An Assessment of Wetland Mitigation Practices Pursuant to Section 404 Permitting Activities in Washington State*

INTRODUCTION

Of the many issues associated with the Clean Water Act Section 404 program, the one debated most often is the policy of replacing natural wetlands with created or "artificial" wetlands. The concept, which has come to be known simply as "mitigation", originated as a method to allow development to occur without suffering a net loss of wetland habitat. (1)

Habitat creation is a concept which has long been used in the management of wildlife preserves. Eventually the idea was applied within the regulatory arena to offset or mitigate for resources lost to development. Not surprisingly, it has been readily accepted within the Section 404 permitting process. But, after the approval and construction of numerous wetland mitigation projects, various researchers began to question their success. The cries for caution are best summarized by Zedler's (1986) statement that "on a national level, the technology of wetland creation/restoration is experimental and unpredictable."

Today, realizing that habitat creation may not work, regulators often cite this lack of technology for creating wetlands as the reason for many project failures. This statement may be well-founded. However, a closer look reveals that other factors are contributing to the poor success rates. Inadequate mitigation negotiation, documentation, planning, monitoring, and enforcement may doom many projects before they ever reach a stage at which we can blame technology. The focus of this study was to evaluate the effectiveness of the mitigation negotiation and planning process in achieving the intended goal of offsetting the loss of wetland ecosystem.

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(1) For the purposes of this study, the term mitigation is defined as compensation for wetland losses in the form of wetland creation, restoration, or enhancement.

METHODS

Each mitigation project was evaluated for content of the mitigated agreement, compliance with the agreement, and a qualitative assessment of the habitat types, functions and values of the original wetlands compared to those planned for replacement. Habitat types were defined according to the USFWS classification system (Cowardin, et.al., 1979).

Data were obtained from EPA and Corps of Engineers (COE) project files, from interviews with persons involved with the various projects, and from qualitative field assessments. Only projects located in Washington State and permi ted between 1980 and 1986 were considered (no mitigation projects were discovered prior to 1980). To cooperate with a national study by EPA's Corvallis Environmental Research Laboratory (CERL), all data gathered were entered into the Wetlands Values Database, a computerized system designed and provided by CERL. The database included information on both the original wetlands permitted for development, and the mitigation sites.

RESULTS

Thirty-five mitigation projects were identified as having been approved via the 404 process between 1980 and July of 1986. Table 1 illustrates the temporal distribution of these projects over the seven year period; Figure 1 depicts the geographic distribution of the projects. After reviewing the data, several trends and conclusions surfaced:

1. Few wetland losses under Section 404 were mitigated.

2. The number of mitigations required increased steadily since 1980.

Table 1. Temporal distribution of required mitigation projects

Year	Number of Projects
1980	1
1981	1
1982	4
1983	5
1984	9
1985	6
1986	9
TOTAL	35

3. Mitigation projects occurred most often in the more densely populated areas of the state. Western Washington projects were more often mitigated than those in Eastern Washington.

4. With mitigation there was still a substantial net loss of wetland acreage.

5. With mitigation there was a net loss of wetland diversity.

6. Not all wetland functions and values were considered or replaced.

7. Wetland losses occurred in time as well as in space. Temporal losses were not taken into account.

8. Mitigation designs were not effectively incorporated into the final 404 permits.

9. There was no routine procedure for tracking the functional success of all mitigation projects.

Few Wetland Losses Under Section 404 are Mitigated

Less than 1% of all Section 404 permits required mitigation (2). In an effort to understand why this was true, we compared the size of development projects involving mitigation. The average size of permitted development projects involving mitigation was 4.3 acres, while the average size of all §404 projects with or without mitigation was approximately .5 acre (3).

Apparently there is a tendency to seek mitigation for the filling of larger wetland parcels rather than for all wetland losses. This may be due to (a) the large number of permits issued each year. Pursuing mitigation for projects under one acre may not be considered an effective use of agency staff time. And/or (b) agencies may not yet recognize the significance of smaller wetland losses. Published data on the cumulative effects of small §404 projects is sparse and has not yet drawn close attention or wide recognition.

With Mitigation There is Still a Substantial Net Loss of Wetland Acreage

Few applicants (7 of 35) proposed to compensate lost wetland acreage on a 1:1 basis; fewer (6 of 35) proposed compensating wetland acreage on a greater than 1:1 basis. Between 1980 and 1986, mitigation negotiations resulted in the exchange of 152 acres of natural wetlands for 100 acres of created/restored wetlands--a replacement rate of only 67% (Figure 2).

(2) Data compiled in EPA Region X Wetland Tracking Database.
(3) Ibid

Further losses occurred when mitigation projects fail to develop as planned or were never constructed. In this study, 5 mitigation projects were not constructed or restored as negotiated. Because formal procedures for designing and implementing mitigation projects were not in place, these mitigation agreements "fell through holes" in the process and are not likely to be initiated even though development occurred.

A margin for error is clearly needed. In order to better offset losses, some amount of wetlands in excess of that lost must be planned for replacement. This is supported by researchers in California who also have reported that mitigation wetlands typically need to be larger than the original wetlands to achieve intended goals (Race, 1985; Eliot, 1985; Baker, 1984).

Mitigation Resulted in a Net Loss of Wetland Diversity

A wetland area may contain one or more habitat types. For example, one system may contain open water, creek bed, emergent vegetation, and a forested tract. For many of the projects surveyed (16 of 35), replacement of this diversity was not fully mitigated.

In this study, 73 wetland habitat types were permitted to be filled; 49 habitat types were proposed for mitigation--a net replacement rate of 67% (Figure 3). This loss was not equally distributed over the major wetland types (Table 2). Estuarine systems lost the least diversity even though they absorbed the largest number of projects. The prevailing emphasis on preserving anadromous or other commercial fishery habitat by the public and resource agencies may be the reason for this.

In contrast, no forested wetlands were replaced. Forested wetlands are complex systems which take many years to mature. It is likely that the ecological understanding of these habitat types was not sufficient to create them and, therefore, replacement was not required.

It is not necessarily a mitigation goal to produce more wetland types than are lost to development. A small, diverse wetland may be less ecologically important than a larger system with less diversity. However, the loss of diversity may indicate that current mitigation practices fall short in replacing wetland functions and values.

Not All Wetland Functions and Values Are Considered and/or Replaced

Specific replacement goals are stated in most mitigation project files. For example, intertidal wetlands may be created to improve fishery habitat or have a dual goal of enhancing fishery and shorebird habitats. We compared a number of functional values that were associated with the developed wetlands with the number of intended values of the mitigation projects (Figure 4). The following is a list of the ecological wetland functions that were considered: (4)

- fisheries habitat
- wildlife habitat
- ecological food chain support
- endangered species habitat
- nutrient retention
- sediment trapping
- flood storage and desynchronization
- uniqueness/rareness

The ecological functions lost were assessed using a qualitative method created for this study. Only functions rated as having a "high" potential value with respect to the original wetlands, were included in this comparison. Similarly, only those functional objectives of the mitigation projects that were documented somewhere within the project files were included.

The assessment revealed that 128 functions provided by the original wetlands were lost to development while the stated objectives of the mitigation projects only sought to replace 78 functions. The results (Figure 5) support Baker's (1984) observation from San Francisco Bay studies; the objective of almost all mitigation plans is to secure fish and wildlife habitat rather than to replace the full spectrum of wetland values. Sediment trapping, nutrient retention, and shoreline stabilization are usually not considered for replacement.

This type of comparison is helpful for evaluating the mitigation process. However, one should realize that although a given function may not have been specified for replacement, it may develop via natural processes. To an unknown degree, these inadvertent "gains" may be offset by the fact that not all planned objectives are fulfilled. To better anticipate these trade-offs, more research and better planning are required.

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(4) As we lacked the tools to adequately evaluate groundwater recharge and discharge, these functions are not addressed even though they may be in operation.

Wetland Losses Occur in Time As Well As In Space

Substantial time lags exist between project construction and mitigation completion (Figure 6). Between 1981 and 1984 the time lags ranged from 45 to 165 weeks. These lag times are underestimates. Many of the projects permitted in 1985 and 1986 have only recently been initiated and, therefore, have time lags which are still accruing. Data represent an average lag time as of 4/87, reflecting a minimum possible value. Projects with development impacts not yet initiated have not been included in this evaluation. Also, the mitigation completion dates were obtained from the contractors and represent official construction completion dates--not the beginning of ecological function, which is assumed to evolve sometime later.

Of the 26 completed projects (9 have not been completed), in only 2 cases was the mitigation project complete prior to the destruction of the original wetland. These extensive time lags represent losses of at least 1 to 3 growing seasons per project. In none of the projects reviewed was the loss of resource functioning time considered as a value requiring compensation.

It appears that much of the lag time between project impact and mitigation completion is due to delays in initiating the mitigation project. The time lags will diminish as mitigation projects are initiated earlier. Unless mitigation is completed prior to destruction of the original wetland, this functional loss of habitat will continue to occur and should be acknowledged in the negotiations.

Mitigation Designs Were Not Effectively Incorporated Into the Final 404 Permits

Documentation of mitigation plans and their various components within the §404 permits was inconsistent and incomplete. Figure 7 illustrates how these permit specifications varied over the seven year period. In only 22 (63%) of the 35 issued permits requiring mitigation was the concept of mitigation even mentioned. Resource agencies required monitoring studies in 18 cases (51%), but in only 11 permits (31%) were the monitoring requirements actually documented.

Nineteen of the 35 permits (54%) included some type of design criteria. No criteria were mentioned prior to 1982. The following is a list of the various design criteria included in the permits reviewed:

- acreage of the mitigation
- location
- methods of construction

- objectives (mitigation goals)
- completion deadlines
- authorization deadlines (to make application for mitigation within a certain timeframe)
- contingency planning (if certain performance standards are not satisfied)
- maintenance requirements
- performance bonds

If any of the above design criteria were incorporated in the written permit, permit blue print, or blue print notes, it was included in this tally (Figure 8). No permits included all of the above criteria and 16 permits (46%) did not specify any. The design criteria most frequently incorporated into the permit were area, location, and construction methods. Though these are potentially the easiest to enforce, they do not determine or guarantee ecological success.

Routine Follow-up For Mitigation Projects is Lacking

Since wetland restoration and creation is still an experimental science, there are expectations that even the best intentioned and designed projects may not function as planned. Clearly, routine follow-up in the form of compliance tracking, project monitoring for success/failure, and contingency planning are needed.

There was no routine procedure for tracking mitigation compliance. This may have contributed to the fact that 5 mitigation projects were never constructed or restored as negotiated. Monitoring was required in 18 of the 35 mitigation projects. Contingency planning was only required in 3 of 35 projects. Monitoring studies applied within the mitigation process should trigger the use of contingency plans as needed, and yet these two project components were rarely required together.

To date, there is no consistent, standardized process for negotiating, planning, implementing, or evaluating wetland mitigation projects. No single agency, federal or state, maintained comprehensive records of wetland mitigation projects. The information contained in federal agency Section 404 project files was dispersed and incomplete. Monitoring results were sparse, construction/restoration completion dates were inconsistent, and the degree of functional success was rarely documented.

The fragmented regulatory design of the Section 404 program invites this chaos. The multiple agency approach may offer some check and balance advantages, but it inhibits effective project management with respect to wetland mitigation. Either (1) an assemblage of regulatory agencies must monitor, analyze results, and respond to inadequacies; or (2) this responsibility must be assigned. Zedler (1986) cites the importance and advantage of an adaptive management-type approach which would allow the developer some freedom to determine the most effective methods in meeting mitigation goals while still fulfilling specific requirements. In view of the awkward alternative, this recommendation may be a good one. But in order for regulatory agencies to learn from the process, they must remain informed through efficient project follow-up--a prerequisite to adaptive management.

RECOMMENDATIONS

Our understanding of wetland ecosystems is far behind that needed to consistently replace lost wetlands. The rates of mitigation failure and wetland losses are higher than we might expect. This may be partially attributed to the failure of regulatory and resource management agencies to adequately negotiate, plan, and track mitigation projects.

Filling of wetlands will continue until the public places a higher value on the resource. Because of this fact, regulators will continue to require mitigation to offset the losses. We do not recommend that all mitigation work be abandoned; as Race (1985) states "the technology is an important tool for balancing the demand for coastal development with the need for the conservation of wetland habitats." However, we do recommend significant improvement in the mitigation process to ensure a higher degree of success for created/restored wetlands and to reduce net losses. Mitigation negotiations have improved over time, but serious inconsistencies still exist.

Several authors have recommended procedures for the development of mitigation plans which, in theory, might improve our chances of resource replacement both at the negotiated level and in reality (Race, 1985; Race and Christie, 1985; Baker, 1985; Zedler, 1986; Harvey and Josselyn, 1986; and Cooper, 1987). We have compiled their recommendations and our own in the following list of criteria for mitigation projects:

ELEMENTS NEEDED IN MITIGATION PLANS

1. Ecological Assessment of Wetland(s) To Be Lost Through Development. It is critical to understand the chemical, physical, and biological interactions of a system in order to replace it.

2. Statement of Goals. The mitigation goals should include a discussion of the functions and values lost, and those planned for replacement.

3. Methods. The questions of what, where, when, and how should be answered, i.e., acreage of mitigation; wetland habitat type(s) to be constructed/restored; location; dates for beginning and completion of the project; methods of construction; and maintenance requirements. Ensure fair compensation in both time and space, by requiring more acreage for replacement than that lost to development.

4. Standards of Success. A qualitative, and to the extent possible, a quantitative description of what will be considered a successful, functioning wetland must be included.

5. Monitoring Strategy. Design a monitoring system to determine whether or not the mitigation goals and standards of success are met.

6. Contingency Plan. If the mitigation should fail or only partially succeed, a plan outlining possible restorative measures is necessary. A performance bond should be included to ensure the applicant's compliance with the terms of the mitigated agreement.

To ensure that all the above criteria are included, a single, structured format for the development of mitigation projects should be developed. Lack of information and conflicting agency goals for wetlands regulation have resulted in the haphazard and ineffective process existing today. All information and all requirements and monitoring results pertaining to mitigation projects should be located in at least one comprehensive file system. Similarly, a complete mitigation plan should be attached and alluded to within the 404 permit from which the agreement originated.

Mitigation plans should be discussed with all agencies and groups involved with the permitting process. Agencies' goals for wetland habitats sometimes differ. It is important to consider these during negotiations.

And finally, it is important for policy and decision makers to realize that mitigation is not "the only answer" to development/preservation conflicts. We must fully understand the limits of the technology of wetland creation. Some habitats (e.g., bog systems) cannot be replaced within our short time references. This understanding must be reflected in the implementation of public policy.

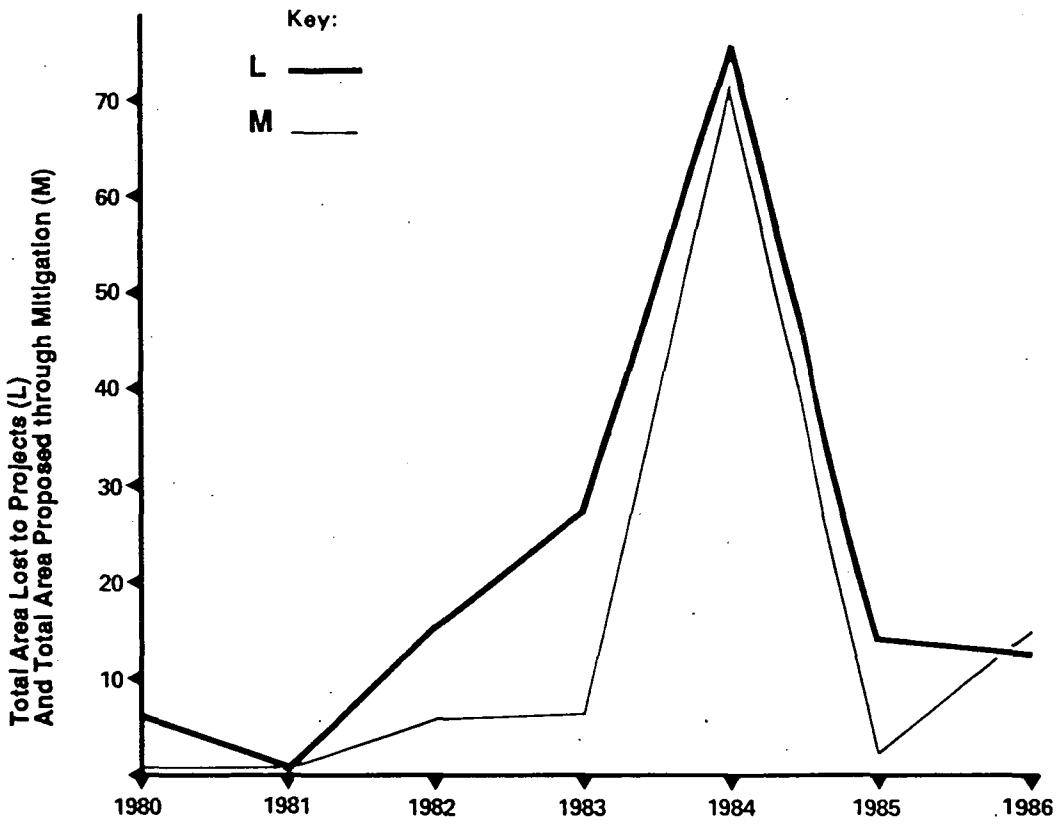

Figure 2
Mitigation Area vs. Project Impact Area

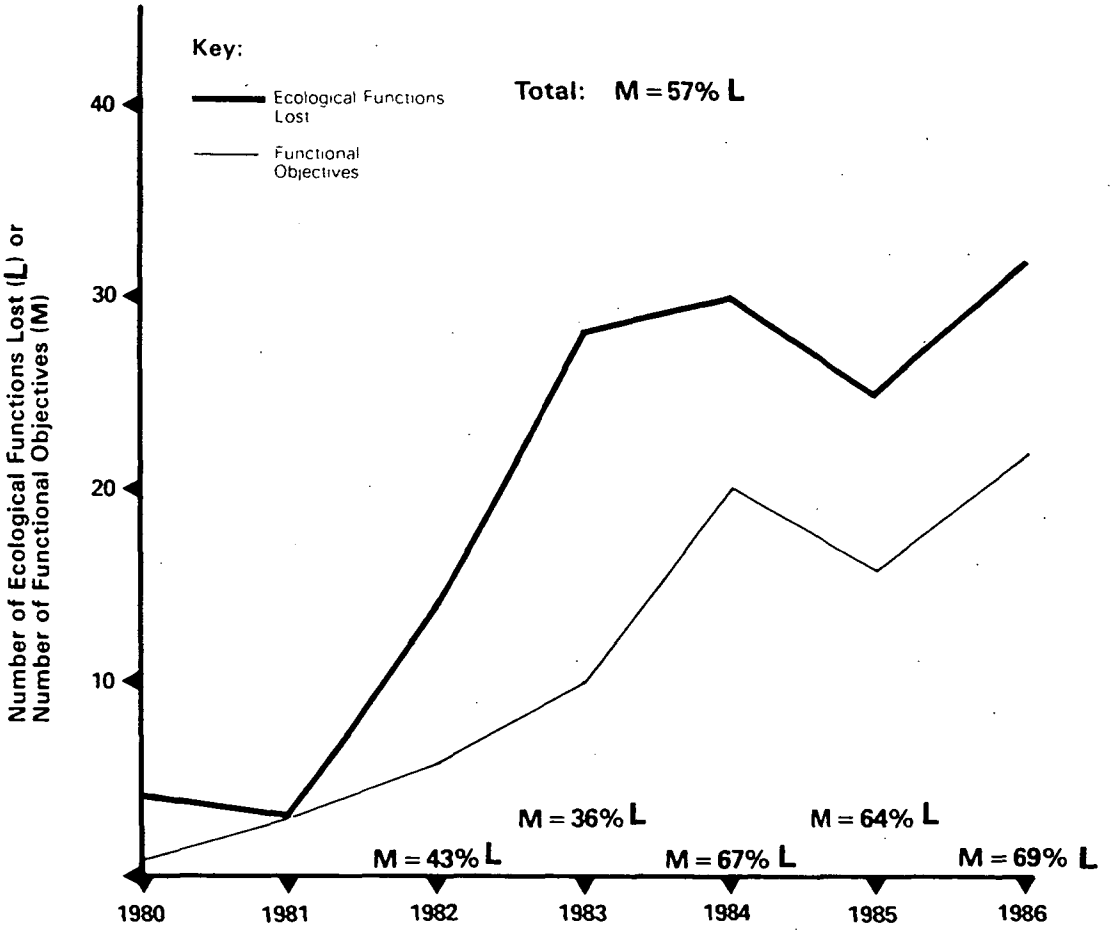

Figure 4
Wetland Functions Lost to Development vs. Functional Objectives of Mitigations

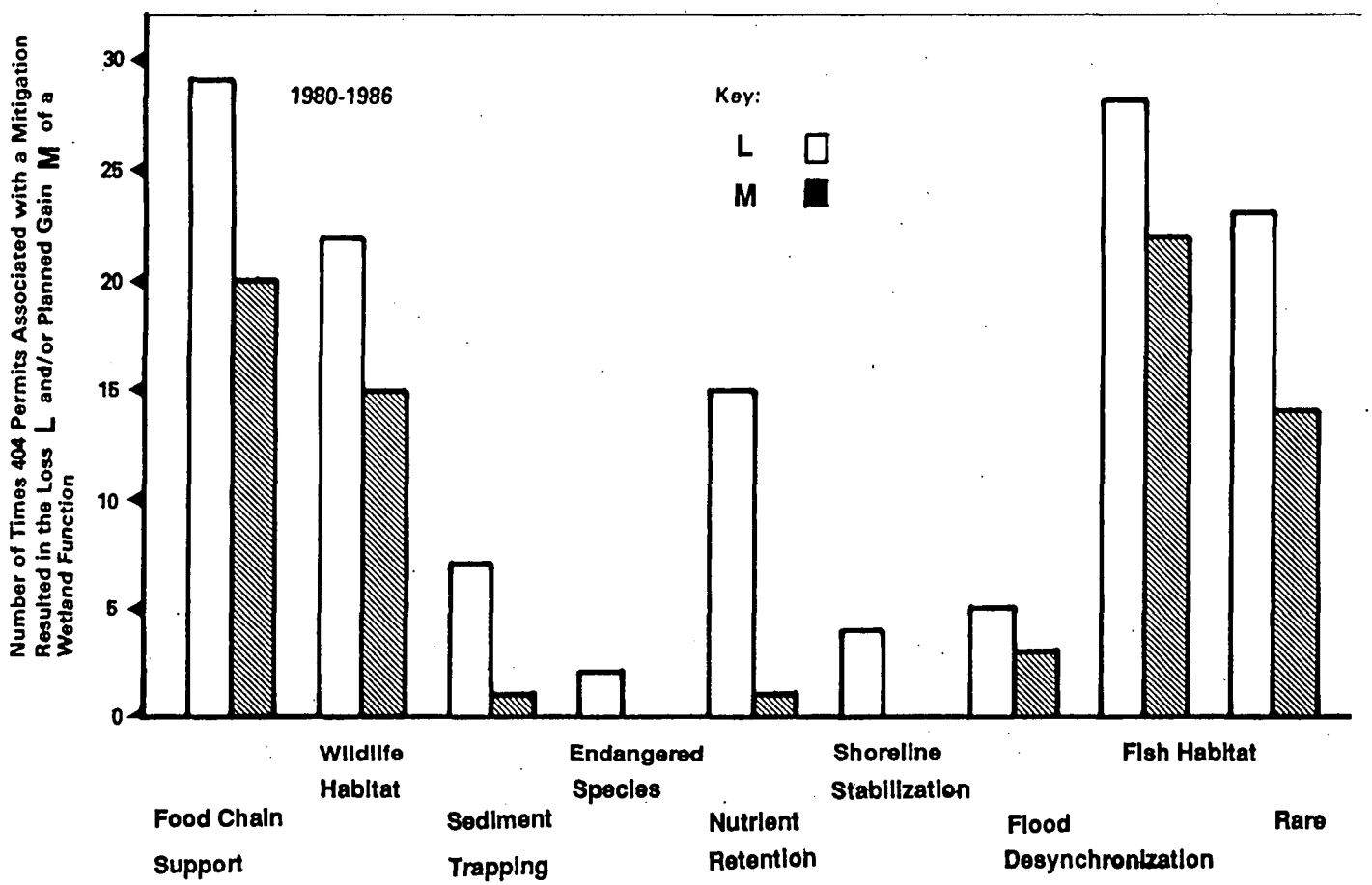

Figure 5
Total Number of Functions Lost vs. Mitigation Functional Objectives

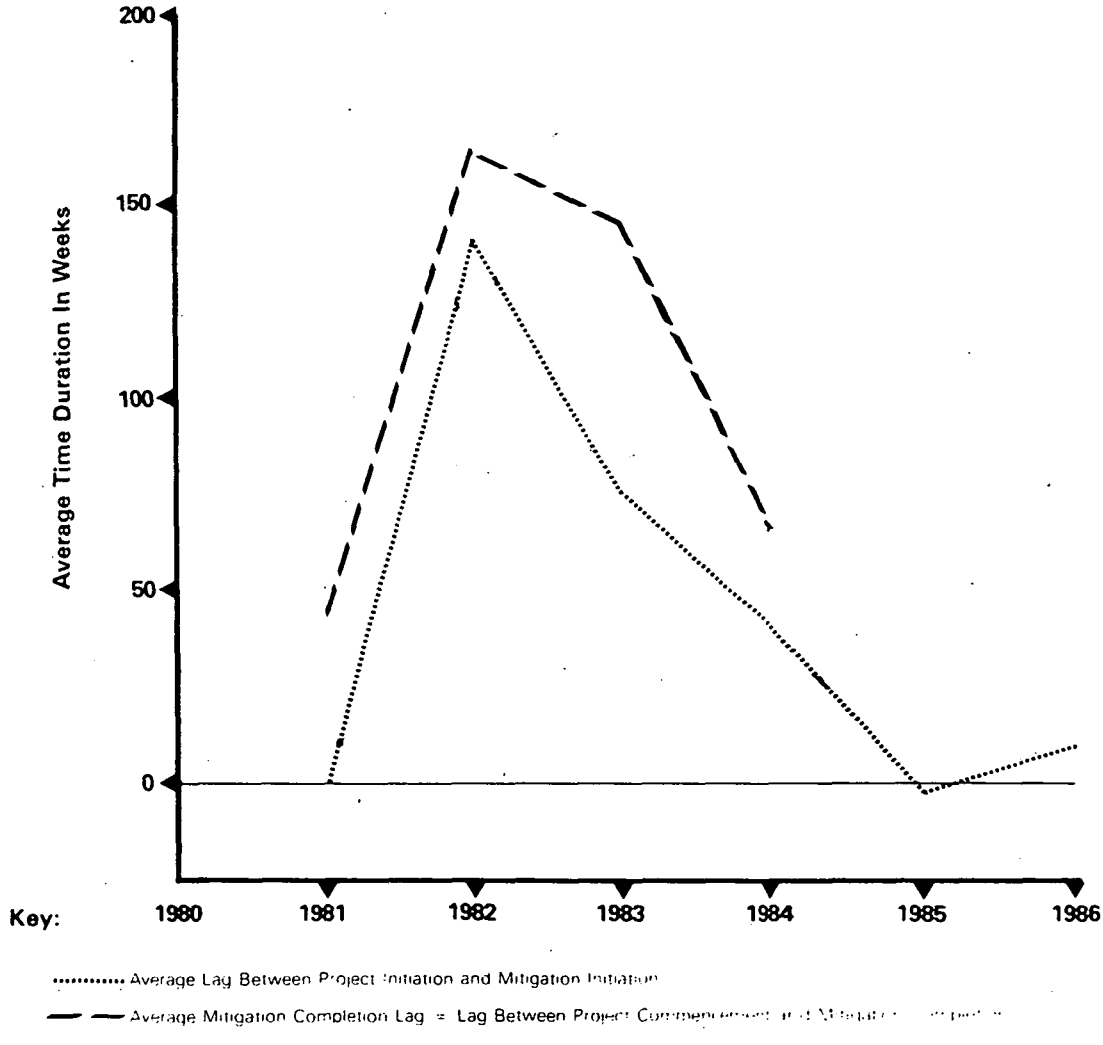

***Figure* 6**
Time Lags Within the 404 Mitigation Process

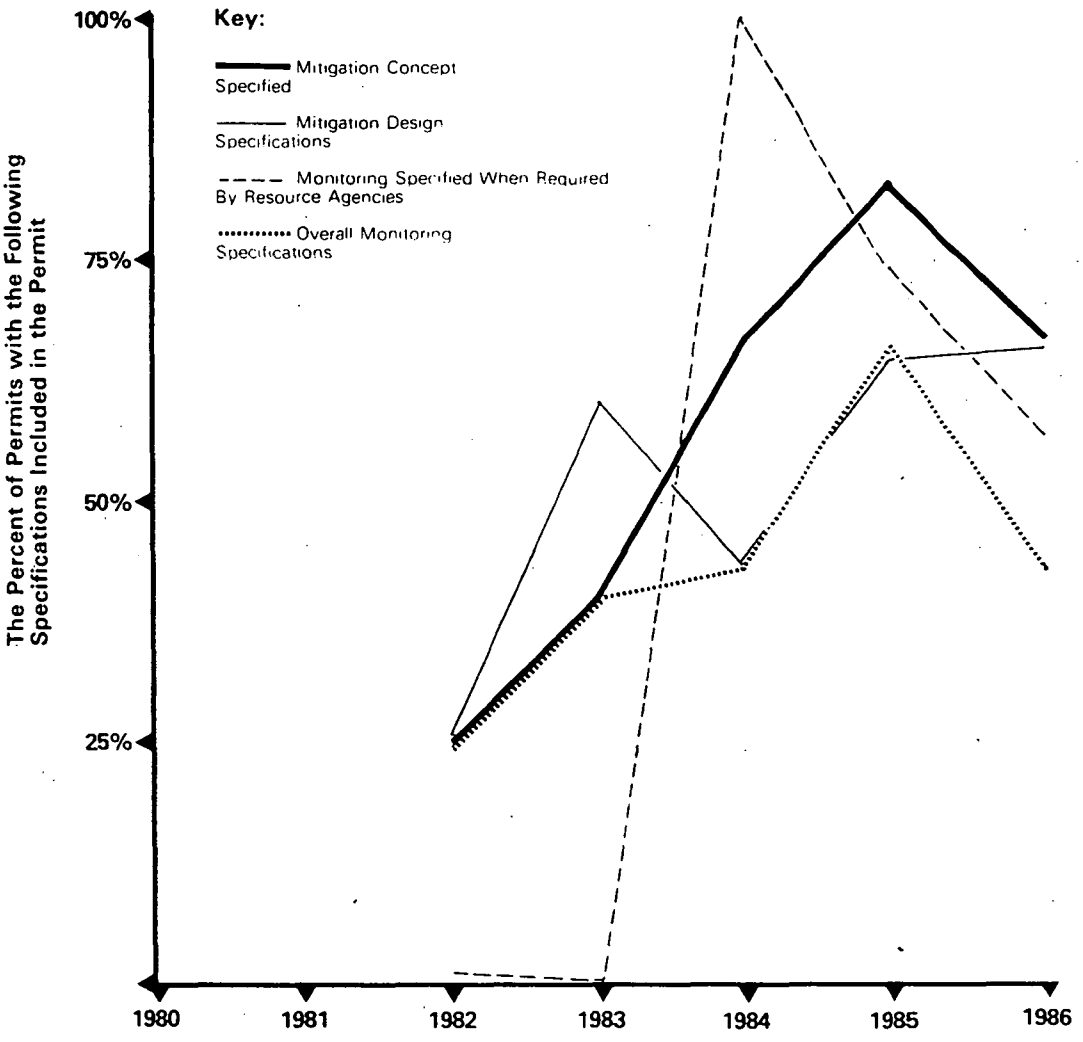

Figure 7
Permit Specifications

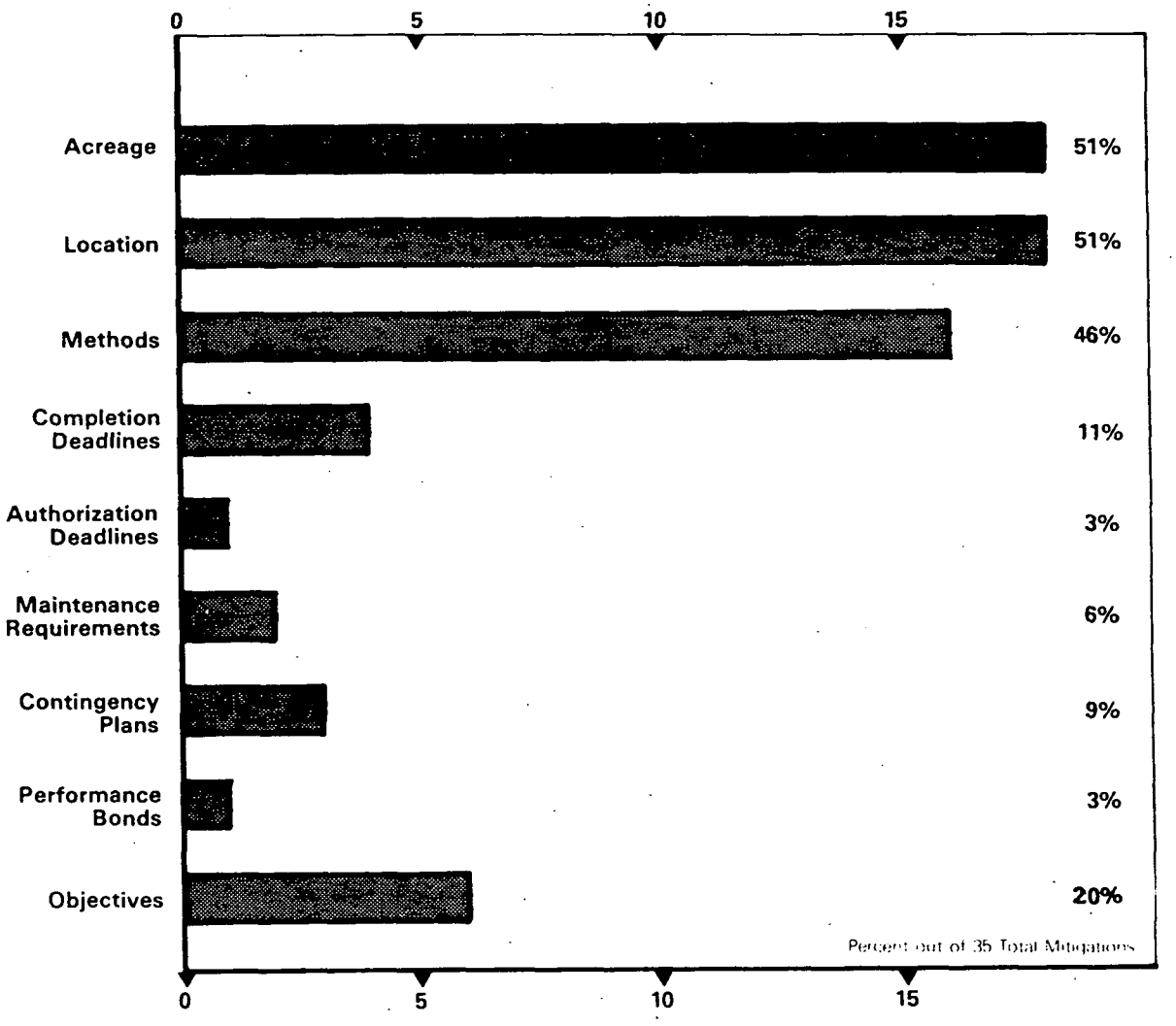

Figure 8
Total Number of Times Mitigation Design Criteria Were Specified in the 404 Permit

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