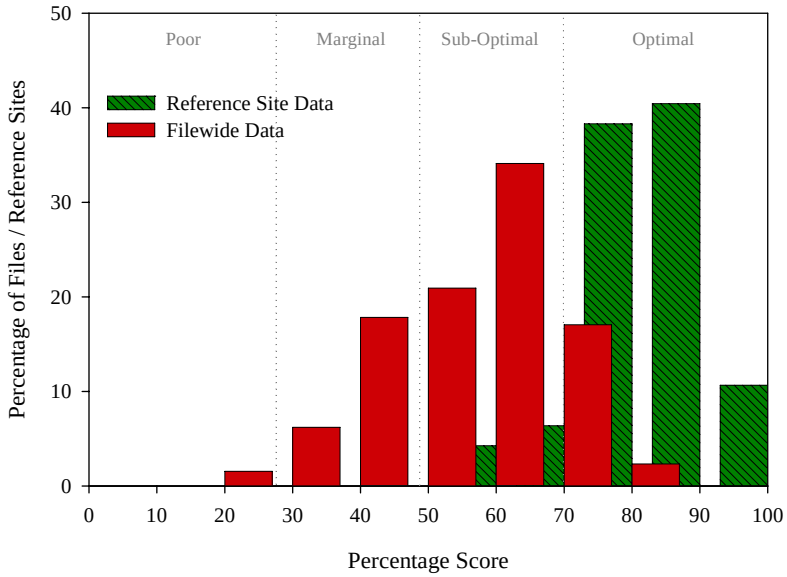

Figure AB-2. All CRAM data combined into a single overall wetland condition success score for each of the 129 files and 47 reference sites evaluated using CRAM.

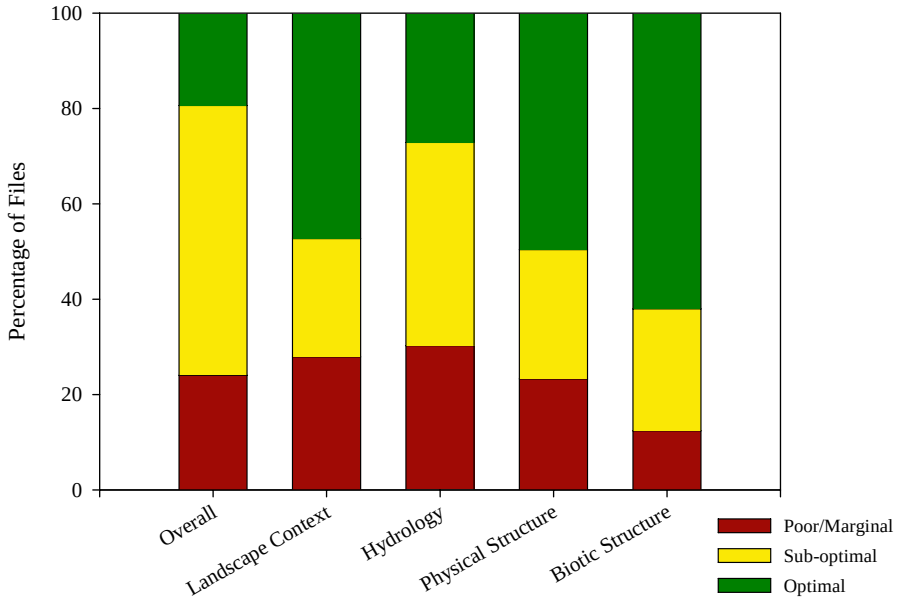

Figure AB-3. Percentage of files in CRAM success categories for overall CRAM scores and the four main attributes. For overall CRAM scores, optimal was considered 70 to 100 percent, sub-optimal was 49 to 70 percent (lower and upper bounds not inclusive), and marginal to poor was 49 percent and below. 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 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.

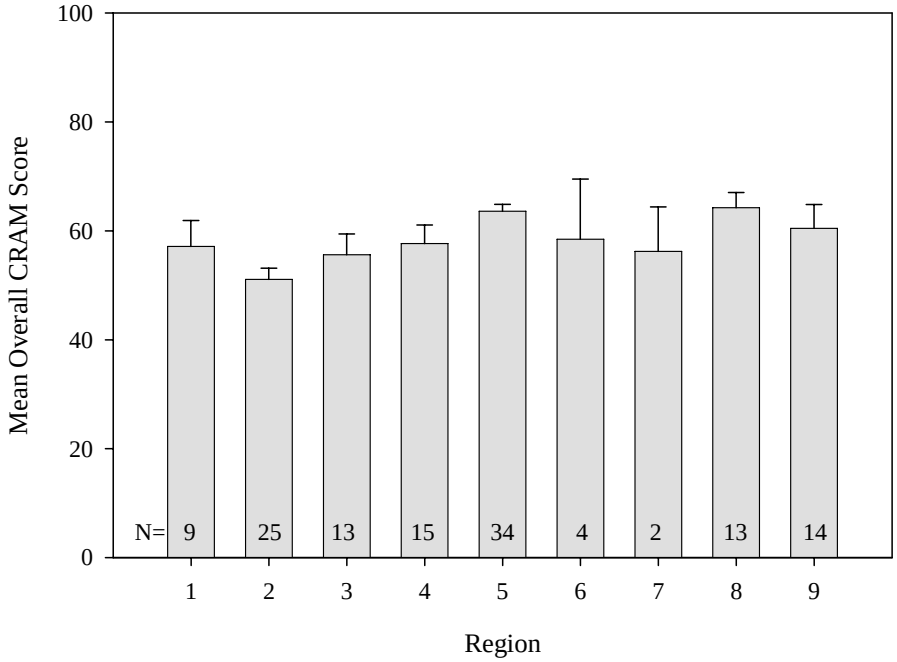

Figure AB-4. File-wide mean Total-CRAM percentage scores by State Board region (N=129 files).

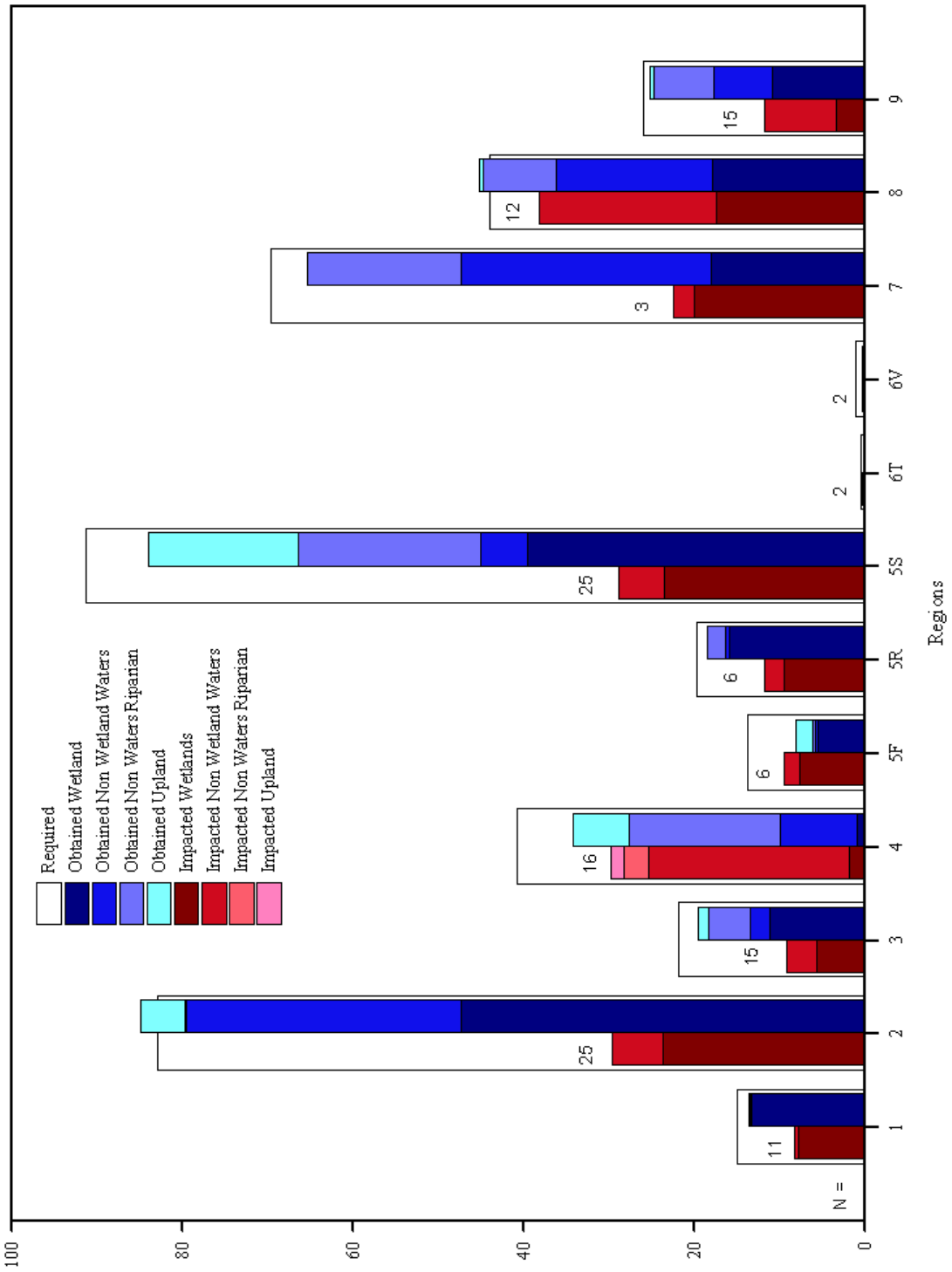

Figure AB-5. Total acreage impacted and obtained proportioned into jurisdictional wetland, and non-wetland "waters," or riparian and upland habitats by State Board region. Total required acreage per region is also displayed. N displayed = number of files assessed per region for both impacted and obtained. Total N=138 files (there were five files for which wetland acreage was not specified for "waters of the U.S.").

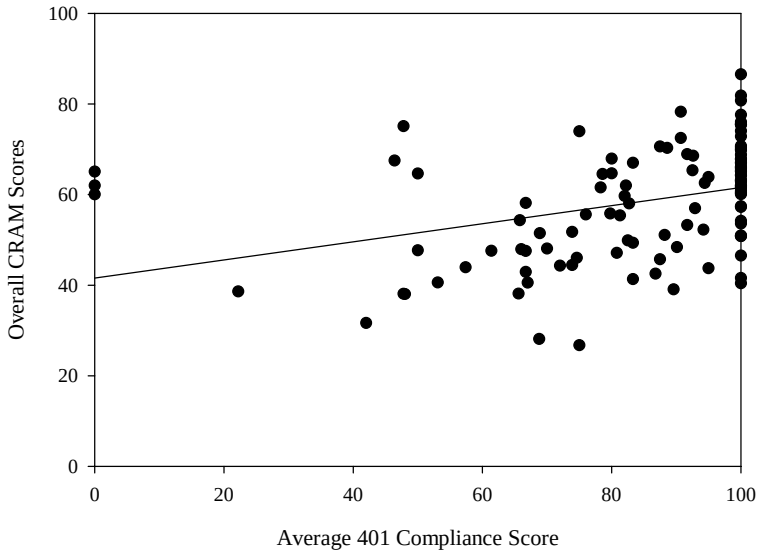

Figure AB-6. Correlation analysis between average 401 permit compliance score and overall file-wide CRAM score (N= 110 files; r^2=0.126, p=0.000).

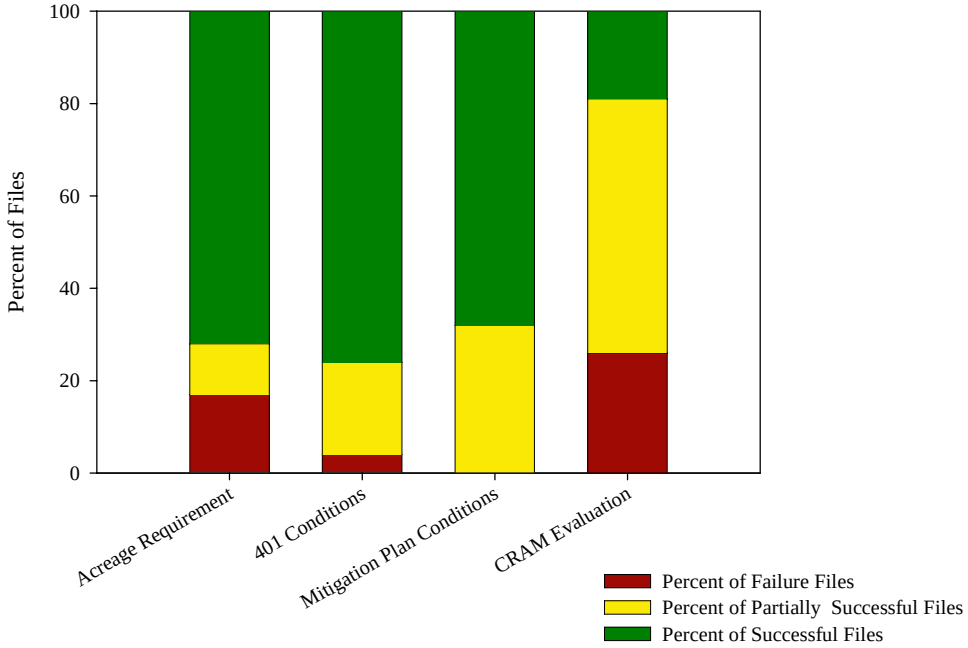

Figure AB-7. Mitigation success by permit file for each evaluation category: acreage requirement, 401 conditions, mitigation plan conditions, and wetland condition. Data shown for acreage and compliance are percentages out of a total number of 143 permit files. Wetland condition data are % out of 129 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 mitigation plan 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 49% and below.