AN EVALUATION OF WETLANDS PERMITTING
AND MITIGATION PRACTICES IN NORTH CAROLINA

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ABSTRACT

Wetland permits issued under Section 404 of the Clean Water Act, as well as the North Carolina Coastal Area Management Act and Dredge and Fill Act were reviewed to determine the effects of regulatory decisions on North Carolina’s remaining wetland resource. Selected compensatory mitigation projects throughout North Carolina were then visited to determine the degree of implementation and likelihood for success.

From 1991 to 1993, 1,702 permits were issued, affecting 2,152 acres of vegetated wetlands. Nearly 74 percent of the area affected resulted from activities authorized under general permits. Sixty-two permits required compensatory mitigation. Twenty-four percent of the area permanently impacted received compensation. The 608 acres of compensation provided through wetland creation, restoration, enhancement and preservation offset only 40 percent of permanent impacts. Permitted activities resulted in the net loss of about 409 acres of vegetated wetlands per year.

Only two of 41 compensatory mitigation projects visited that were supposed to have been completed were never implemented. While most projects were successful in creating some amount of jurisdictional wetlands, the majority failed to meet project goals based on planned size and/or community type. The case-by-case application of mitigation, regulatory preferences for on-site compensation and reliance on permittees to plan and implement mitigation projects contributed to the general mediocre quality of the compensation provided.

Recommendations for improving current wetlands permitting and mitigation practices at both the program and project levels are suggested.
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SUMMARY & CONCLUSIONS

Wetlands development in North Carolina is regulated by Sections 404 and 401 of the Clean Water Act (CWA), as well as the state’s Coastal Area Management Act (CAMA) and Dredge and Fill Act. CWA Section 404 requires permits for development activities in jurisdictional wetlands, and Section 401 requires that states certify that a proposed activity will not result in a violation of state water quality standards. Permits issued under these laws require developers to avoid, minimize, and often compensate for wetland impacts. This report presents results of a study to characterize the effects of wetlands development permits on North Carolina's remaining wetland resource and to evaluate the adequacy of existing mitigation practices required by wetland permits to achieve no-net-loss of wetland acreage (used as a surrogate for wetland functions and values.)

Study objectives were accomplished through a comprehensive review of the wetlands permit record in North Carolina and on-site evaluation of selected compensatory mitigation projects statewide. Information on 1,768 projects requesting Section 404/401 authorization to impact emergent vegetated wetlands during a three year period (1991-1993) was compiled from state and federal agencies, including the N.C. Division of Environmental Management (DEM), N.C. Division of Coastal Management (DCM), N.C. Department of Transportation (DOT) and the U.S. Army Corps of Engineers, Wilmington District (Corps). A Section 401 water quality certification is a necessary prerequisite for obtaining any wetland development permit issued in North Carolina. Information contained in original permit files was used to supplement the database, as necessary, and provided important information about the mitigation planning process. In addition to the analysis of wetland permits, 41 compensatory mitigation sites throughout North Carolina were visited. On-site evaluation of compensatory wetland creation and restoration projects was necessary to assess project implementation, success, and ecological viability.

Results of this comprehensive review of wetland development permits and compensatory mitigation projects suggest that current mitigation practices are not sufficient to fully offset permitted wetland impacts or achieve no-net-loss of wetland acreage. Two primary factors contribute to the inadequacy of current permitting and mitigation practices. First, only a small percentage of wetland development permits actually contain compensatory mitigation requirements. Second, the substitute or replacement resources provided by compensatory wetland mitigation projects are generally of mediocre quality due to inherent limitations in the current regulatory approach to mitigation.

Evaluation of the permit record revealed that an average of 589 applications for permits to impact wetlands were received per year in North Carolina. An average of 20 permit applications were denied or withdrawn by applicants, eliminating almost 300 acres of potential impact annually. In addition, mandatory avoidance and minimization further reduced permitted impacts by 95 acres per year. Wetland development activities authorized by Section 404 and state wetland permits affected, on average, about 717 acres of vegetated wetlands annually and led to the permanent loss of 507 acres per year.
An average of 20 permits per year required compensatory mitigation through the creation, restoration, enhancement or preservation of wetlands. The average annual amount of compensation totalled 203 acres, which offset only 40 percent of the total area permanently impacted. However, more than one-half of the total compensation was provided through enhancement or preservation, neither of which increase existing wetland acreage. Approximately 100 acres of newly created or restored wetlands were added each year, leaving a net annual loss of approximately 410 acres of wetlands per year. Only four percent of the permits authorizing permanent wetland impacts required compensation. As a result, 76 percent of the total area permanently impacted received no compensation.

The majority of uncompensated wetland impacts resulted from activities authorized under general permits, which are issued for categories of activities assumed to result in only minimal adverse environmental impacts, both individually and cumulatively. For this reason, mitigation is rarely required for impacts authorized by general permit. One particular general permit, Nationwide Permit 26 (isolated and headwater discharges) resulted in significant cumulative impacts. In fact, over 60 percent of the total area permanently impacted and 90 percent of the total area impacted by general permits was the result of impacts authorized under NWP 26. Yet, only 5.4 percent of these impacts received compensation, whereas 69 percent of impacts authorized by individual permits received compensation.

Nationwide permit 26 is of particular concern because its differential regulation of wetlands is based on an arbitrary distinction—landscape position. NWP 26 is the only general permit which is location-specific; all others are activity-specific. While landscape position does affect the types of functions a wetland provides, there is little evidence to suggest that isolated, and particularly headwater wetlands, provide functions that are less “valuable” than those functions provided by wetlands which have been subject to more intense regulation since Section 404 was first implemented (i.e., wetlands adjacent to navigable waterways.) Rather, NWP 26 was implemented to cope with increased administrative workload resulting from further expansion of the Corps’ jurisdiction. While most permitted losses have occurred through Nationwide Permit 26, regulations governing that permit do require applicants to avoid and minimize impacts on wetlands. Without these regulations, losses could be substantially greater than they are.

State coastal zone management regulations (i.e., CAMA & Dredge and Fill permits) provide coastal wetlands with a level of protection much greater than that afforded to inland, freshwater wetlands under Section 404 alone. Average net loss of coastal wetland acreage resulting from CAMA permits is typically less than two acres per year, whereas net loss of acreage under Section 404 is several hundred acres per year. The increased protection afforded to coastal wetlands under state permitting programs may be attributed to the non-availability of general permits for projects affecting these wetlands. In contrast, heavy reliance by the 404 program on general permits plays a major role in its failure to prevent net loss of wetland acreage.

The high percentage of uncompensated wetland impacts accounts for only part of the inadequacies of current mitigation practices, however. Even if all permits were conditioned
to require compensatory mitigation, the current approach to mitigating development impacts often limits the ability of wetland mitigation projects to provide ecologically meaningful compensation. Contributing factors include the case-by-case application of compensation, regulatory preferences for on-site mitigation, and the reliance on permittees to conduct mitigation.

Not all of the planned compensatory mitigation becomes a reality. Field evaluation of compensatory wetland projects throughout North Carolina revealed that, while most projects were successful in creating some amount of jurisdictional wetlands, the majority failed to meet project goals. Of the 30 sites visited that were sufficiently mature to evaluate, 84 percent contained, or would most likely develop, at least some areas of jurisdictional wetlands (as defined by federal agencies under the 1987 Manual), although only 37 percent had met, or would probably meet, stated or implied project goals for target acreage and wetland community type. Failure to implement planned projects was not a major problem, however. Only two of the compensatory projects visited that were supposed to have been installed were never implemented. Some projects failed to create the desired wetland type.

Regulatory preferences for on-site mitigation frequently compromised project success by requiring installation of compensatory wetlands in inappropriate settings, particularly highly developed or rapidly developing locations. In fact, adverse affects from current or future surrounding urban land uses were found to potentially affect long-term success for a number of projects. Surrounding urban development also appeared to limit many of the environmental benefits compensatory wetlands are intended to replace, particularly wildlife habitat. However, the water quality improvement functions provided by many compensatory wetlands were appropriate in urban settings.

Placement of responsibility to plan, design, and implement compensatory wetland projects on the permittee appears to further compromise the quality and usefulness of many compensatory mitigation projects. Permittees typically have neither the desire, nor the scientific and technical expertise to plan and implement complex compensatory wetland projects that maximize potential environmental benefits. In the majority of cases, developers view mitigation as an unwanted, but necessary, part of obtaining a permit. Permittees, for the most part, have little vested interest in the long-term success or ecological viability of the compensatory wetlands they create. Thus, many projects appeared to provide the bare minimum effort necessary to satisfy permit conditions. Regulatory staff limitations compound this problem because time and personnel constraints often prevent the level of project review and oversight necessary to ensure that permittees do provide quality mitigation. Furthermore, specific mitigation requirements in wetland permits, such as success criteria, monitoring and contingency plans, are not always adequate to ensure that compensatory wetlands will provide the desired level of functional performance. However, even appropriate and thorough permit conditions alone cannot guarantee successful mitigation.

Lastly, the current regulatory approach leads to ad hoc or case-by-case application of compensatory mitigation which not only leads to a lack of predictability for permit applicants, but more importantly, prevents the integration of individual compensation efforts.
into a comprehensive mitigation strategy. Few individual mitigation projects are large enough to provide significant stand-alone environmental benefits. With the exception of mitigation banks created by large government agencies, there is currently no mechanism for consolidating the many small, separate compensatory actions into larger projects which can be used to address local and regional resource needs.
RECOMMENDATIONS

In order to prevent further destruction of valuable wetland ecosystems and achieve no net loss of wetland functions and acreage, current wetlands permitting and mitigation practices must be modified at both the program and project level.

Program-Level Recommendations

Suggested improvements to be applied at the project level include the following:

- Refine and standardize record-keeping and reporting among state and federal agencies sharing wetlands permitting responsibilities.

  Lack of information documenting cumulative impacts resulting from wetland permit decisions is not a result of insufficient data. As this report has shown, ample data is contained within agency permit files. However, the majority of this data is not maintained in a readily usable format. As a result, most permit applications are evaluated on an ad hoc basis.

  State and federal agencies, particularly DEM, DCM, and the Corps’ Wilmington district office, should develop a standard format for recording pertinent information about every permit application received, including general permits. This information should be stored in a computer database to enable rapid retrieval of data on past permit decisions. The Section 401 water quality certification database maintained by DEM would provide a good foundation from which to build. Limitations of its current structure, identified as part of this report, could be easily remedied.

  Information contained within the new standardized database should be used to compile quarterly reports providing information similar to that contained in this report. (Database analysis could be easily automated.) Ultimately, information contained in these database reports should be used in the permitting process as a means of evaluating incoming permit applications within the context of past permit actions.

- Establish a state-level program for regulating non-tidal wetlands through development of a programmatic regional permit similar to the approach used under CAMA.

  As illustrated by the results of this study, coastal wetlands regulated under CAMA receive higher levels of protect than wetlands regulated under Section 404 alone. Similar state-level regulation of non-tidal wetlands could greatly improve the protection of these wetlands, as well.
Non-tidal wetland regulation could be achieved through passage of new legislation, or through modification of the existing Section 401 water quality certification process, which is perhaps a more politically feasible approach. With this approach, Section 401 permit review conducted by DEM would remain largely unchanged. In fact, Section 401 evaluation is already based, in part, on application of the Section 404(b)(1) Guidelines. However, instead of evaluating permit applications at both the state and federal levels, substantive permit review would be focused at the state level, while the Corps would coordinate cursory federal agency review. A regional or programmatic permit, similar in nature to GP 291, would then be developed in cooperation with the Corps’ Wilmington District. This regional permit would provide Section 404 authorization from the Corps to all projects receiving prior authorization in the form of a Section 401 water quality certification. All special conditions, including mitigation requirements, would be attached to the water quality certification, a practice which is already being conducted.

Development of a state-level permitting arrangement for non-tidal wetlands in North Carolina offers several advantages over existing methods. First, such an approach would reduce regulatory delays resulting from redundant permit review conducted by both DEM, for Section 401 water quality certification, and the Corps, for Section 404 authorization. Second, it offers wetland managers the ability to regulate wetlands development more stringently than the Corps, particularly through a reduction in the use of general permits, thereby increasing the state’s role in determining the appropriate level of wetland protection and development. Several state agencies have already restricted the use of general permits in certain situations and have begun to attach mitigation requirements to 401 certifications for projects where the Corps has required none. Third, this approach allows retention of federal authority to issue and/or enforce permits for controversial projects where state-level politics become contentious.

- Compile comprehensive guidance materials for planning, designing, and implementing compensatory wetland mitigation projects.

The widespread use of compensatory mitigation to offset development impacts has created the need for technical guidance on wetland creation and restoration that can be used by a wide range of audiences, including developers, consultants, and regulators. Mitigation guidance should be developed as a cooperative effort by state and federal agencies in North Carolina having either permitting authority or review responsibilities. Although simple “cookbook” approaches to planning and designing complex wetlands projects are unacceptable, general guidance on wetland creation and restoration would provide permittees with the basic resources necessary to help them conduct mitigation projects that have greater potential to provide ecologically valuable replacement resources. A recent handbook covering the creation and restoration of several coastal wetland types (Holman and Childres 1995) provides a good example of this type of guidance.

Guidance materials should outline information necessary to plan, design, and implement effective mitigation projects. Such information might include: an appropriate process for planning mitigation projects, siting criteria, key factors to be considered in project
design, "tools" and information sources for properly designing projects (i.e., how to calculate a water budget and where to obtain local meteorological data), information on how to conduct monitoring, mechanisms for long-term protection, typical native wetland plant species, and listings of local wetland plant suppliers, wetland consultants, and experienced subcontractors.

Guidance materials should also provide the regulated community with generally acceptable standards for project design, recognizing that there will always be exceptions. Use of standardized design criteria will improve predictability within the permitting process. Since developers would have the ability to design mitigation projects with knowledge of the standards to which they will be held, costly delays resulting from extensive project modification at the time of permit review can be reduced. In turn, better project design will help reduce the burden placed on wetland regulators.

- Develop regional wetland restoration plans to maximize environmental benefits from compensatory mitigation projects.

The current reactive approach to compensatory mitigation has often been found to limit the potential environmental benefits of compensatory wetland projects. Permittees typically base mitigation decisions, particularly site selection, on economic considerations rather than ecological concerns. Furthermore, regulatory preferences for on-site mitigation lead to the installation of compensatory wetlands in urbanized setting. In order to overcome these limitation and maximize environmental benefits from compensatory wetland projects, a regional approach to mitigation planning must be adopted (Tanner 1991).

Regional wetland restoration plans which systematically identify areas of degraded wetlands offering the potential for restoration should be developed. Ideally, potential restoration sites will also be prioritized based on the ecological functions that could be replaced. Permit applicants required to provide compensatory mitigation can then be directed to sites with the greatest functional potential. Bledsoe et al. (1995) list several advantages of this approach, including increased probability of successfully replacing lost ecological functions, focus on lost functions rather than availability during site selection, and reduction of permittee’s burden of searching for a suitable restoration site. Regional restoration plans may be used to guide non-compensatory restoration programs, as well.

The N.C. Division of Coastal Management has developed a Geographic Information System-based approach for identifying and prioritizing potential wetland restoration sites in the Coastal Plain (Bledsoe, et al. 1995). This approach should be used as a model for development of expanded regional restoration plans that would eventually offer statewide coverage. Successful regional wetland restoration planning efforts have also been conducted in Seattle (Tanner 1991) and Florida (Tampa Bay Regional Planning Council 1986).
Create provisions for the collection of *in lieu* mitigation fees to enable consolidation of individually small compensation projects into larger projects which address regional resource needs.

The current case-by-case approach to mitigation prevents the consolidation of numerous small mitigation projects into larger stand-alone projects capable of providing significant environmental benefits. A mechanism for combining individually small mitigation projects, which provide only minimal benefits, into projects of sufficient size to address regional resource needs is required.

One method of enabling such consolidation is through the collection of *in lieu* compensation or mitigation fees. Instead of permittees implementing small mitigation projects themselves, a fee equivalent to the amount potentially spent conducting mitigation would be assessed. In practical terms, the amount of *in lieu* fees might be based on the average cost per acre to create or restore a particular wetland type. *In lieu* fees would be held in a designated account until sufficient funds were accumulated to implement large-scale restoration projects. State or federal agencies, many of which already create and restore wetlands, would be responsible for planning, designing, and implementing these projects. *In lieu* fees could also be combined with non-compensatory wetland projects or programs to restore lost wetland functions identified in regional restoration plans described above.

Collection of *in lieu* mitigation fees will not always be appropriate, however. Permitting agencies will be required to develop specific criteria to determine when the benefits of *in lieu* fees outweigh the benefits of more traditional mitigation approaches (i.e., on-site mitigation). Likewise, collection of *in lieu* fees will not eliminate the need to first avoid and minimize wetland impacts. However, the appropriate use of *in lieu* mitigation fees provides a vehicle for consolidating compensation from multiple, individually small mitigation projects and applying it towards the restoration of ecologically valuable wetlands which address regional resource needs.

**Project-Level Recommendations**

In addition to improvements at the program level, several project-level recommendations will help ensure that compensatory mitigation projects have a reasonable probability of successfully establishing ecologically valuable and viable wetlands.

- **A formal mitigation plan, contained in a separate document, should be created for each compensatory mitigation project.**

  The level of plan detail should be commensurate with project complexity. Mitigation plans, at a minimum, should contain the following information: description of impacts, conceptual project overview, project goals, success criteria, construction drawings and specifications, and monitoring, remedial action, and long-term management plans.
I. BACKGROUND

According to U.S. Fish and Wildlife Service (FWS) estimates, nearly 54 percent of the 215 million acres of wetlands existing in the conterminous United States at the time of our Nation's settlement have been destroyed as a result of agricultural and urban development (Tiner 1984). Hefner and Brown (1985) report that 84 percent of the losses during the twenty-year interval from the mid-1950s to the mid-1970s occurred in the southeastern United States. Recent estimates of wetland losses in North Carolina place the combined loss or alteration of wetlands at about 5,087,500 acres, or slightly less than one-half of the state's original wetlands (NCDEM 1992b). Still, North Carolina ranks sixth among the states in the number of wetland acres remaining (Dahl 1990).

The widespread historic loss of wetlands in the United States, together with a growing recognition of the valuable functions wetlands provide, has led to the creation of numerous programs to manage and protect the remaining wetland resource. Both regulatory and non-regulatory wetland programs exist at the federal, state and local levels. In North Carolina, wetlands are affected by more than 20 federal statutes and at least 10 state programs through a combination of management approaches, including research and public education; economic incentives to protect wetlands; preservation of wetlands through public and private acquisition; and direct regulation of wetlands development (Moreau 1993, unpublished). This study focuses on the direct regulation of wetlands development in North Carolina.

Three laws (one federal and two state) directly regulate the development of wetlands in North Carolina. At the federal level, most activities affecting wetlands are regulated under Sections 404 and 401 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500), later renamed the Clean Water Act. Under Section 404, a permit from the U.S. Army Corps of Engineers is required for activities resulting in the discharge of dredged or fill material into "waters of the U.S.," which have been defined to include most wetlands. Activities typically requiring Section 404 permits include fills for development, water resources projects (i.e., dams and levees), infrastructure development (i.e., highways and utilities) and conversion of wetlands to uplands for farming and forestry (Interagency Working Group on Federal Wetlands Policy 1993.) In addition, coastal wetlands in North Carolina are also regulated under the state's Dredge and Fill Act (NCGS 113-229) and the Coastal Area Management Act (NCGS 113A-100, et seq.), both of which also require a permit from the proper state authority prior to conducting most development activities in designated coastal wetlands.

In 1987, the National Wetlands Policy Forum was convened by the Conservation Foundation, at the request of EPA, to develop a more comprehensive approach to wetlands management and protection. The forum's primary recommendation was to achieve an interim goal of "no overall net loss of the nation's remaining wetlands base," with a long-term goal of increasing the quantity and quality of the Nation's wetlands through restoration and creation efforts (National Wetlands Policy Forum 1988).

Although a no-net-loss goal has yet to be formally codified in the Section 404 regulations, in 1990 EPA and the Corps, through a joint Memorandum of Agreement (MOA), articulated the Section 404 regulatory program's goal to "strive to avoid adverse impacts and offset
unavoidable impacts to existing aquatic resources, and for wetlands, will strive to achieve a
goal of no overall net loss of [wetland] values and functions" (USEPA/DA 1990). Under
Section 404 and other wetland permitting programs, unavoidable wetland impacts are offset
through the use of compensatory mitigation, which is the practice of restoring or creating
new wetlands to replace wetland acreage and functions lost as a result of permitted
development. While such an approach appears to be a viable mechanism for achieving no-
et-loss and a logical compromise between continued development and environmental
protection, concerns have been raised over both the level of wetland protection afforded by
permitting programs and the reliance on compensatory mitigation to effectively offset lost
wetland acreage and functions.

According to a survey conducted by the Corps of Engineers for the Office of Technology
Assessment (1984), the Corps districts (excluding Alaska) processed permits that resulted in
the conversion of approximately 50,000 acres of wetlands per year in 1980 and 1981.
Furthermore, a series of studies conducted by the Environmental Protection Agency’s (EPA)
Wetlands Research Program found that wetland impacts authorized by Section 404 permits
resulted in sizable cumulative impacts in many of the regions studied (Kentula, et al. 1992b;
drawn from several studies on compensatory and non-compensatory wetland creation and
restoration projects indicate that (1) the technical ability to create or restore wetlands which
achieve levels of functional performance equivalent to natural wetlands is largely unproven
(Confer and Niering 1992; Race and Christie 1982; Kusler and Kentula 1990); and (2) in
practice, the ability of compensatory mitigation to offset unavoidable impacts and achieve no-
et-loss of wetlands was limited by low implementation rates, frequent failure to establish
desired wetland conditions, and inadequate mitigation requirements (Dial and Dies 1986;

Study Objectives

With these concerns in mind, the North Carolina Water Resources Research Institute (WRRI)
conducted a study to evaluate state and federal wetlands permitting in North Carolina in
order to characterize the effects of management decisions on the state’s remaining wetland
resource and to determine the adequacy of mitigation practices required in those permits.
Funding for this research was provided, in part, by the Albemarle-Pamlico Estuarine Study,
through WRRI.

Specific objectives of this study were:

• to document the number and types of permits issued, the type, acreage and location of
  wetlands affected and the types of development requiring state and federal authorization;

• to document current mitigation requirements contained in permits and evaluate the role of
  mitigation in reducing and compensating permitted wetland impacts in support of a no-net-
  loss of wetlands goal; and
to assess the planning, implementation, likelihood of success, and ecological viability of selected compensatory mitigation projects throughout North Carolina.

Conceptual Approaches

Two distinct conceptual approaches were used to complete this research: analysis of the permit record and on-site field investigation. Information contained in original project files, collectively known as the permit record, was compiled from various sources and analyzed to provide an overall characterization of wetlands permitting, including documentation of mitigation requirements and assessment of mitigation planning. Direct investigation of mitigation projects in the field was also conducted, since the permit record contains no information on actual project implementation or success.

Organization

This report comprises five sections and three appendices. Summary and Conclusions and Recommendations are presented as part of the front matter. This section presents background and study objectives. Section II contains a detailed explanation of federal and state laws regulating wetlands development in North Carolina, including key concepts and definitions, as well as the regulatory standards and processes which form the framework for each of the permit programs examined. Section III outlines the practice of wetland mitigation, with particular emphasis on its application within the context of the Section 404 permitting program. These two sections are intended to provide those readers who may be unfamiliar with the intricacies of wetlands regulation with the policy background necessary to understand the report’s findings. Those already familiar with wetlands laws, regulations and mitigation may wish to skip these sections. Section IV contains a detailed discussion of the research methods used and presents the results of a characterization of wetlands permitting in North Carolina based on analysis of the permit record, including the effects of permitted impacts on the remaining wetland resource and the role of mitigation in reducing and compensating those impacts. Section V provides a detailed evaluation of compensatory mitigation projects in North Carolina based on additional review of the permit record, as well as an assessment of selected compensatory mitigation projects in the field. The three appendices contain examples of standardized forms and a letter used in collecting and compiling data for this study.
II. STATE & FEDERAL REGULATION OF WETLANDS IN NORTH CAROLINA

Section 404 of the Clean Water Act

Section 404 of the Clean Water Act (CWA) has emerged as the primary federal mechanism for regulating wetlands development (Cox 1989). Under Section 404, a permit is required to discharge dredged or fill material into "waters of the U.S.," including wetlands. Administration of the Section 404 permitting program is shared by the U.S. Army Corps of Engineers (Corps) and the U.S. Environmental Protection Agency (EPA). Under Section 404(b), Congress authorized the Secretary of the Army, acting through the Corps, to issue permits according to the application of guidelines developed by the EPA Administrator in conjunction with the Corps. Day-to-day operation of the Section 404 program was delegated to the Corps because of its historical responsibility for the protection and improvement of the nation’s navigable waterways and its experience administering a similar permitting program under the Rivers and Harbors Act of 1899. In addition, the U.S. Fish and Wildlife Service (FWS), the National Marine Fisheries Service, EPA and numerous state resource agencies have important advisory roles.

Scope of Jurisdiction. Although the original Federal Water Pollution Control Act Amendments of 1972 never specifically mentioned wetlands, their regulation under Section 404 has been achieved through a series of key court decisions which have provided successively broader interpretations of the definition of "waters of the U.S."

When the Corps first issued regulations implementing the Section 404 permitting program in 1974, it limited the program’s jurisdiction to traditionally navigable waters, which included adjacent wetlands, but excluded most wetlands located adjacent to smaller, non-navigable waterways (USEPA 1993). This narrow interpretation was consistent with the Corps’ existing jurisdiction over traditionally navigable waters established by the Rivers and Harbors Act. The EPA, however, opposed the Corps’ narrow definition of "waters of the U.S.," claiming that the legislative history of the CWA made clear that Congress intended the broadest possible federal jurisdiction, expanded beyond just traditionally navigable waters.

In the 1975 landmark case of Natural Resources Defense Council (NRDC) v. Calloway (392 F. Supp. 685 (D.D.C. 1975)) a federal district court held that Congress had indeed intended federal jurisdiction over the nation’s waters to the maximum extent possible under the Commerce Clause of the Constitution. In response to NRDC v. Calloway, the Corps issued interim final regulations in July 1975 which expanded Section 404 jurisdiction to include wetlands located adjacent to non-navigable waters.

In 1977, the Corps issued final regulations extending Section 404 jurisdiction to all wetlands located adjacent to traditionally navigable waters and their tributaries, and to all interstate waters and their tributaries, regardless of whether or not they are navigable. Jurisdiction was

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1 The legislative history outlined in this section borrows liberally from information provided by Liebesman (1990), Mitsch and Gosselink (1993) and the Environmental Protection Agency (1993).
also extended to include intrastate waters and their adjacent wetlands and isolated wetlands such as mudflats, sandflats, sloughs, prairie potholes, wet meadows, playa lakes or natural ponds if their use, degradation or destruction could affect interstate or foreign commerce (33 CFR Part 328.3).

Until recently, Section 404 only regulated activities resulting in the discharge of dredged or fill materials. Non-discharge activities such as draining, excavation, flooding or clearing of vegetation were not specifically regulated. Yet, according to the Office of Technology Assessment (1984), these activities were responsible for the vast majority of inland wetland conversions between the mid-1950s and the mid-1970s.

In accordance with a settlement agreement in the case of North Carolina Wildlife Federation, et al. v. Tulloch (C90-713-CIV-5-BO (E.D.N.C. 1992)), the Corps and EPA issued regulations in August 1993 clarifying the definition of "discharge of dredge materials" and effectively closed a major loop-hole which had enabled continued unregulated wetland conversion by non-discharge activities (33 CFR Parts 323 and 328; 40 CFR Part 100, et seq.). Under the new definition, certain activities, including mechanized landclearing, ditching, channelization and other excavation activities, are presumed to result in the discharge of dredged or fill material when performed in "waters of the U.S." Accordingly, these activities will now be regulated under Section 404 when they have the effect of destroying or degrading "waters of the U.S.," including wetlands. The regulations also clarify that when the placement of pilings would have the same effect as a discharge of dredged or fill material, the activity requires Section 404 authorization. The expansion of Section 404's regulatory scope brought about by these recent changes has greatly improved the level of wetlands protection afforded by the CWA.

Wetland Delineation. For the purposes of the Section 404 permitting program, the Corps and EPA have adopted a uniform regulatory definition of wetlands which includes:

those areas that are inundated or saturated by surface or groundwater 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 (33 CFR Part 328.3(b)).

The actual process of identifying wetlands in the field is known as delineation and is based on the presence of specific field indicators. The Corps, which is responsible for conducting the majority of wetland delineations (or verifying delineations made by wetland consultants) currently uses the 1987 Corps of Engineers Wetlands Delineation Manual (USACOE 1987) to define wetland boundaries in the field. The 1987 Manual establishes field indicators for three wetland parameters: (1) wetland hydrology; (2) hydric soils; and (3) hydrophytic vegetation. Evidence thresholds, or criteria, are established for each of these parameters. Jurisdictional wetlands are those areas which meet the applicable criteria for all three parameters.

Section 404(b)(1) Guidelines. The substantive environmental criteria used to evaluate individual permit applications are provided in the Section 404(b)(1) "Guidelines for Specification of Disposal Sites for Dredged or Fill Material," hereafter referred to as the
Section 404(b)(1) Guidelines. The Section 404(b)(1) Guidelines were developed by the EPA, in conjunction with the Corps, and published as binding regulations (40 CFR Part 230) in December 1980.

Most regulatory criteria developed pursuant to the CWA specify numerical standards for hazardous or toxic discharges (Freeman 1990). The Guidelines, however, specify certain regulatory "tools" to be used in evaluating and testing the propriety of potential discharge sites, in part because aquatic ecosystems are susceptible to degradation by purely physical placement of dredged or fill materials (40 CFR Part 230, Background).

The fundamental premise of the Guidelines is that dredged or fill material should not be discharged into special aquatic sites, including wetlands, unless the discharge will have no unacceptable individual or cumulative adverse environmental impacts. Under Section 404, degradation and destruction of wetlands and other special aquatic sites is considered to be among the most environmentally damaging impacts (Interagency Working Group on Federal Wetlands Policy 1993). The Guidelines set forth four general restrictions:

1. No discharge may be permitted if a less environmentally damaging practicable alternative exists. A less damaging practicable alternative is presumed to exist for projects impacting wetlands which are not water-dependent (i.e. that do not require direct access to the water to fulfill their primary function).

2. No discharge may be permitted which would violate other applicable state or federal laws, particularly toxic and hazardous effluent standards, state water quality standards, or the Endangered Species Act.

3. No discharge may cause or contribute to the significant degradation of waters of the U.S.

4. Discharges can be permitted only after all appropriate and practicable actions have been taken to minimize adverse environmental impacts through mitigation.

All permitted impacts must comply with the Guidelines, unless it is determined that the economic impact on navigation and anchorage necessitate issuing a permit pursuant to Section 404(b)(2).

Public Interest Review. In addition to the regulations issued by EPA, the Corps has developed its own decision-making procedures. The most recent version of these regulations are contained in 33 CFR Parts 320 through 330, although not all of these apply to Section 404 permits.

In evaluating proposed permits, the Corps applies its decision criteria, known as the "Public Interest Review," in addition to the Section 404(b)(1) Guidelines. The Public Interest Review consists of a weighing or balancing of projects' expected benefits and reasonably
foreseeable detriments, based on consideration of the relevant factors\(^2\), the relative extent of the public and private need for the project, the practicability of alternatives, and the extent and permanence of the beneficial and detrimental effects (33 CFR 320.4(a)).

These regulations have helped to clarify the Corps' position on the importance of protecting wetlands through the Section 404 permitting program. Corps regulations explicitly state:

Most wetlands constitute a productive and valuable public resource, the unnecessary alteration or destruction of which should be discouraged as contrary to the public interest (33 CFR 320.4(b)(1)).

The Corps may not authorize the use of wetlands as a disposal site unless it has been determined through the Public Interest Review that the benefits of the proposed alteration outweigh the damages to the wetland resource. However, a favorable public interest review alone does not guarantee issuance of a permit. Even if a proposed action is determined to be in the public interest, a permit must be denied if the discharge authorized would fail to comply with the Section 404(b)(1) Guidelines.

**Veto Authority.** Section 404(c) provides EPA with the authority to veto Corps' permit decisions by restricting or prohibiting the use of an area as a disposal site for dredged or fill material when the discharge will have unacceptable adverse impacts on certain resource uses, including municipal water supplies, shellfish beds and fishery areas, wildlife, or recreational areas. In reality, however, EPA has completed only 11 Section 404(c) actions nationwide out of an estimated 150,000 permit applications since the Section 404(c) regulations went into effect in October 1979 (USEPA 1993).

**Section 401 Water Quality Certification.** In addition to the specific requirements of Section 404, projects seeking dredge and fill permits must also be evaluated under Section 401 of the Clean Water Act. Section 401 requires the States (and eligible Indian Tribes) to certify that any federally permitted or licensed activity that might result in a discharge to waters of the U.S. will not result in the violation of EPA-approved State water quality standards developed pursuant to the CWA. Federal authorizations subject to Section 401 certification include CWA Section 402 National Pollutant Discharge Elimination System (NPDES) permits (in non-delegated States) and Section 404 Dredge and Fill permits, Federal Energy Regulatory Commission (FERC) hydropower licenses, and Rivers and Harbors Act Section 9 and 10 permits (USEPA 1993). These authorizations are valid only when a Section 401 certification has been issued or waived. In North Carolina, Section 401 water quality certifications are issued by the N.C. Division of Environmental Management (DEM). In most cases, state review for the 401 water quality certification occurs simultaneously with Federal agency review.

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\(^2\) The relevant factors considered in the Public Interest Review include: conservation, economics, aesthetics, general environmental concerns, wetlands, historic properties, fish and wildlife values, flood hazards, floodplain value, navigation, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, considerations of property ownership and, in general, the needs and welfare of the people (33 CFR 320.4(a)).
The Section 401 water quality certification process provides state natural resource agencies the opportunity to review and approve, condition, or deny Section 404 permits issued by the Corps, allowing the States to take a more active role in decisions affecting wetlands.

Recently, EPA has issued guidance to the States on applying the Section 401 certification process specifically to wetlands protection (USEPA 1989; USEPA 1990). As of 1993, 19 States, including North Carolina, and one Indian Tribe have been awarded EPA grants to support the use of the 401 certification process to protect wetlands.

As mandated by the CWA, North Carolina’s Environmental Management Commission has "classified" the state’s waters by establishing "designated uses" for specific areas of waters. Rules were then promulgated defining the classification and the water quality standards or management practices to be applied to those waters based on their designated uses. The Division’s statutory authority to enact regulations for the purpose of implementing the provisions of the CWA are set forth in NCGS 143-215.3(a)(1) and (c), while the authority to issue and deny certifications pursuant to Section 401 of the CWA is contained in 15A NCAC 2H .0500.

Wetlands in North Carolina have not yet received formal classification as have other waters, although the development of specific wetland rules is underway. Nevertheless, wetlands are protected under the state’s Antidegradation Policy (15A NCAC 2B .0201), which mandates that all "significant and nonincidental" existing uses of waters, including wetlands, may not be removed, regardless of whether or not these uses have been formally "designated." Wetlands are afforded protection under the Antidegradation Policy because (1) they are defined as "waters" by the CWA and (2) because they provide important water quality improvement functions which help to protect the uses of other waters which have been formally designated. Important water quality functions provided by wetlands include, among others, conveyance and storage of floodwaters, pollutant removal, shoreline stabilization, groundwater recharge and surface flow augmentation during drought (NCDEM 1992a).

In May 1992, DEM issued interim guidance on the use of the Section 401 certification process for the protection of wetlands (NCDEM 1992a). The substantive review criteria governing the Division’s decision to issue or deny Section 401 certifications are set forth in 15A NCAC 2B .0109. The rule states:

Projects that alter the reach and extent of a freshwater wetland will not be considered as removing existing uses of the wetland in violation of the Antidegradation Policy [pursuant to 15A NCAC 2B .0201(b)] if the alteration protects all existing and designated uses of all waters of the State. In making this determination, the Director will be guided by 40 CFR Part 230, Subpart A through F [of the Section 404(b)(1) Guidelines] (15A NCAC 2B .0109).

Stated simply, when the decision to issue a certification is based on application of the review standards embodied in the Section 404(b)(1) Guidelines, the proposed discharge will not violate the Antidegradation Policy. Thus, DEM will deny water quality certification for proposed activities impacting wetlands if a practicable alternative exists, unless DEM determines that the wetland affected has no significant beneficial existing uses or that the proposed activity will not remove a significant use. Therefore, DEM’s decision to issue a
certification is governed by essentially the same criteria as used by the Corps in deciding whether to issue many Section 404 permits.

**Individual Permits.** Projects which pose potentially significant impacts to waters of the U.S., including wetlands, due to their size or location, typically require authorization by an "individual" or standard permit. The review process for individual permits entails in-depth, case-by-case evaluation of each permit application based on the application of the standards and criteria contained in the Section 404(b)(1) Guidelines and the Public Interest Review. The procedural requirements established by the Corps for processing Section 404 and other Department of the Army permits, as set forth at 33 CFR Part 325, are highlighted below.

Within 15 days of receiving a complete permit application, the Corps will issue a public notice. The public notice is the primary method of advising and soliciting comments and information from all interested parties in order to evaluate the proposed action's impact on the public interest (33 CFR Part 325.3(a)). The public notice will contain a brief description of the proposed activity, including plan and elevation drawings; the applicant's name and address; a discussion of potential environmental impacts; and procedures for taking public comments.

The comment period generally lasts from 15 to 30 days, during which time the application is reviewed by the Corps, other federal and state review agencies, and interested individuals and organizations. Normally, the Corps will not hold a public hearing for each permit under consideration. However, one will be scheduled at the valid request of interested citizens.

Corps regulations require that a decision to issue or deny a permit be made within 60 days of receipt of a completed application. However, in reality, this 60-day period is often exceeded because sufficient information cannot be reasonably obtained in this time or legal prerequisites for final Section 404 authorization (i.e., Section 401 water quality certification) have not been completed.

Upon reaching a final decision, the Corps prepares a Statement of Findings (SOF), or Record of Decision (ROD) where an Environmental Impact Statement has been prepared, to document how a particular decision has been reached. If a permit is issued, the Corps will determine the special conditions to be incorporated into the permit, if any, necessary to ensure compliance with all applicable regulations. Once the standard individual permit form has been drafted, it is forwarded to the applicant for signature. The applicant then returns the form to the Corps where it is signed by the district engineer. Section 404 authorization is valid only when the permit form has been signed by the issuing official.

Under current Corps regulations, there is no administrative appeals process for applicants who are denied Section 404 permits. Initiation of judicial actions in court is the only recourse available to applicants wishing to contest a Corps' decisions. The lack of an administrative appeals process for resolving disputes over jurisdictional delineations, permit denials, and administrative penalties has recently been targeted for reform by the Clinton Administration (White House Office on Environmental Policy 1993).
General Permits. In addition to individual permits, Section 404(e) authorizes the Secretary of the Army to issue general permits for specific categories of activities that have been determined to cause only minimal individual or cumulative adverse environmental impacts (33 CFR Part 323.2).

The primary motivation behind the Corps' development of general permits is to reduce regulatory delays and administrative workload for projects having only minimal impacts. Unlike the case-by-case review provided for projects seeking authorization under individual permits, general permits provide the public at large with up-front authorization to conduct all qualifying activities. Because each general permit has been reviewed for compliance with the Section 404(b)(1) Guidelines prior to issuance (general permits are reauthorized every five years) and each contains specific requirements and standards which constrain the nature of the authorized activity, lengthy case-by-case review of specific projects is unnecessary.

In most cases, permittees may proceed with the authorized activities without first contacting the Corps. However, some general permits require the prospective permittee to notify the Corps prior to commencing the activity, a procedure known as Pre-Discharge Notification (PDN). The Corps then has 30 days in which to review the PDN. Under the power of "discretionary authority," the district engineer may add activity-specific conditions, such as compensatory mitigation, to ensure that the discharge will satisfy the requirements of the Section 404(b)(1) Guidelines and the Public Interest Review or, in extreme cases, may require the perspective permittee to submit an individual permit application if cursory review reveals that impacts are more than minimal. It is important to note that the initial determination of whether a particular activity qualifies for authorization under a general permit or requires PDN is the responsibility of the permittee, not the Corps. Developers are liable for the incorrect use or mis-application of general permits and failure to comply with a general permit's special conditions constitutes an illegal discharge which can lead to enforcement actions if discovered.

General permits may be issued on a state, regional, or nationwide basis. Table 1 shows 26 of the 40 nationwide permits (NWPs) currently in use by the Corps applicable under Section 404 authority; however, two of these NWPs prohibit discharges to vegetated wetlands. The N.C. Division of Environmental Management has issued general Section 401 water quality certifications corresponding to all but three of the NWPs. Persons seeking authorization under these three NWPs must apply for and obtain individual Section 401 certifications before proceeding.

The rules and regulations of the Nationwide Permit Program, as well as the current requirements and standards for each NWP are outlined in 33 CFR Part 330, issued in November 1991. In addition, the Corps' Wilmington District issued a public notice in February 1993 to further outline each approved permit's regional conditions, requirements for general Section 401 certification, and, where applicable, conditions required to maintain consistency with the Coastal Zone Management Act (USACOE-Wilmington District 1993b).
Table 1. Nationwide general permits (NWPs) issued by the Corps of Engineers applicable under Section 404 authority.

<table>
<thead>
<tr>
<th>Permit Number</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWP 03&lt;sup&gt;d&lt;/sup&gt;</td>
<td>Maintenance activities</td>
</tr>
<tr>
<td>NWP 04&lt;sup&gt;d&lt;/sup&gt;</td>
<td>Fish and wildlife harvesting, enhancement, and attraction devices and activities</td>
</tr>
<tr>
<td>NWP 05&lt;sup&gt;a-d&lt;/sup&gt;</td>
<td>Scientific measurement devices</td>
</tr>
<tr>
<td>NWP 06&lt;sup&gt;e&lt;/sup&gt;</td>
<td>Survey activities</td>
</tr>
<tr>
<td>NWP 07&lt;sup&gt;a-d&lt;/sup&gt;</td>
<td>Outfall structures</td>
</tr>
<tr>
<td>NWP 12&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Utility line backfill and bedding</td>
</tr>
<tr>
<td>NWP 13&lt;sup&gt;b,c&lt;/sup&gt;</td>
<td>Bank stabilization</td>
</tr>
<tr>
<td>NWP 14&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Road crossings</td>
</tr>
<tr>
<td>NWP 15&lt;sup&gt;b&lt;/sup&gt;</td>
<td>U.S. Coast Guard approved bridges</td>
</tr>
<tr>
<td>NWP 16&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Return water from upland contained (dredged material) disposal areas</td>
</tr>
<tr>
<td>NWP 17&lt;sup&gt;a,c&lt;/sup&gt;</td>
<td>Hydropower projects</td>
</tr>
<tr>
<td>NWP 18&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Minor discharges</td>
</tr>
<tr>
<td>NWP 20&lt;sup&gt;d&lt;/sup&gt;</td>
<td>Oil spill cleanup</td>
</tr>
<tr>
<td>NWP 21&lt;sup&gt;a,c&lt;/sup&gt;</td>
<td>Surface coal mining activities</td>
</tr>
<tr>
<td>NWP 22&lt;sup&gt;d&lt;/sup&gt;</td>
<td>Removal of vessels</td>
</tr>
<tr>
<td>NWP 23&lt;sup&gt;d&lt;/sup&gt;</td>
<td>Approved &quot;Categorical Exclusions&quot; pursuant to National Environmental Policy Act regulations (40 CFR Part 1500)</td>
</tr>
<tr>
<td>NWP 25&lt;sup&gt;d&lt;/sup&gt;</td>
<td>Structural discharges</td>
</tr>
<tr>
<td>NWP 26&lt;sup&gt;e&lt;/sup&gt;</td>
<td>Headwater and isolated waters discharges</td>
</tr>
<tr>
<td>NWP 27&lt;sup&gt;d&lt;/sup&gt;</td>
<td>Wetland and riparian restoration and creation activities</td>
</tr>
<tr>
<td>NWP 32&lt;sup&gt;d&lt;/sup&gt;</td>
<td>Completed enforcement actions</td>
</tr>
<tr>
<td>NWP 33&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Temporary construction, access and dewatering activities</td>
</tr>
<tr>
<td>NWP 34&lt;sup&gt;c&lt;/sup&gt;</td>
<td>Cranberry production activities</td>
</tr>
<tr>
<td>NWP 36&lt;sup&gt;d,e&lt;/sup&gt;</td>
<td>Boat ramps</td>
</tr>
<tr>
<td>NWP 37&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Emergency watershed protection and rehabilitation</td>
</tr>
<tr>
<td>NWP 38&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Cleanup of hazardous and toxic waste</td>
</tr>
<tr>
<td>NWP 40&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Farm buildings</td>
</tr>
</tbody>
</table>

<sup>a</sup> COE may require Pre-Discharge Notification (PDN).
<sup>b</sup> DEM requires written application for Section 401 general water quality certification.
<sup>c</sup> Section 401 general certification denied; projects require individual certification.
<sup>d</sup> DEM requires no written application; NWP 13 requires notification to DEM.
<sup>e</sup> Prohibits discharges into vegetated wetlands.
Table 2. Regional general permits (GPs) issued by the Corps of Engineers, Wilmington District applicable under Section 404 authority for use exclusively in North Carolina.

<table>
<thead>
<tr>
<th>Permit Number</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>GP 020^a</td>
<td>Fish enhancement structures in mountain trout waters</td>
</tr>
<tr>
<td>GP 030^a</td>
<td>Work in lakes and reservoirs owned and operated by TVA or FERC regulated utilities</td>
</tr>
<tr>
<td>GP 031^b</td>
<td>Work associated with bridge construction, maintenance or repair conducted by the NCDOT or a federal, state or local entity</td>
</tr>
<tr>
<td>GP 048^a,c</td>
<td>Emergency construction and repair of primary dunes on ocean beaches</td>
</tr>
<tr>
<td>GP 049^a</td>
<td>Aerial and subaqueous utility lines, attendant structures and temporary access corridors</td>
</tr>
<tr>
<td>GP 056^b,c</td>
<td>Construction, maintenance and repair of piers, docks and boathouses in navigable waters</td>
</tr>
<tr>
<td>GP 079^a</td>
<td>Work in COE reservoirs</td>
</tr>
<tr>
<td>GP 080^a,c</td>
<td>Construction and maintenance of bulkheads</td>
</tr>
<tr>
<td>GP 125^a,c</td>
<td>Construction and maintenance of boatramps</td>
</tr>
<tr>
<td>GP 194^a,d</td>
<td>Artificial reefs and fish attractors in coastal and offshore waters</td>
</tr>
<tr>
<td>GP 277^a,c</td>
<td>Dredging activities in upland manmade basins and canals and maintenance dredging in basins and canals in open waters</td>
</tr>
<tr>
<td>GP 291^b</td>
<td>Work authorized by a Coastal Area Management Act (CAMA) major development permit</td>
</tr>
<tr>
<td>GP 297^a</td>
<td>Fire control activities on federal or state owned property and fire control activities on private land when conducted by the U.S. Forest Service or the N.C. Division of Forest Resources</td>
</tr>
</tbody>
</table>

^a**Section 401 general certification issued, but written application to DEM required.**

^b**Section 401 certification not required.**

^c**Prohibits discharges into vegetated wetlands.**

^d**Not applicable to vegetated wetlands.**
In addition to NWPs, 13 regional general permits having Section 404 authority have been approved for use in North Carolina (Table 2). Of these, seven may be used to impact vegetated wetlands. In North Carolina, general permits are issued by the district engineer of the Corps' Wilmington district office under authority delegated by the Secretary of the Army. Section 401 general certifications have been issued by DEM for all applicable regional general permits.

Through discretionary authority, the district engineer has conditioned the use of general permits in certain areas of North Carolina. In the 25 counties which contain waters classified as Public Trout Waters, shown in Table 3, general permits require submission of a PDN to the Corps and a letter of concurrence from the Corps, pending favorable review by the N.C. Wildlife Resources Commission, who is given the opportunity to comment on projects prior to final authorization (R. Johnson, Office Manager, Asheville Regulatory Field Office, USACOE, pers. com. 1995). The WRC is provided the opportunity to review and comment on these projects' Asheville regional office Wilmington district office has been obtained (S. Goudreau. Projects for which authorization by general permit has been denied by the WRC must seek authorization under individual permits.

Table 3. North Carolina counties containing waters classified as Public Trout Waters by the N.C. Wildlife Resources Commission.

<table>
<thead>
<tr>
<th>Alleghany</th>
<th>Ashe</th>
<th>Avery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buncombe</td>
<td>Burke</td>
<td>Caldwell</td>
</tr>
<tr>
<td>Cherokee</td>
<td>Clay</td>
<td>Graham</td>
</tr>
<tr>
<td>Haywood</td>
<td>Henderson</td>
<td>Jackson</td>
</tr>
<tr>
<td>Macon</td>
<td>Madison</td>
<td>McDowell</td>
</tr>
<tr>
<td>Mitchell</td>
<td>Polk</td>
<td>Rutherford</td>
</tr>
<tr>
<td>Stokes</td>
<td>Surry</td>
<td>Swain</td>
</tr>
<tr>
<td>Transylvania</td>
<td>Watauga</td>
<td>Wilkes</td>
</tr>
<tr>
<td>Yancey</td>
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<td></td>
</tr>
</tbody>
</table>

The Wilmington District has also exercised discretionary authority to impose notification requirements on the use of NWPs for any wetland impact occurring within six designated maritime forests in coastal North Carolina, including Bald Head/Smith Island Complex, Emerald Isle Woods, Theodore Roosevelt Natural Area, Buxton Woods, Kitty Hawk Woods and Nags Head Woods.

Several general permits deserve further discussion due to their applicability to the results presented later in this report. These general permits are: NWP 12 (Utility Line Backfill & Bedding), NWP 26 (Headwater & Isolated Waters Discharge), NWP 33 (Temporary Construction, Access and Dewatering Activities) and GP 297 (Fire Control Activities).

Wetland impacts authorized under NWPs 12 and 33, as well as GP 297, may not result in the total conversion or permanent destruction of wetlands for various reasons. NWP 33 and
GP 297 involve activities that do not significantly alter pre-existing wetland hydrology, while NWP 12 contains special conditions requiring restoration of preconstruction contours. Based on the restrictions associated with each of these permits, as defined in the regulations, impacts occurring under these permits are assumed to be temporary in nature for the purpose of this report. In reality, however, Corps regulators report that in many cases, wetlands affected by these permits are never allowed to regain pre-existing wetland functions. Many of these wetlands are planted with non-native domestic grasses and maintained as mowed access ways, thereby becoming sterile wet areas (G. Wayne Wright, USACOE, Wilmington District, pers. com. 1995).

Nationwide Permit 26 authorizes discharges of up to ten acres for waters and/or wetlands considered to be isolated or located above headwaters.

**Exemptions.** Not all activities resulting in discharges of materials to waters or wetlands are regulated by Section 404. Under Section 404(f), normal farming, ranching and forestry activities which impact wetlands may be exempt from the usual permitting requirements. The requirements for these exemption are provided by 40 CFR Part 232.3. In order for qualifying activities to remain exempt, they must be part of an established or on-going operation. Activities which bring new areas of wetlands into use are not considered to be part of an established operation. Furthermore, any farming, ranching or forestry activity whose purpose is to convert a jurisdictional wetland to a non-wetland, or which impairs the flow or circulation, or reduces the reach of waters of the U.S. is not exempt.

Additional exempted activities include: most maintenance activities; construction of farm or stock ponds and irrigation (but not drainage) ditches; temporary sedimentation basins on construction sites; and farm, forest, and temporary mining roads constructed in accordance with established Best Management Practices (BMPs).

**North Carolina Dredge and Fill Act**

In 1969, the state legislature adopted the North Carolina Dredge and Fill Act (NCGS 113-229) to halt the destruction of coastal salt marshes. The Act required that any project involving the excavation or fill of estuarine waters, tidelands, marshlands, or state-owned lakes obtain a permit from the Department of Natural Resources and Community Development (now the Department of Environment, Health and Natural Resources) prior to commencement. It defined "Estuarine waters" as:

all the waters of the Atlantic Ocean within the boundary of North Carolina and all the waters of the bays, sounds, rivers, and tributaries thereto seaward of the dividing line between coastal fishing waters and inland fishing waters... (NCGS 113-229(n)(2)).

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4. Although DEM has issued a Section 401 general certification for NWP 26, the application and notification requirements differ from those imposed by the Corps. While the Corps requires notification according to the PDN procedure for impacts greater than one acre for the general permit, DEM requires notification and written permission for impacts greater than one-third of an acre for the water quality certification. The Division's notification threshold was lowered from one acre to one-third of an acre in January 1991. In addition, general certification for NWP 26 has been denied for projects impacting greater than one acre of waters or wetlands classified as SA (Shellfish), trout, HQW (High Quality Waters), ORW (Outstanding Resource Waters, and WS I and II (Water Supply).
Likewise, "marshlands" were defined as:

any salt marsh or other marsh subject to regular or occasional flooding by tides, including wind tides (whether or not the tidewaters reach the marshland areas through natural or artificial watercourses), provided this shall not include hurricane or tropical storm tides (NCGS 113-229(n)(3)).

With the exception of excavation or fill activities in state-owned lakes, North Carolina Dredge and Fill Act permits are now administered through the state's Coastal Management Program, discussed below.

North Carolina Coastal Area Management Act

In 1972, the Federal Coastal Zone Management Act (CZMA) (PL 92-583) was enacted to encourage coastal states to voluntarily develop comprehensive coastal zone management programs. Federal approval of state coastal management programs, and continued funding, was contingent upon the development of enforceable standards to ensure the conservation and environmentally sound development of coastal resources, including wetlands (World Wildlife Fund 1992).

In 1974, North Carolina enacted the Coastal Area Management Act (CAMA) in response to growing public concern over threats to sensitive coastal resources from increased development (Owens 1985) and financial incentives provided by the CZMA. The Coastal Area Management Act, together with the State Dredge and Fill Act, form the basis for North Carolina’s Coastal Management Program.

The framework adopted by CAMA involves both direct regulation of specific coastal resources and mandatory comprehensive land use planning (Schoenbaum 1974) for the 20 coastal counties designated in the Act\(^5\). The regulatory component of CAMA is based on the identification and designation of "Areas of Environmental Concern" or AECs. These AECs consist of critical resource areas in which uncontrolled development might threaten property, public health and the natural environment. All development activities within designated AECs require authorization by permit.

Two main categories of CAMA permits exist: one for "major" development and one for "minor" development. Major development permits are required for projects that exceed certain size limits, or that also require another state or federal permit, license, or authorization. Since development within coastal wetlands also requires a state dredge-and-fill permit, as well as a Section 404 permit, a major development permit is needed, regardless of project size, if development occurs within an AEC. The CAMA major development permit program is administered by the North Carolina Division of Coastal Management (DCM).

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\(^5\) The 20 coastal counties under CAMA jurisdiction are Beaufort, Bertie, Brunswick, Camden, Carteret, Chowan, Craven, Currituck, Dare, Gates, Hertford, Hyde, New Hanover, Onslow, Pamlico, Pasquotank, Pender, Perquimans, Tyrrell and Washington.
Coastal wetlands, as defined by the Dredge and Fill Act, have been designated an Area of Environmental Concern within the Estuarine System category of AECs. Freshwater swamps and inland wetlands are not specifically covered by the Act, unless they have been designated a Natural Resource AEC. However, certain peat marshlands and cypress-gum swamps are included in the Estuarine Shoreline AEC because of their important shoreline stabilization and erosion control functions (NCDCM 1992).

In September 1977, the Coastal Resources Commission, CAMA’s appointed governing body, issued "use standards" to define the types of development activities permissible within AECs. These standards are the substantive regulatory criteria which form the basis for CAMA’s permitting program.

The specific use standards for the Coastal Wetlands AEC and the general use standards for all Estuarine System AECs are set forth as binding regulations in 15A NCAC 7H .0205(d) and 7H .0208, respectively. These regulations establish criteria very similar to the EPA’s Section 404(b)(1) Guidelines and the Corps’ Public Interest Review. The highest priority is given to conservation of coastal wetlands. Second priority is given to those water-dependent activities for which no suitable non-AEC location exists and result in only minimal adverse environmental impacts. Non-water dependent activities will not be permitted. Activities which fail to meet these criteria may be permitted if the applicant can demonstrate that public benefits "clearly" outweigh adverse effects; no reasonable alternative exists; and all adverse effects will be mitigated to the greatest extent possible through avoidance, minimization, restoration and compensation.

In addition to the development of use standards applied to activities within AECs, CAMA also mandated that each of the 20 coastal counties develop land use plans to define land use classifications, articulate development policies, and guide future development. Municipalities may also voluntarily develop their own land use plans. Any proposed project not located within an AEC, but still requiring a CAMA major development permit for other reasons must be consistent with the county or town CAMA land use plan in order to receive a permit.

Joint Permit Application. Recognizing that state and federal jurisdiction overlapped for many development activities affecting coastal wetlands, DCM developed a joint permit application to streamline the regulatory process by reducing confusion and redundancy. Instead of applying for all necessary state and federal permits and certifications separately, the CAMA major development permit application serves as the application for all authorizations necessary to impact coastal wetlands, including:

- permits to excavate or place fill in estuarine waters or coastal wetlands as required by the North Carolina Dredge and Fill Act;

- permits to discharge dredged or fill material into waters of the U.S. issued by the Corps under Section 404 of the CWA and Section 10 of the Rivers and Harbors Act; and
water quality certifications issued by DEM pursuant to Section 401 of the CWA for any federal permit resulting in a discharge to waters or wetlands.

In 1981, the Corps’ Wilmington District agreed to entrust the administrative review of certain Section 404 permits to DCM to further eliminate regulatory redundancy (NCDCM 1992). More specifically, a regional general permit (GP 291) has been issued by the Wilmington District authorizing activities that receive prior approval from the State of North Carolina in the form of the following authorizations:

- CAMA Major Development Permit;
- North Carolina Dredge and Fill Permit; and
- Clean Water Act Section 401 Water Quality Certification.

Unlike other general permits, which entail little if any formal review by the Corps, the use of GP 291 does not eliminate rigorous permit review. Rather, it transfers the majority of review responsibilities to the State. Under this arrangement, the Wilmington District coordinates federal agency review of the project and conducts a cursory review itself, similar to the review provided for projects seeking authorization under nationwide permits requiring Pre-Discharge Notification. As is the case for other general permits, the Corps retains the discretionary authority to conduct a separate federal review and require an individual permit if deemed necessary. If the federal agency review is favorable and the Corps does not require an individual permit, substantive review of the proposed project is conducted by DCM. The Division’s decision to issue or deny a CAMA permit is based on application of the appropriate CAMA use standards (or consistency with CAMA land use plans for non-AEC projects). Federal authorization pursuant to Section 404, granted under GP 291, occurs only when a CAMA permit has been issued by the State.

Non-AEC wetland development within the 20 CAMA counties is regulated by the Corps. In these cases, the standard procedures of the Section 404 program are applied, as described previously. However, in addition, the Corps must also evaluate the proposed activity for "consistency" pursuant to Section 307 of the CZMA. Section 307 of the CZMA, referred to as the "consistency clause," requires that each Federal agency activity (such as issuing a Section 404 permit) be carried out in a manner which is consistent with approved State management programs. Since the CAMA land use plans are part of North Carolina’s approved coastal management program, the Corps must deny permits for proposed activities which are inconsistent with CAMA land use plans, even if those activities would otherwise qualify for authorization.
III. MITIGATION OF WETLAND IMPACTS

Both the Section 404(b)(1) Guidelines and the CAMA use standards mandate the use of mitigation to reduce adverse environmental impacts. Yet, the concept of mitigation has been the topic of considerable debate among regulatory agencies. The following discussion describes the conceptual foundations of mitigation, provides a brief history of the policy debate surrounding its use, and outlines major mitigation "options" that should be considered within the context of Section 404.

Regulatory Definition

In common usage, "mitigation" refers to the reduction or moderation of severity of particular actions or circumstances. Within the context of environmental management and regulation, the term mitigation has taken on a more specific definition. In regulations implementing the National Environmental Policy Act (NEPA), the President's Council on Environmental Quality (CEQ) has defined mitigation to include:

- avoiding impacts by not undertaking an action;
- minimizing impacts by limiting the degree of the action;
- rectifying impacts by restoring and rehabilitating damages;
- reducing or eliminating impacts over time by preservation and maintenance operations; and
- compensating for impacts by replacing or providing substitute resources (40 CFR Part 1508.20).

In practice, these actions have been combined to form three general types of mitigation: avoidance, minimization and compensation (USEPA/DA 1990).

Mitigation and Section 404

While the Corps and EPA have both adopted the CEQ's definition of mitigation for the purposes of the Section 404 regulatory program, until 1990, they each differed significantly in their interpretations of the proper application of mitigation during permit review. Liebesman (1990), Want (1990) and Kruczynski (1990a) provide detailed accounts of the policy debate surrounding this issue.

In short, the debate involved the application of EPA's Section 404(b)(1) Guidelines and the use of mitigation, particularly compensatory actions such as wetland creation and restoration. The EPA position held that the CEQ's definition of mitigation implied a specific sequence: avoidance first, then minimization, and lastly compensation of unavoidable impacts. The highest practicable level of mitigation should be achieved, starting with avoidance, before applying techniques in the next higher step.
The Corps, on the other hand, did not adhere to this mitigation sequence. According to its interpretation, as long as compensatory mitigation was sufficient to ensure that total impacts would be adequately offset (at least on paper), there was no need to first avoid or minimize environmental impacts, even if practicable alternatives, in fact, existed. Such an interpretation, EPA claimed, led to authorization of discharges which were in violation of the 404(b)(1) Guidelines.

On February 6, 1990, the Department of the Army and the EPA signed a Memorandum of Agreement (MOA), hereafter referred to as the Mitigation MOA, establishing procedures to determine the type and level of mitigation necessary to comply with the 404(b)(1) Guidelines when considering mitigation requirements for individual permit applications (USEPA/DA 1990). While the MOA did not change the substantive standards of the Guidelines, it did, however, set forth a unified policy regarding the interpretation and application of mitigation in the review process.

The MOA established that the Corps, like EPA, would follow the sequence implied in the CEQ's definition of mitigation. Thus, compensatory mitigation would no longer be considered as a means of reducing impacts in the evaluation of the least environmentally damaging alternative; or stated simply, compensation could not be used to make an unfavorable project favorable. Compensatory mitigation may only be used to offset those unavoidable impacts which remain after all other impacts have been avoided or minimized to the greatest extent practicable. The MOA also articulated the Corps' and EPA's goal for the Section 404 regulatory program to achieve no overall net loss of the Nation's remaining wetland values and functions, although it recognizes that this goal may not be achieved in each and every permit action.

Compensatory Mitigation

Numerous authors, including Salvesen (1990), Kruczynski (1990b), Liebesman (1990) and Kentula, et al. (1992a), have reported on various aspects of compensatory mitigation as it pertains to Section 404. Within the context of Section 404, compensatory mitigation refers to the practice of providing substitute resources to replace or offset the unavoidable loss of wetland acreage and functional values resulting from permitted impacts. Therefore, compensatory mitigation is also the primary mechanism for achieving the program's no-net-loss goal.

Permitting agencies require compensation when they feel that the severity of permitted impacts will result in unacceptable adverse environmental impacts. Compensatory mitigation is seen as a method of reducing those impacts to acceptable levels. Of the three levels of mitigation, compensation is the only type which involves the installation of significant physical measures to offset environmental losses. (Minimization might involve limited physical activities such as installation of silt fencing to protect adjacent wetlands from sedimentation.)
Compensatory mitigation is incorporated into wetlands permits through the attachment of legally binding special conditions requiring the permittee to implement appropriate measures. Compensation may be required as a condition of Section 404 permits issued by the Corps, Section 401 certifications issued by DEM, and CAMA major development permits issued by DCM. The Corps typically imposes compensatory mitigation requirements only on projects requiring individual permits, since activities authorized by general permits are assumed to result in only minimal impacts. Thus, compensatory mitigation required for impacts authorized under general permits is usually a condition of the Section 401 certification. However, as noted earlier, the Corps does retain the ability to require compensation for impacts authorized under general permits through discretionary authority. In addition, the Corps will allow the use of compensatory mitigation to "buy down" adverse impacts to a minimal level, thereby allowing projects whose impacts are greater than minimal without compensation to qualify for authorization under a general permit. However, compensation may not be used to "buy down" impacts greater than ten acres in order to qualify for authorization under NWP 26.

In practice, the level and amount of mitigation required is typically determined on a case-by-case basis and is often the result of intense negotiations between regulatory agencies and permit applicants. The resulting lack of predictability is a common criticism of the use of compensatory mitigation, in particular, and the overall permitting process, in general.

Compensatory Mitigation Options & Regulatory Preferences

Compensatory mitigation involves the planning, implementation and evaluation of complex projects. Kruczynski (1990b) has identified a number of options which define the character of mitigation projects, including the type, location, timing, and size of compensatory actions. Furthermore, the 1990 Mitigation MOA outlines the regulatory preferences that exist among these options. These options, discussed below, must be considered by both applicants and their consultants during project planning and by regulatory agencies during permit review.

Type of Compensation. Three basic types of compensatory mitigation are commonly used to offset wetland losses due to development activities: restoration, creation and enhancement. Preservation of existing wetlands is also an available option, but is only acceptable in exceptional circumstances (USEPA/DA 1990).

Wetland restoration involves the reestablishment of wetland conditions in an area where wetlands historically existed. Restoration is usually achieved through the removal of either man-made or natural disturbances to pre-existing hydrologic regimes. Restoration projects typically have a greater likelihood of success than other types of mitigation because many of the necessary wetland structural components (aside from hydrology), such as relic hydric soils and dormant seed banks, remain undisturbed. Because restoration has a lower risk of failure and also avoids potential impacts to valuable upland habitats, regulatory agencies prefer the use of restoration over other types of compensation (USEPA/DA 1990).
In cases where the opportunity to restore degraded wetlands does not exist, it may be necessary to create wetlands by deliberately converting uplands into wetlands. Establishment of the necessary wetland hydrology is the paramount concern in creating wetlands. Wetland hydrology is typically achieved by manipulation of the surrounding landscape and usually involves a combination of both excavation and grading of upland soils and diversion of an existing water source. The diversion of an existing water supply often requires the installation of water-control structures. The lack of pre-existing wetland hydrology, which necessitates manipulation of existing site topography, increases both the cost and the risk of failure associated with wetland creation projects.

Enhancement of existing wetlands is sometimes used to provide compensation for permitted impacts. Wetland enhancement refers to the intentional increase or augmentation of one or more existing wetland functional values to provide conditions that did not previously exist. While a net increase in wetland functional values is implied, enhancement of one function may cause declines in other wetland functions (Erwin 1991).

Lastly, preservation involves the permanent protection of valuable existing wetland areas from potential development through outright acquisition or some other legal agreement such as the purchase of a conservation easement or development rights.

Enhancement and preservation of existing wetlands can provide important environmental benefits and, therefore, may sometimes constitute acceptable forms of compensation. However, preserved wetlands are generally regulated under Section 404 already, although this alone does not preclude development. In exceptional circumstances, such as when the wetlands to be preserved are unique or pristine, or would be subject to unregulated development under nationwide permitting, preservation may be an acceptable form of compensation. However, since enhancement and preservation do not result in the production of "new" wetlands, neither form of compensation contributes directly to the Section 404 program's no-net-loss goal.

**Location.** Compensatory mitigation projects may be located either adjacent or contiguous to the authorized activity (on-site), or at some distance from the site of the impact (off-site). On-site mitigation is the preferred alternative because lost wetland functions and values are replaced within the ecosystem which was impacted. When on-site compensation is not practical, off-site compensation should be provided in the same geographic area and, ideally, within the same functional watershed.

**Wetland Community Type.** Community type refers to the classification of wetlands based on their ecological attributes. Classification is frequently based on a wetland's vegetation assemblages because this attribute also indirectly reflects a wetland's hydrologic regime (Mitsch and Gosselink 1993). Bottomland hardwood forest, pocosin and salt marsh are examples of specific wetland community types.

Permitting agencies generally prefer "in-kind" replacement; that is, compensatory wetlands that are of the same community type as the wetlands impacted. In-kind compensation is considered preferable because it restores the natural balance of community types within an
ecosystem. Furthermore, as a practical matter, accurately valuing the contribution and propriety of out-of-kind compensation involves extensive functional analysis which is seldom provided during regulatory review.

Timing. Compensatory actions can be implemented at various times in relation to the occurrence of wetland impacts. Mitigation is considered to be "up-front" when compensatory actions have been implemented and satisfy permit conditions prior to the permitted impact occurring. "Concurrent" mitigation occurs when compensatory actions are implemented simultaneous to wetland impacts. Mitigation which occurs after project completion, usually as the result of enforcement actions for an unauthorized fills, is said to be "after-the-fact."

Up-front mitigation is the preferred option because it minimizes the temporal loss of wetland functions. Both concurrent and after-the-fact mitigation result in temporary functional losses because the level of many wetland functions is dependent upon the maturity of the system (Kentula, et al. 1992a).

Mitigation Ratios. A mitigation ratio is a numerical comparison of the area provided as compensation and the area of the permitted impact. According to the 1990 Mitigation MOA, compensatory mitigation should provide a minimum of one to one functional replacement to achieve no net loss of wetland functional values. However, because definitive information on the functional values of specific wetland sites to be impacted frequently does not exist, a minimum of one to one acreage may be used as an acceptable surrogate for functional replacement. In practice, mitigation ratios are commonly required to be greater than one to one, as a reflection of both differences in functional values of the impacted and compensatory wetlands and the likelihood for success or failure associated with the type of mitigation planned (USEPA/DA 1990).
IV. CHARACTERIZATION OF WETLANDS PERMITTING IN NORTH CAROLINA

Little published information exists on the effects of Section 404 permit decisions on the wetland resource. That information which does exist, indicates that most permit decisions affecting wetlands are made on a case-by-case basis without the benefit of quantitative information on how the cumulative effects of past permit decisions relate to the current proposal (Kentula, et al. 1992b; Holland and Kentula 1992; Sifneos, et al. 1992a; Sifneos, et al. 1992b). Yet, much of the information needed to consider these cumulative effects is contained in the project files of applicants, consultants, and regulatory and review agencies (Stockton and Richardson 1987). Collectively, this information is known as the permit record.

A primary objectives of this research was to characterize the effects of Section 404 and state wetland permits on the remaining wetland resource of North Carolina, with particular attention focused on the role of compensatory mitigation. This section presents an overall characterization of wetlands permitting in North Carolina based on analysis of the permit record. Following a discussion of the data sources, scope, research methods, and limitations, specific data is provided for the following parameters: the number and types of permits issued, the type, acreage and location of affected wetlands, the types of the development requiring permits and the role of mitigation in reducing and compensating for permitted impacts. The results of this characterization are intended to help resource managers evaluate permit applications within the context of the cumulative effects of past permitted impacts, as well as enable the evaluation of the adequacy of current compensatory mitigation requirements.

Analysis of the wetlands permit record, however, comprises only one portion of the overall research effort. A more detailed evaluation of compensatory mitigation project planning and implementation is contained in the following section.

Research Methods

The accurate characterization of wetlands permitting requires information about the affected wetlands, the nature of development activities requiring authorization, and the relevant regulatory parameters, such as the type of permit issued, mitigation requirements, if any, etc. Much of the necessary information is contained in the permit record, and optimally, will be compiled into an accessible form by regulatory agencies for use in the evaluation of permit applications (Kentula, et al. 1992a). For the purpose of this report, the term permit record refers to information associated with both Section 404 permits issued by the Corps, as well as information from CAMA/N.C. Dredge-and-Fill permits issued by the Division of Coastal Management.

Data Sources. Section 404 program administration in North Carolina is handled by the Corps’ Wilmington district office. While the Wilmington District does maintain traditional
paper files for all Section 404 permit actions, at present, this information is not available in a readily accessible form. Since compilation of this information into a useable database would have been extremely time and labor intensive, alternative data sources were sought.

The N.C. Division of Environmental Management (DEM), Water Quality Section maintains a computer database used to track applications for projects requiring Section 401 water quality certification (WQC). Since all state and federal permits authorizing wetland impacts must receive certification pursuant to Section 401 prior to issuance, analysis of the WQC database was considered a valid approach to examining the overall effects of wetlands permitting programs in North Carolina. In addition, given the lack of compiled Section 404 information, the WQC database represented the only available data source capable of providing timely, comprehensive, and consolidated statewide wetlands permitting information.

In addition to information contained in the WQC database, original project files maintained by DEM, DCM, the N.C. Department of Transportation (NCDOT), and the Corps' Wilmington district office were reviewed as necessary. These files typically contained permits and permit applications, public notices (if required), mitigation plans, environmental assessments or review documents, memos, and correspondence between applicants, consultants, and review agencies. Follow-up interviews with agency personnel, consultants, and project applicants also provided valuable information.

Review Procedures. Compilation and analysis of the permit record was conducted separately for compensatory and non-compensatory permits. This differential treatment resulted from the study's primary focus on compensatory mitigation and several practical considerations regarding data availability. The examination of the wetlands permit record was based, in part, on methods used in similar studies by Stockton and Richardson (1987), Holland and Kentula (1992), Kentula, et al. (1992b), Sifneos, et al. (1992a) and Sifneos, et al. (1992b).

Compensatory permits received the most thorough review. The WQC database was queried to generate a list of all projects involving compensatory mitigation. Information contained in the original permit files for the identified projects was then obtained from the following sources:

- **Non-DOT projects authorized under individual permits**: Corps' Wilmington district office supplied copies of the public notice; the Section 404 permit, including all special conditions; and the mitigation plan, or correspondences referenced in the special conditions containing the equivalent of a mitigation plan;

- **Projects authorized under nationwide general permits (NWPs)**: DEM Section 401 water quality certification files contained the necessary information, since mitigation required by these permits typically resulted from conditions placed on the 401 certification;

- **N.C. Department of Transportation (NCDOT) projects**: permit files maintained by the NCDOT, Planning & Environmental Branch were reviewed; and
Projects permitted under CAMA: permit files maintained by the N.C. Division of Coastal Management were reviewed.

An evaluation sheet was developed to standardize data collection from the compensatory project files reviewed (Appendix A). Each project/permit file was thoroughly reviewed and all relevant information was recorded on a project evaluation sheet. Selected information for each project was then entered into a separate computer database for analysis.

The large number of non-compensatory permits precluded the complete review of all original permit files. Therefore, information on the majority of non-compensatory permits was based solely on data contained in the WQC database. The original WQC files maintained by DEM were, however, reviewed for those database entries missing key information. In addition, the WQC database was checked for obvious inconsistencies and duplicate entries.

Scope. Two parameters defined the scope of this research: ecosystem type and date of initial permit application.

Only permits authorizing impacts to emergent vegetated wetlands, including forested wetlands, were included in this study, since it is for these types of wetland impacts that compensatory mitigation is most frequently required. Impacts to open water, submerged aquatic vegetation (SAVs), and unvegetated mud flats have not been included, although discharges of dredged or fill material into any area classified as "waters of the U.S." require Section 404 authorization.

The permit record was reviewed for a three year period beginning January 1, 1991 and ending December 31, 1993. Selection of this evaluation "window" was based on two practical considerations. First, DEM did not compile information in the WQC database prior to January 1991. Second, the majority of compensatory mitigation projects required by permits issued after December 1993 would not have been implemented at the time field investigations were undertaken.

The date of initial application was defined as the date on which application for Section 401 certification was recorded, not the date on which the actual Section 404 permit was issued. Projects for which applications for certification were received prior to January 1, 1991, yet which were issued Section 404 permits dated within the study period, were not included. Conversely, projects which received final Section 404 authorization after December 31, 1993 were included, as long as application for Section 401 certification was made within the study period. This treatment results from the consideration that projects are assigned unique "tracking" numbers by DEM at the time applications are received.

Assessing the Role of Compensatory Mitigation. For the purpose of this study, the ability of compensatory mitigation to offset permitted impacts and achieve a goal of "no net loss" was measured by considering gains and losses of wetlands acreage resulting from permitted development activities. This study did not attempt to measure actual changes in wetland functions or provide quantitative functional assessments of individual mitigation projects. It
is important to note, however, that the goal set forth by the Corps and EPA in the 1990 MOA on mitigation calls for achieving "no overall net loss of [wetland] values and functions" (USEPA/DA 1990). Thus, according to a strict interpretation, changes in wetland acreage are an inappropriate measure of no net loss. However, the MOA also states that "[i]n the absence of more definitive information on the functions and values of specific wetlands sites, a minimum of 1 to 1 acreage replacement may be used as a reasonable surrogate for no net loss of functions and values" (USEPA/DA 1990). The reader should be aware that throughout this report, wetland acreage has been used as a surrogate for measuring attainment of a no net loss goal defined in terms of wetland functions and values.

When using changes in wetland acreage as a measure of no net loss, it is important to distinguish between those forms of compensation which add to the remaining wetlands base and those that do not. Because the preservation and enhancement of existing wetlands can provide important environmental benefits, and may potentially contribute to the no net loss as defined in terms of functions and values, these activities are considered acceptable forms of compensation for regulatory purposes. However, preservation and enhancement do not increase the existing stock of wetlands measured in terms of acres. Only restoration and creation increase the amount of existing wetlands. Thus, for the purpose of this report, restoration and creation are the only forms of compensation considered to contribute towards achieving a no-net-loss goal.

Treatment of Missing Data. Several database entries for non-compensatory permits were missing portions of key data. Of those entries missing data, information on the size and type of wetlands impacted was missing most frequently. The DEM permit files for these records were reviewed for the missing data. In some cases the actual project files could not be located. Others simply did not contain the necessary information. For a number of projects, impacts were reported in qualitative rather than quantitative terms, such as "impacts to less than one acre of wetlands." The acreage of all compensatory impacts was known.

Following a thorough review of the permit files, data on the acreage affected remained unknown for 167 non-compensatory permits, or slightly less than 10 percent of all permits issued. To facilitate analysis, the size of each unknown impact was estimated based on the specific type of permit authorizing the impact. The average size of all known non-compensatory impacts was calculated for each permit type (Table 4). Unknown impacts were then assigned the proper average value based on permit type. Size estimates could not be made for two entries because permit type was unknown. The estimation process resulted in a total estimated impact of 113.2 acres, or 5.3 percent of the total (known + estimated) acreage affected by permits.

Limitations. The methods used to conduct this research contain two distinct types of limitations: those associated with the use of the Section 401 WQC database to characterize non-compensatory wetlands permits, and those associated with the analysis of the permit record in general.
Table 4. Average known non-compensatory wetland impacts by permit type.

<table>
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<th>Permit Type</th>
<th>Average Known Non-Compensatory Impact (acres)</th>
<th>No. of Non-Compensatory Permits with Known Impacts</th>
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</table>

* A single 300 acre impact was excluded when calculating the average known non-compensatory impact because its inclusion would have resulted in a highly skewed, unrepresentative average value.

b LT 26, or "Less than NWP 26", refers to projects permitted under NWP 26 that require neither notification of the Corps (PDN) or Section 401 water quality certification from DEM because impacts are below certain size thresholds. Size thresholds for LT 26 were less than 1 acre for project permitted in 1991 and less than 1/3 acre for projects permitted in 1992 and 1993. These impacts were recorded in the WQC database only for those projects whose developers desired written confirmation from DEM that, because of project size, no water quality certification was needed.

Once a water quality certification has been issued by DEM, final approval from the Corps or DCM is still required. However, because DEM is generally not notified of the final permit decision, the WQC database contains no record of whether a Section 404 or CAMA permit was issued for the project, or whether any modifications to the project were made. In some cases, the water quality certification is issued months in advance of the Section 404 permit, and the actual permitted impact may be reduced through negotiations during those intervening months. Therefore, analysis of permitted actions based on examination of the WQC database will over-state impacts when certifications have been issued but final authorization from the Corps or DCM is denied or modified. However, agency personnel felt that these differences were minimal.

As mentioned previously, only impacts to vegetated wetlands were considered. However, even though the WQC database enabled the distinction between wetland impacts and open water impacts, projects affecting both ecosystems were not reported separately. Thus, for projects impacting both open water and wetlands, the area of vegetated wetlands affected will
be over-stated because an unknown portion of the reported impact is composed of open water impacts.

DEM staff were also unsure of whether the reported acreage for projects impacting streams consisted of the area of streambank wetlands only or also included the area of open water impact. Because many of the database entries for stream impacts specifically indicated that wetlands were impacted, streams were included as a wetland type. However, the reader is cautioned that the total acreage of streambank wetlands may actually be over-stated.

Similarly, the WQC database is capable of recording only one wetland type per entry. Since information on each project was limited to a single entry, the wetland type having the greatest impact was entered for those projects impacting multiple wetland types. However, the recorded size for these entries was based on the total area of all wetland types impacted (E. Galamb, NCDEM, Water Quality Section, pers. com. 1994). The number of projects impacting both waters and wetlands, as well as the number of projects impacting multiple wetland types is unknown.

Wetland impacts from projects entered into the WQC database as CAMA permits were found to overstate the actual area of coastal wetlands affected by CAMA major development permits. Coastal wetlands, as defined by CAMA, are regulated by DCM. Coastal freshwater wetlands outside of CAMA jurisdiction are regulated by the Corps under GP 291. (See Section II for detailed explanation of the CAMA regulatory process.) However, for projects which impacted both CAMA wetlands and “404” wetlands under GP 291, the WQC database made no distinction between permit types; all impacts were entered as occurring under CAMA. DCM records were reviewed to determine actual impacts resulting from CAMA permits (B. Bledsoe, NCDCM, pers. com. 1995). Impacts resulting from GP 291 were then assumed to be the difference between CAMA impacts contained in the WQC database, and actual CAMA impacts supplied by DCM. Throughout the remainder of this report, reported CAMA impacts consist of impacts to coastal wetlands under DCM jurisdiction only, as reported by DCM, while reported GP 291 impacts consist of impacts to non-CAMA coastal freshwater wetlands permitted under Section 404 jurisdiction only.

Analysis of the permit record, in general, imposes additional limitations. Information contained in the permit record provides no systematic data on whether permitted impacts ever occurred or whether required mitigation was conducted. Nor does this method enable the evaluation of the success of mitigation practices. However, during the process of selecting projects for on-site evaluation, it was discovered that several compensatory projects had been canceled or had not yet received final Section 404 or CAMA authorization. These projects were removed from the database in order to provide the greatest possible accuracy.

It is also essential to remember that analysis of the permit record will reveal only impacts resulting from those development activities which require permits. It does not provide conclusive data on all activities affecting wetlands, such as impacts resulting from certain agriculture and forestry practices exempted from Section 404, or impacts resulting from illegal development. Similarly, compensatory mitigation required by permits is only one
portion of the overall effort to increase the amount of existing wetlands through restoration and creation.

Information in the permit record will also under-estimate the true amount of impact reduction resulting from avoidance and minimization. Significant impact reductions may result from conscientious planning or project modifications made during pre-application consultations with wetland regulators. However, because these actions occur prior to formal permit review, they are not reflected in the permit record (OTA 1984). Furthermore, the permit record contains no information on the amount of impact reduction resulting from the deterrent imposed simply by the existence of regulatory programs such as Section 404 and state wetlands permitting programs (OTA 1984).

Conventions. Several conventions are used throughout the remainder of this report. These conventions deal primarily with the qualification of particular terms used to describe permits and their resulting impacts. In addition, the form of the available data resulted in definitions of wetland impacts and compensatory actions that require clarification.

The term wetland impact is defined as the number of different wetland types impacted by each project. For example, a project impacting bottomland hardwood wetlands at six different locations constitutes a single impact, since it affects only one wetland type. Although it is somewhat misleading, this definition results from a lack of information on the actual number of individual wetland sites impacted. Furthermore, the total number of impacts is greater than the total number of permits issued because several projects resulted in impacts to more than one wetland type.

Permitted wetland impacts vary in severity, or the degree to which they affect wetland functions and values. For the purposes of this study, impacts were classified as either permanent or temporary. Permanent impacts are impacts which destroy or severely degrade wetlands and are assumed to result in the permanent loss of wetland acreage and functions. Temporary impacts, on the other hand, represent short-term disturbances, usually to wetland vegetation. Wetland hydrology is assumed to remain undisturbed. While wetland functions may be impaired for limited amounts of time, no long-term reductions are incurred.

The distinction between permanent and temporary impacts was usually based on the type of permit issued for each project. Given the nature of the activity authorized by particular general permits and/or permit conditions contained within those general permits, the following permit types were judged to result in temporary impacts: GP 297 (discing fire breaks on wildlife management lands), NWP 12 (utility line backfill & bedding) and NWP 33 (temporary access, maintenance and dewatering activities). The activities authorized by all other permit types were assumed to result in permanent wetland impacts, unless review of the individual permit files revealed otherwise.

The separation of permanent and temporary wetland impacts is necessary in order to accurately consider the role of compensatory mitigation. Since temporary impacts, by definition, result in no long-term destruction of wetlands, there is seldom reason to require
mitigation. Therefore, when determining the proportion of permitted impacts receiving compensation, an important measure of the effectiveness of mitigation, consideration should be limited to permanent impacts only.

The terms non-compensatory permit and non-compensatory impact refer to permits, and their resulting impacts, for which no compensation has been or will be provided. Likewise, the terms compensatory permit and compensatory impact refer to permits, and their resulting impacts, for which compensatory mitigation in the form of wetland creation, restoration, enhancement or preservation has been or will be provided.

Since several of the permits reviewed utilized more than one form of compensation within a single mitigation project, the term compensatory action is used to define the number of separate restoration, creation, enhancement, or preservation efforts implemented to offset a given wetland impact. Compensatory actions which differed in wetland type, but were intended to offset a single impact, were also considered separate actions. However, multiple occurrences of identical compensatory actions (i.e. five separate marsh creations at one project site) were considered to comprise a single compensatory action. Each compensatory action has been considered to constitute a separate compensatory project.

Lastly, the term no-net-loss (NNL) compensation refers to compensation provided through restoration or creation, which increases existing wetland acreage. Total compensation refers to the combined acreage provided by all types of compensation (i.e., restoration, creation, enhancement and preservation.

Results

The characterization of wetlands permitting in North Carolina presented below is based on data contained in the permit record. While this information is subject to the limitations stated previously, it represents the most accurate information on wetlands permitting in North Carolina available.

Total Permits Requested. A total of 1,768 applications for state and federal wetlands development permits were received over the 36 month study period. Table 5 shows the status of these permit applications as of September 1994. If issued as requested, these permits would have authorized impacts to vegetated wetlands totalling 3,335 acres. Permits for three projects, requesting a total of 3.7 acres of impact, were pending at the time of review.

Permits Denied & Withdrawn. Seventeen projects, or about one percent of the 1,768 permit applications received, were denied permits. These denials resulted in the elimination of 781 acres of potential impact. In addition, 44 applications, or 2.5 percent of the total number of applications received, were withdrawn by applicants prior to a formal decision, eliminated another 113 acres of potential impact. A limited review of these permit files indicated that most projects were withdrawn based on unfavorable regulatory review and probable denial.
Table 5. Status of Section 404 and CAMA permit applications received in North Carolina, 1991-93.

<table>
<thead>
<tr>
<th>Permit Status</th>
<th>No. of Permits</th>
<th>Wetland Impacts Requested (acres)</th>
<th>Wetland Impacts Authorized (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denied</td>
<td>17</td>
<td>780.9</td>
<td>0</td>
</tr>
<tr>
<td>Withdrawn</td>
<td>44</td>
<td>112.5</td>
<td>0</td>
</tr>
<tr>
<td>Issued: Non-Compensatory</td>
<td>1,642</td>
<td>1913.1</td>
<td>1781.6</td>
</tr>
<tr>
<td>Issued: Compensatory</td>
<td>62</td>
<td>525.2</td>
<td>370.4</td>
</tr>
<tr>
<td>On Hold</td>
<td>3</td>
<td>3.7</td>
<td>pending</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1,768</td>
<td>3,335.4</td>
<td>2,152.0</td>
</tr>
</tbody>
</table>

Total Authorized Impacts. Of the 1,768 permit applications received, 1,704 permits, or 96.4 percent of the total number of applications received, were eventually issued. Two projects were discarded due to insufficient data. Therefore, the following quantitative data is based on the analysis of 1,702 permits that were issued.

The 1,702 wetland permits evaluated authorized 1,711 impacts affecting a total area of 2,152 acres. As shown in Figure 1, 199 of the 1,711 permitted impacts were temporary in nature. These temporary impacts affected 632 acres, or 29.4 percent of the total area affected by permitted activities. The remaining 1,512 impacts resulted in the permanent loss of 1,520 acres of wetlands, or 70.6 percent of the 2,152 acres affected by wetlands permits.

Avoidance & Minimization. Agency-mandated reduction of wetland impacts occurred in 118 permits (i.e., authorized impacts were smaller than the initial request), resulting in avoidance of 286 acres of impact. Involuntary reductions through avoidance and minimization during permit review represented 11.7 percent of the 2,438 acres requested by applications for which permits were eventually issued. On average, reductions for compensatory permits were an order of magnitude higher than reductions for non-compensatory permits: 12.9 acres and 1.2 acres per permit, respectively. As stated previously, the amount of impact reduction resulting from voluntary avoidance (i.e., modification of a project to the extent that a wetland permit is no longer needed) outside of the permitting process cannot be determined using the permit record.

Compensatory Mitigation. Sixty-two permits, or 4 percent of all permits authorizing permanent wetland impacts, required compensatory mitigation (Figure 2). These 62 permits authorized 70 wetland impacts and affected a total area of 370 acres. All compensatory impacts were considered to be permanent. Of the 1,520 acres of permanent impacts, compensation was provided for 24 percent of the area of these impacts.
Compensatory mitigation resulted in the restoration, creation, enhancement, or preservation of approximately 608 acres of wetlands. Figure 3 illustrates the relative proportion of each type of compensation used. The greatest area of compensation was provided through restoration (306.3 acres). Restoration and creation of wetlands accounted for similar amounts of compensation, 151.4 acres and 141 acres, respectively. Enhancement played only a minor role, constituting 9.5 acres, or about 2 percent of the total area of compensation provided. Interestingly, 58 percent of the acres enhanced provided improvements to oyster habitat, which is considered a non-wetland habitat.

Other Mitigation. Six permits required installation of stormwater detention basins to mitigate for the permitted loss of 9.5 acres of wetlands. While these engineered structures frequently contain wetlands, by design or otherwise, they do not constitute wetlands creation for the purposes of this study. They do, however, compensate for the loss of water quality improvement functions provided by natural wetlands lost to development (Schueler 1987). The number of projects implementing stormwater controls to satisfy the requirements of other rules and regulations is unknown.

Role of Compensatory Mitigation. Figure 4 provides a comparison of the area of permanent wetland impacts and the amount of compensation required by wetland development permits over the three year study period. When all types of compensation were considered—creation, restoration, enhancement and preservation—mitigation efforts were sufficient to completely offset compensatory impacts, resulting in a net gain of 237 acres and a mitigation-to-impact ratio of 1.6 to 1. However, not all types of compensation result in the addition of "new" wetlands, thereby contributing to the no-net-loss goal. When consideration was limited to the amount of compensation provided through restoration and creation (NNL compensation), mitigation efforts were sufficient to offset only about 79 percent of compensatory impacts.

When the compensation provided by the 62 permits requiring mitigation was compared to all permanent permitted impacts (compensatory + non-compensatory), compensation was sufficient to offset 40 percent of the total area permanently impacted. Restoration and creation were sufficient to offset about 19 percent of all permanent permitted impacts. Assuming that all restoration and creation projects will be completely successful, permanent wetland losses permitted under Section 404 over the three year study period resulted in the net loss of 1,227 acres of vegetated wetlands, or slightly more than 400 acres per year.

Types of Permits Issued. Wetland impacts were authorized by 16 types of permits, including individual permits, three general permits approved for use in North Carolina, and 11 nationwide permits, all issued under Section 404, as well as CAMA/N.C. Dredge and Fill Act permits issued by the State (Table 6). Since state and federal jurisdiction overlap for coastal wetlands, technically, CAMA permits also receive Section 404 authorization under GP 291. However, for the purpose of analysis, CAMA permits have been reported separately. Seven permit types required compensatory mitigation.
Figure 1. Area and number of permanent and temporary wetland impacts permitted in North Carolina, 1991-93.

Figure 2. Area and number of permits authorizing permanent wetland impacts in North Carolina receiving compensation, 1991-93.
Figure 3. Total area of compensatory mitigation provided in North Carolina by type of compensation, 1991-93.
Figure 4. Comparison of wetland impacts and compensation resulting from wetland permits issued in North Carolina, 1991-93.

Cumulative Area (acres)

- Permanent Impacts
- Total Compensation
- NNL Compensation

---

a Restoration, Creation, Enhancement & Preservation
b No Net Loss (NNL) Compensation: Restoration & Creation Only
Nearly 74 percent of the 2,152 acres affected by wetland permits resulted from activities authorized under general permits. Compensation was required for 5.6 percent of the permanent impacts resulting from activities authorized under general permits. One general permit, NWP 26 (including LT 26), accounted for 62 percent of all permanent impacts authorized by general permits, yet only 5 percent of NWP 26 impacts received compensation.

Projects authorized by permits receiving in-depth case-by-case review (i.e. individual and CAMA permits) accounted for the remaining 26 percent of impacts. Nearly 65 percent of the permanent impacts authorized by these permits received compensation. Figures 5 and 6 show comparisons of permanent impacts and compensation for compensatory permits only and all permits, respectively.

Table 6. Distribution of total wetland impacts and compensation in North Carolina by permit type, 1991-93.

<table>
<thead>
<tr>
<th>Permit Type</th>
<th>Non-Compensatory Permits</th>
<th>Compensatory Permits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Temporary Impacts</td>
<td>Permanent Impacts</td>
</tr>
<tr>
<td></td>
<td>No. of Permits</td>
<td>Area (acres)</td>
</tr>
<tr>
<td>CAMA*</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Individual</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>GP 30</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>GP 31</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>GP 291b</td>
<td>1</td>
<td>77.1</td>
</tr>
<tr>
<td>GP 297</td>
<td>7</td>
<td>363.5</td>
</tr>
<tr>
<td>NWP 3</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>NWP 7</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>NWP 12</td>
<td>186</td>
<td>191.2</td>
</tr>
<tr>
<td>NWP 13</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>NWP 14</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>NWP 16</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>NWP 18</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>NWP 23</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>NWP 25</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>NWP 26</td>
<td>0</td>
<td>0.1</td>
</tr>
<tr>
<td>LT 26</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>NWP 33</td>
<td>5</td>
<td>0.6</td>
</tr>
<tr>
<td>TOTAL</td>
<td>199</td>
<td>632.4</td>
</tr>
</tbody>
</table>

* Impacts to coastal wetlands within CAMA jurisdiction permitted by NCDCM.

b Impacts to coastal freshwater wetlands outside CAMA jurisdiction permitted by Corps.

c LT 26 or "Less than NWP 26": see footnote, Table 4.
Figure 5. Comparison of wetland impacts and compensation by permit type for compensatory permits issued in North Carolina, 1991-93.

Figure 6. Comparison of wetland impacts and compensation by permit type for all permits issued in North Carolina, 1991-93.
Wetland Types Affected. Wetland development permits affected 13 wetland types (including a miscellaneous category) and 1 non-wetland habitat type. All wetland types impacted experienced net losses in area, despite compensation provided. The largest cumulative impact, as well as the greatest net loss occurred for bottomland hardwoods. Net losses were generally higher for forested wetlands than for marshes; however, freshwater marshes also experienced a sizable net loss. Wetland type was unknown for 155 non-compensatory permits, totalling 108 acres, or five percent of all authorized impacts. Figures 7 through 10 illustrate the distribution of various types of permitted impacts by wetland type.

Location of Impacts. Permitted wetland impacts occurred throughout North Carolina. The distribution of permitted impacts among the state’s three physiographic regions appeared to correspond directly to the relative extent of original wetlands in each of these regions, as determined by hydric soils (Holman 1993, unpublished data). As shown in Figure 11, permanent wetland losses were distributed as follows: Coastal Plain, 882 acres (58%); Piedmont, 587.7 acres (38.7%); and Mountains, 50.2 acres (3.3%).

Permitted wetland impacts occurred in all counties in North Carolina except Warren County. Richmond County had the greatest cumulative impacts; however, this was due to a single large (130 acre) impact. Excluding this impact, Duplin County has the most acres permanently impacted. Cumulative impacts were greater than 100 acres in three counties: Richmond, Duplin and New Hanover; and greater than 50 acres in an additional five counties: Wake, Guilford, Craven, Mecklenburg and Cumberland.

Size of Permitted Impacts. The size of permitted impacts ranged from about 45 square feet to 300 acres. The average size of compensatory impacts was 5.3 acres, while the average non-compensatory impact was 1.1 acres. The average size for all permanent wetland impacts (compensatory and non-compensatory) was 1.19 acres.

Figure 12 shows the distribution of permanent and temporary permitted wetland impacts by size of impact. Figure 13 provides a comparison of permanent impacts for various impact size ranges and the compensation provided to offset impacts within each specific range. The greatest cumulative impacts occurred for authorizations between the sizes of one and three acres. However, very little compensation was provided for impacts in this range. The only size range for which compensation offset impacts was the 10 to 25 acre range. Nineteen permits authorized impacts greater than ten acres.

Nature of Development Activity. Figure 14 shows the relative proportion of all authorized wetland impacts resulting from various activities. Wildlife management activities, in particular the discing of fire breaks in game management lands, authorized under GP 297, affected the greatest area of wetlands. However, the vast majority of these impacts were temporary. Road and highway construction resulted in the greatest amount of permanent

6 Wetlands classification was based on the system used by the N.C. Division of Environmental Management. Detailed descriptions of the typical plant communities, hydrologic regimes, and landscape positions of these wetland types can be found in A Field Guide to North Carolina Wetlands (NCDEM 1994). The category “other” was used to classify wetlands which did not fall into any of the established wetland categories.
Figure 7. Distribution of total wetland impacts in North Carolina by wetland type, 1991-93.

Figure 8. Proportion of permanent wetland impacts in North Carolina receiving compensation by wetland type, 1991-93.
Figure 9. Comparison of wetland impacts and compensation by wetland type for compensatory permits issued in North Carolina 1991-93.

Figure 10. Comparison of wetland impacts and compensation by wetland type for all permits issued in North Carolina 1991-93.
impacts, nearly 300 acres. Almost 70 percent of roadway impacts, or about 208 acres, resulted from N.C. Department of Transportation projects, 64 percent of which received compensation. Less than one-quarter of all roadway impacts were the result of private development. Commercial and residential development also resulted in large cumulative impacts. More than two-thirds of the 283 acres impacted by residential activities resulted from development of subdivisions. Water-dependent development, such as construction of marinas, docks, boat ramps, and bulkheads, resulted in rather small total impacts. Figure 15 shows the proportion of impacts authorized under NWP 26 for each type of development.

Trends in Compensatory Mitigation Requirements

Based on trends in the proportion of permanent impacts receiving compensation seen for various distributions of impacts, the requirement to provide compensation appears to be based primarily on the size of the permitted impact. As shown in Figure 16, the percentage of permanent impacts requiring compensation increases steadily with the size of the authorized impact. Since the type of permit required for a given project is largely dependent on the size of the proposed impact, with larger projects usually requiring individual permits, it is not surprising that the greatest proportion of impacts receiving compensation occurred for individual permits (Figure 17).

Table 7. Comparison of permanent wetland impacts and relative abundance of wetlands in North Carolina by physiographic region.

<table>
<thead>
<tr>
<th>Region</th>
<th>% of impacts</th>
<th>% of state's hydric soils</th>
<th>% of impacts receiving comp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mountains</td>
<td>3.3</td>
<td>0.71</td>
<td>4.4</td>
</tr>
<tr>
<td>Piedmont</td>
<td>38.7</td>
<td>4.23</td>
<td>41.9</td>
</tr>
<tr>
<td>Coastal Plain</td>
<td>58.0</td>
<td>95.06</td>
<td>13.8</td>
</tr>
</tbody>
</table>

* (Holman 1993, unpublished data).

The location of impacts by physiographic region also appeared to affect the proportion of permanent impacts receiving compensation. The large differences in the percentage of permanent impacts receiving compensation among regions, presented in Figure 18, can most likely be attributed to regional differences in the relative abundance of original wetlands, determined by Holman (1993, unpublished data) based on analysis of hydric soils. As shown in Table 7, nearly 39 percent (by area) of all permanently impacts occurred in the Piedmont, which contains less than 5 percent of North Carolina's original wetlands. Thus, while losses in the Coastal Plain were highest in absolute terms, losses in the Piedmont represented a larger proportion of the total area of original wetlands. As a result, a larger proportion of impacts in the Piedmont were required to provide compensation.
Figure 11. Distribution of permanent wetland impacts in North Carolina by physiographic region, 1991-93.

Cumulative Area (acres)

Mountains
50.2 acres

Piedmont
587.7 acres

Coastal Plain
882 acres

Figure 12. Distribution of total wetland impacts in North Carolina by size of impact, 1991-93.

Cumulative Area (acres)

X<1/3
1/3<X<1
1<X<3
3<X<10
10<X<25
25<X<50
50<X<100
X>100

X * Size of Impact (acres)

temporary
permanent
Figure 13. Comparison of permanent wetland impacts and compensation by size of impact for all permits issued in North Carolina, 1991-93.
Figure 14. Distribution of total wetland impacts in North Carolina by type of development, 1991-1993.

Figure 15. Proportion of permanent wetland impacts in North Carolina authorized under NWP 26 by type of development, 1991-93.
Figure 16. Proportion of permanent wetland impacts in North Carolina receiving compensation by size of impact, 1991-93.
Figure 17. Proportion of permanent wetland impacts in North Carolina receiving compensation by permit type, 1991-93.

Figure 18. Proportion of permanent wetland impacts in North Carolina receiving compensation by physiographic region, 1991-93.
V. EVALUATION OF COMPENSATORY MITIGATION PROJECTS IN NORTH CAROLINA

Analysis of the permit record is useful for examining the overall affects of permit decisions on the wetland resource; however, it does not provide detailed information on the planning and implementation of specific compensatory mitigation projects. Yet, the ability of compensatory mitigation to offset permitted impacts and support a no-net-loss goal is ultimately dependent upon the application and success of mitigation at the project level. The following section provides a detailed examination of compensatory mitigation in North Carolina at the project level. Individual compensatory mitigation projects were studied to determine (1) the adequacy of the mitigation planning process and (2) the implementation and apparent or potential success of selected wetland creation and restoration projects.

Evaluation of Mitigation Planning

Compensatory mitigation involves planning complex projects. Consideration must be given to a number of options, including location, timing, type of compensation, and type of replacement community of the creation or restoration effort. Inadequate planning can lead to project failure and often contributes to regulatory delays, increased costs, and difficulties evaluating project success. Evaluation of mitigation planning efforts can help identify inadequacies in planning approaches that may lead to poor project design and limited success.

Research Methods The evaluation of mitigation planning was based on information contained in the wetlands permit record. Fifty-nine of 62 permits requiring compensatory mitigation issued from January 1, 1991 to December 31, 1993 were selected from the permit record. Selection of individual projects for examination was based on the availability of data in the permit files and the degree to which project planning had been completed. The permit files were then reviewed for information pertaining to the planning and implementation of compensatory mitigation projects.

Compensatory mitigation requirements contained in the 59 permits reviewed resulted in 82 separate compensatory mitigation "actions." Each compensatory "action" having unique characteristics was defined as a separate project, even though separate projects were sometimes provided as compensation for a single permitted impact, occurred on the same site, or were included in a single mitigation plan. For example, on-site creation of freshwater marsh and forested lake fringe conducted to compensate for a single impact to bottomland hardwoods and proposed within a single mitigation plan, would be considered two separate compensatory projects. In addition, for projects utilizing mitigation banks, each debit to compensate for a permitted impact was considered a separate compensatory project.

Results The results presented below provide data on compensatory mitigation project planning. Information on project implementation and success of selected compensatory mitigation projects is presented later in this section.

Mitigation Plans. Seventy-one, or 86.6 percent of the 82 compensatory projects evaluated contained some form of mitigation plan. The quality, formality, and level of detail of these mitigation plans varied substantially, however. The mitigation plans for less than half of the
projects consisted of formal documents specifically outlining and justifying the actions to be taken. For a significant number of mitigation projects, all or part of the information constituting the mitigation plan was contained in correspondence between applicants, consultants and regulatory or review agencies. Eleven projects had no mitigation plans.

Special Conditions. Requirements to provide compensatory mitigation are typically incorporated into wetland permits or water quality certifications through the attachment of special conditions. These special conditions are legally binding and outline additional requirements to which the applicant must comply in order for the authorization to remain valid. A permit’s special conditions may or may not outline the specific details of the mitigation project.

The level of detail to which compensatory actions were outlined in the special conditions of the permits reviewed varied significantly. The majority of permits simply referenced separate documents containing mitigation plans or specific correspondences containing the equivalent of a mitigation plan. Some permits restated the most important elements of the mitigation plan in the special conditions, including key elements such as the target acreage and wetland type, planting guidelines and time-frames, success criteria, monitoring requirements and provisions for remedial actions and long-term management. For a few projects, the special conditions requiring and outlining the compensatory mitigation constituted the entire mitigation plan.

Project Goals. Project goals provide both a framework to direct the compensatory effort and a benchmark for evaluating project success (Erwin 1991). In general, two types of project goals exist: qualitative or conceptual goals and quantitative goals. Conceptual goals typically include the acreage and community type of the wetland to be created and sometimes identify specific target functions to be created or restored, such as replacement of wildlife habitat or water quality improvement. Quantitative goals are usually contained in the project’s success criteria. Project goals may be directly stated or inferred from the actions prescribed and are commonly contained in mitigation plans, correspondence, public notices, and/or permits.

Figure 19 illustrates the stated or implied project goals for the 82 compensatory projects studied. Some form of goals were stated or implied for 80, or 97.6 percent, of the projects reviewed, although the level of specificity and usefulness of these goals varied greatly. Of the 82 projects studied, 36 or 43.9 percent had a complete set of goals, based on criteria used by Erwin (1991), where target acreage, wetland type, and functions constitute a complete set of goals. Forty-four projects, or 53.6 percent, contained only a partial set of goals. Although rarely stated explicitly, "no net loss" of wetland acreage was an implied goal in most projects.

Of the 36 projects which stated specific target functions, habitat replacement was mentioned most frequently (19 times), followed by water quality improvement (4 times). The functional goal of nine projects was replacement of lost wetland functions; however, no specific functions were listed. Similarly, four projects called for the establishment or restoration of jurisdictional wetland parameters to the site.
**Success Criteria.** Success criteria are the specific regulatory performance standards used to evaluate the development of compensatory wetland projects. Because the direct measurement of wetland functional performance is difficult within the regulatory context, most success criteria are based on measures of wetland structure, such as the vegetational, hydrologic and/or soil characteristics for a given wetland type. Under this paradigm, key indicators of wetland structure serve as surrogate measures of wetland function (Adamus 1987). Once compensatory wetlands have surpassed the pre-determined structural thresholds, adequate functional performance is assumed and the projects are released from regulatory liabilities.

As illustrated by Figure 20, only four projects, or 4.9 percent contained success criteria for all three jurisdictional wetland parameters (vegetation, hydrology, soils). Of the remainder, 22 projects, or 26.8 percent, contained success criteria for wetland vegetation and hydrology, while 23 projects, or 28 percent, contained vegetation success criteria only. Twenty-two projects, or 26.8 percent had no success criteria. Success criteria were not considered applicable for projects providing compensation through preservation because natural wetland conditions already exist.

Success criteria for vegetation were typically based on the percentage or density of planted materials surviving over a specified period of time (i.e. survival of 75 percent of planted wetland vegetation, or survival of 320 trees per acre after the third full growing season.) Other vegetation success criteria established thresholds based on areal coverage of vegetation (i.e. 75 percent areal coverage within two growing seasons.) Since vegetation success criteria are usually based on the plant species specified in the mitigation plan, these types of vegetational success criteria appear to be somewhat type-specific.

Success criteria for hydrology were usually based on guidelines established for forested wetland compensation developed by the Corps' Wilmington District. These guidelines recommend minimum acceptable hydrology criteria of saturation to within 12 inches of the surface, ponding, or flooding for 12.5% of the growing season, or about 26 days in North Carolina (USACOE-Wilmington District 1993a). Few projects contained hydrology success criteria based on achieving a hydrologic regime specific to the type of compensatory wetland designed.

**Monitoring Requirements.** Monitoring of compensatory wetlands is necessary to identify and remedy problems, assess progress towards meeting project goals and success criteria, and determine compliance with permit conditions. At a minimum, monitoring of compensatory wetlands should enable the quantitative evaluation of those wetland structural components upon which project success criteria have been based.

Fifty-one projects, or 66.2 percent of the projects reviewed, required monitoring by at least one site visit. Several projects had detailed monitoring plans which outlined specific monitoring timetables and items to be monitored at each specified interval. Project monitoring was typically required to continue for a period of two and five years. Twenty-two projects, excluding projects utilizing the Company Swamp Mitigation Bank, required submission of "as-built" or time zero monitoring reports.
Figure 19. Stated or implied project goals for 82 compensatory mitigation projects studied in North Carolina, 1991-93.

- Size, Type, Function (36)
- Size Only (1)
- No Goals (2)
- Size & Function Only (2)
- Size & Type Only (41)

Number of Projects

Figure 20. Stated success criteria for 82 compensatory mitigation projects studied in North Carolina, 1991-93.

- Vegetation & Hydrology Only (22)
- Vegetation Only (23)
- Vegetation, Hydrology & Soils (4)
- Not Applicable: Preservation (11)

Number of Projects
With one exception, specified monitoring requirements were sufficient to enable the evaluation of all stated success criteria (for those projects containing success criteria.) Six projects required monitoring, despite their lack of stated success criteria. Only three of the 82 projects monitored nearby natural wetlands as "reference" ecosystems to assess the functional equivalency and success of compensatory wetlands. See White, et al. (1989), Kentula, et al. (1992a) or Bartoldus, Garbish and Kraus (1993) for detailed information on the use of reference ecosystems for monitoring compensatory wetland projects.

**Remedial Actions.** Remedial actions are frequently required to rectify problems that may develop in compensatory wetlands, such as incorrect site elevations and/or hydrology, poor plant survival, colonization of undesired species, or erosion. If left unchecked, these problems can jeopardize long-term project success.

Forty-four projects, or 53.7 percent, specified some form of remedial action. In most cases, remedial actions were triggered by the failure to satisfy vegetation success criteria. Commonly listed remedial actions included consultation with permitting agencies, replanting, minor regrading, and removal of nuisance species. A limited number of mitigation plans included reference to remedial actions, but failed to specify what actions those actions would be.

**Long-Term Management & Protection.** Although projects are typically released from regulatory liabilities within three to five years following completion, long-term management and protection is needed to ensure that compensatory wetlands will continue to function ecologically beyond their regulatory "lifetimes".

Fifty-five projects, or 67.1 percent, identified provisions for the long-term management and protection of compensatory wetlands. Management and protection methods included transfer of ownership, deed restrictions, location on state- or county-owned land or right-of-way, conservation easement, and unofficial agreement from owners to maintain wetland conditions. It is important to note that, in most cases, successful compensatory wetlands will be regulated as "waters of the U.S." in the same manner as natural wetlands.

**Regulatory Preferences.** As illustrated in Figure 21, 85.3 percent of the area provided as compensation was in-kind, or the same wetland community type as the wetland impacted. The remaining 14.7 percent of compensation was out-of-kind, of which 9.6 acres consisted of enhancement of non-wetland oyster habitat.

Nearly three-quarters (74.6%) of the area provided as compensation for permitted impacts was located on-site (Figure 22). The remainder of compensation was provided off-site, with some compensation located significant distances from the site of the impact.

The majority (52.7%) of compensation was provided up-front, due primarily to the large amount of compensation provided through preservation (Figure 32.) The assumption that preservation provided up-front compensation is based on the provision of wetland functions, not on the timing of the actual preservation arrangement. Most of the remaining area was
Figure 21. In-kind vs. out-of-kind mitigation for 82 compensatory mitigation projects studied in North Carolina, 1991-93.

In-Kind 85.3%
Out-of-Kind 14.7%
Cumulative Area (acres)

Figure 22. On-site vs. off-site mitigation for 82 compensatory mitigation projects studied in North Carolina, 1991-93.

On-site 74.4%
Off-site 25.6%
Cumulative Area (acres)

Figure 23. Timing of mitigation for 82 compensatory mitigation projects studied in North Carolina, 1991-93.

Front 62.7%
Never Done 0.3%
Unknown 3.8%
After-the-Fact 2.2%
Concurrent 41.0%
Cumulative Area (acres)
Mitigation Banking: Mitigation banking refers to the restoration, creation, enhancement, and preservation of wetlands for the purpose of providing compensatory mitigation in advance of expected permitted impacts. Guidance on mitigation banking provided by EPA and the Corps list its potential advantages, including reduction of temporal functional losses and uncertainty of success; ecological advantages gained from consolidating compensation for multiple smaller, isolated impacts into a single, larger parcel; accumulation of financial, planning and scientific resources not practical for small scale projects; and reduction of regulatory uncertainty and improved cost-effectiveness for permittees (USEPA/DA 1993).

Two mitigation banks currently exist in North Carolina. Both of these mitigation banks have been developed by the North Carolina Department of Transportation (NCDOT) to compensate for unavoidable wetland impacts associated with highway projects.

The Company Swamp. The Company Swamp mitigation bank consists of a 1,436 acre tract located adjacent to the Roanoke River in Bertie County, North Carolina (Laney, et al. 1988). The site’s estimated 1,031 acres of wetlands consist of a mixture of old-growth bottomland hardwood forest and alluvial gum-cypress swamp, portions of each having been selectively harvested for timber. The site was purchased by the NCDOT with a $500,000 appropriation from the State Legislature. All compensation provided from the bank is in the form of preservation.

The Company Swamp mitigation bank was established in September 1985 by a Memorandum of Agreement (MOA) entered into by the N.C. Department of Transportation, the N.C. Nature Conservancy, the N.C. Wildlife Resources Commission (WRC) and the U.S. Fish and Wildlife Service (FWS). The MOA established the bank’s major provisions which have been summarized below.

The bank may be used to compensate only for unavoidable impacts to bottomland hardwood wetlands (including alluvial swamps), when adequate opportunities for on-site mitigation do not exist. The bank will have a 30-year "lifetime", with the possibility for two 30-year renewals. The site is to be managed by the WRC in perpetuity. The FWS’s Habitat Evaluation Procedure (HEP) will be used to determine the bank’s available credits, as well as debits for impacts exceeding five acres. Impacts of less than five acres are to be debited on an acre-for-acre basis based on the average credit per acre value derived using HEP. Lastly, the FWS, Raleigh field office has been designated as the "banker."

Compensatory mitigation for nine impacts permitted during the study period utilized the Company Swamp mitigation bank. Compensation for impacts to 11.2 acres of bottomland hardwoods and 1.7 acres of alluvial swamp consisted of a total of 41.8 acres debited. All mitigation was considered in-kind.

Pridgen Flats. The Pridgen Flats mitigation bank, located in Sampson County, North Carolina, consists of a 346 acre tract of former pocosin wetlands that were cleared and
drained for agricultural use. Following failure of farming operations, ownership reverted to the Farmer's Home Administration. The U.S. Fish and Wildlife Service currently holds a conservation easement on the property as part of the National Wildlife Refuge System.

In June 1992, the N.C. Department of Transportation, N.C. Wildlife Resource Commission, and the FWS signed a Memorandum of Understanding (MOU) which established the bank and formally adopted a restoration and monitoring plan (NCDOT/NCWRC/FWS 1992). The bank's provisions are similar to those for the Company Swamp.

The terms of the MOU will remain binding for 20 years; however, the FWS is to manage the site in perpetuity. The NCDOT is responsible for the implementation of the restoration and monitoring plan. The bank may be used only to compensate for unavoidable impacts to pocosin wetlands after it has been demonstrated that no practical on-site mitigation options exist. Compensation is to be debited from the bank at a mitigation-to-impact ratio of 2 to 1. A final evaluation is to be completed five years after implementation.

Restoration will involve reestablishment of pocosin wetland hydrology and vegetation over roughly 200 acres. Hydrologic restoration will be achieved by installing flashboard risers in existing drainage ditches. Revegetation will utilize an experimental approach, including planting appropriate container-grown seedlings; seeding with seeds collected from a nearby pocosin area; and natural revegetation from the existing seed bank.

Based on preliminary evaluation by the Corps in early 1993, restoration efforts at Pridgen Flats have generated 87 acres of mitigation credit. Mitigation requirements for six permits issued for NCDOT projects have exhausted the available credits, although the site may yield additional credits in the future. Only three of the six permits utilizing Pridgen Flats fall within the temporal scope of this study. In keeping with the mandated 2 to 1 mitigation to impact ratio, debits equalling 38.8 acres have been deducted to compensate for 19.4 acres of impact authorized by these three permits.

**Evaluation of Mitigation Project Implementation and Success**

Analysis of the permit record alone does not provide a complete and satisfactory evaluation of compensatory mitigation projects. Such an approach reveals nothing about the actual implementation or success of compensatory mitigation projects. Information on the implementation, success and propriety of compensatory mitigation projects can only be determined through direct, on-site evaluation of compensatory projects in the field.

**Research Methods** Forty-one of the 82 compensatory mitigation projects reviewed above were visited during the summer of 1994 to provide a general assessment of (1) the degree to which required projects had been implemented and (2) the "success" of projects based on evaluation of actual field conditions.
Site selection was based on the degree of project completion and location. All sites where construction and planting were known to be completed, or should have been completed, were visited. In addition, mitigation sites in various stages of partial completion were also visited if located within reasonable proximity to completed sites. Projects whose status could not be adequately determined from available data were also visited.

Various methods were used to determine the status of mitigation projects. Following identification of permits requiring compensatory mitigation from the WQC database, applicants and/or their consultants were mailed letters advising them of this study (Appendix B). Each letter also contained a brief survey/information card, to be returned by the permittee, indicating the current project status.

A standard evaluation form for the on-site assessments was developed in conjunction with a Federal Highway Administration (FHWA) Wetlands Mitigation Task Force which evaluated several NCDOT mitigation projects in June 1994. The evaluation form (Appendix C) was developed cooperatively by officials from DEM, DCM, NCDOT, FHWA, FWS and the Corps. Use of the FHWA on-site form was intended to promote greater consistency in the evaluation of mitigation projects throughout North Carolina.

The on-site investigation of compensatory projects considered a number of project aspects, including:

- degree of project implementation;

- presence and extent of jurisdictional wetlands created or restored (as defined by the 1987 Delineation Manual);

- attainment of stated or inferred project goals, based on planned acreage, desired wetland type and target function(s);

- potential habitat value, based on size of mitigation and relationship to surrounding land uses;

- potential water quality benefits based on wetland type and landscape position; and

- observed or potential factors adversely affecting the survival or functional performance of compensatory wetlands, including effects of current or future surrounding land uses, erosion and sedimentation, nuisance species, herbivory and human impacts.

Several of the approaches used to evaluate compensatory mitigation projects in the field were based on a similar study conducted by Erwin (1991).

**Defining Success.** Determining the "success" of compensatory mitigation projects is ultimately dependent upon the evaluation criteria used. Success can be measured in terms of compliance with permit conditions or success criteria, attainment of project goals, or functional performance comparable to the wetlands impacted or a reference ecosystem.
There is, however, no generally accepted methodology for judging the success of compensatory mitigation projects.

The complexity, inherent variety and relatively young age of the compensatory wetlands evaluated make it difficult to define success or failure in absolute terms. Instead of attempting to judge project success as an absolute, several key factors of compensatory wetlands were considered, including:

Does the mitigation site meet jurisdictional wetland criteria, under the 1987 Manual?;

- Have stated or inferred project goals, as defined by size, type and function, been achieved?;
- Have success criteria been met (if stated in permits or plans) as the project currently stands?; and
- Is the compensatory wetland located in an ecologically viable landscape position, based on surrounding land uses, habitat and/or water quality improvement value?

Both together and individually, evaluation of compensatory wetlands with respect to these factors can help form a unified picture of the degree of overall project success and the adequacy of current compensatory mitigation practices.

Limitations The actual evaluation of compensatory projects in the field was limited by two primary factors. First, the relatively young age of the projects studied limited the number of sites where wetland parameters were sufficiently developed to enable evaluation based on the actual conditions present. For projects where wetland conditions were not sufficiently developed (i.e. partially completed projects), evaluation was based on the most likely outcome, as determined using best professional judgement. Assessment of certain evaluation criteria, particularly the achievement of target functions and success criteria, was not possible for many projects given their age or degree of implementation.

A second limitation derives from the qualitative nature of the field evaluations. Evaluation of project goals, success criteria, functional performance and the probable effect of surrounding land uses were based on general observation. The large number of sites visited, as well as time and budgetary constraints, prevented a rigorous quantitative assessment of the mitigation projects investigated.

Results Table 8 shows the status of the 41 compensatory mitigation projects visited. Construction was completed at 20 of the projects visited. Fourteen of the sites visited were in various stages of partial completion. Site selection had been finalized for five sites visited, although construction activities had not yet begun (i.e., developers intended to implement project as planned). Mitigation efforts which should have been completed had never been implemented at two sites visited (i.e., developers refused to conduct required mitigation.) The status of the 41 projects that were not visited was confirmed to be either partially completed or not yet begun, but planned to be implemented as required. However,
it was not possible to predict with absolute certainty whether projects that were not yet begun would actually be implemented as required.

Table 8. Status of 41 compensatory mitigation projects visited in North Carolina.

<table>
<thead>
<tr>
<th>Project Status</th>
<th>No. of Projects</th>
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<tbody>
<tr>
<td>Complete</td>
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<tr>
<td>Partially Complete</td>
<td>14</td>
</tr>
<tr>
<td>Not Yet Begun</td>
<td>5</td>
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<tr>
<td>Never Implemented</td>
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</tr>
<tr>
<td>TOTAL</td>
<td>41</td>
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The age of the mitigation projects visited varied significantly. At the time of evaluation, the oldest completed projects had been in place for three growing seasons. Other projects had been planted only recently and were less than one growing season old. Projects still under construction were in various stages of completion, ranging from graded and awaiting planting to initial site-preparation following finalization or site selection.

**Jurisdictional Wetland Status.** Eighteen of the 20 completed projects were successful in creating or restoring jurisdictional wetlands on at least some portion of the site. (For wetland creation projects, development of hydric soil characteristics was presumed where adequate wetland hydrology existed.) Eight of the partially completed mitigation projects had or would most likely achieve jurisdictional wetland conditions also. Wetland conditions were not sufficiently developed to enable evaluation at three of the partially completed sites.

**Project Goals.** Nineteen completed projects and 14 partially completed projects had some combination of stated or inferred project goals (size, type, function). An implied goal of no-net-loss was used to evaluate the one project having no stated or inferred goals. No attempt was made to directly measure target functions; however, the level of function may be partially inferred from achievement of wetland size and type goals.

As illustrated by Figures 24 and 25 respectively, only five (25%) of the completed projects and five (35.7%) of the partially completed projects had met or would probably meet project goals for both wetland size and type. Not including projects which failed to create jurisdictional wetlands, six completed projects failed to achieve both acreage and wetland type goals. Six partially completed projects were too young to estimate attainment of size or wetland type goals.

Nine (52.9%) of the completed projects and six (42.9%) of the partially completed projects that contained a stated or implied target wetland type resulted or would probably result in the creation or restoration of the desired wetland type. A target wetland type was not specified.
Figure 24. Attainment of target size and wetland type for 20 completed compensatory mitigation projects studied in North Carolina, 1991-93.

- Correct wetland type, but too small (6)
- Incorrect wetland type and too small (6)
- Incorrect wetland type, but correct size (1)
- Failed to achieve jurisdictional wetland conditions (2)
- Correct wetland type and correct size (5)

Number of Projects

Figure 25. Probable attainment of target size and wetland type for 14 partially completed compensatory mitigation projects studied in North Carolina, 1991-93.

- Correct wetland type and correct size (5)
- Too early to determine (4)
- Incorrect wetland type, but correct size (1)
- Correct wetland type, but too small (1)
- Failure to achieve jurisdictional wetland conditions (3)

Number of Projects
for three of the completed projects. Assessment of target wetland type was not possible for five partially completed sites because wetlands had not been planted.

Only six (30%) of the completed projects and six (42.9%) of the partially completed projects had or would most likely achieve wetland conditions, regardless of wetland type, over the majority of the planned area. Twelve of the 18 completed projects which actually created wetlands (66%), failed to achieve wetland conditions over the desired area. Estimation of wetland size was premature at four sites still under construction.

**Success Criteria.** Eleven completed and six partially completed mitigation projects contained success criteria. Conditions at only three of the 20 finished sites (15%) satisfied all stated success criteria. Seven projects met none or only part of the success criteria. Wetland conditions at one completed and six partially completed projects were not sufficiently developed to enable assessment.

It is important to note that, because the projects studied are all relatively new, determination of success based on satisfaction of regulatory success criteria alone is premature. None of the projects containing time-dependent permit conditions (i.e. satisfaction of certain success criteria after three years) have been "released" from regulatory liability. Furthermore, projects will not be released until all success criteria have been met. The evaluation of success criteria does, however, provide an indication of a project’s potential for future success or the need for remedial action.

**Design Hydrology.** Hydrology has been identified as the single most important determinant in the establishment and maintenance of specific wetland types and functions (Mitsch and Gosselink 1993). Thus, establishment of a hydrologic regime appropriate for the type of wetland planned is essential for success.

The assessment of wetland hydrology was based on achievement of hydrologic conditions necessary to establish and maintain the type of wetland planned. Fifteen of the 18 completed projects (79%) indicating a target wetland type were successful in establishing the appropriate hydrologic regime. However, for three of these projects, the area exhibiting proper hydrology was significantly less than planned. For partially completed projects, the correct site hydrology would probably be established at five of the ten sites where conditions enabled evaluation.

According to Kruczynski (1990b), establishment of site elevations necessary to ensure the appropriate hydropereiod is the critical element in the success of created wetlands. Incorrect elevation was a contributing factor for seven of the eight completed projects with incorrect hydrology. Elevations at six of these sites were too high. In addition, elevations were too high at four of the partially completed sites.

Improper drainage also affected achievement of target hydrology, especially for flood-dependent wetland types. Five completed sites and three partially completed sites showed indications that drainage problems may prevent achievement of the desired wetland type.
Although not widespread problems, failure of water-control structures and erosion affected establishment of the desired hydrology at a small number of sites.

Viability of Compensatory Wetlands. Viability refers to the ability of compensatory projects to persist through time and replace lost wetland functions in an ecologically meaningful manner. According to Erwin (1991), size and landscape context are two important determinants of the viability of compensatory wetlands. Three qualitative measures were used to determine the viability of compensatory wetlands: (1) the potential of current or future surrounding land uses to adversely affect the development or functional performance of compensatory wetlands; (2) the potential for mitigation areas to provide or contribute to local wildlife habitat; and (3) the potential for compensatory wetlands to provide water quality benefits.

Eight completed projects, seven partially completed projects and one project not yet begun were located in areas where current or future surrounding land uses may prevent the compensatory wetland from providing the intended wetland functions. Since most mitigation projects were conducted in response to wetland impacts resulting from urban or suburban development, the majority of compensatory wetlands were located within an urbanized context.

The relatively high frequency of impacts to compensatory wetlands resulting from inadvertent or deliberate human activities affecting project success was most likely attributable to the urban context of most mitigation sites. Of the 20 completed projects, human impacts were evident at seven sites, while an additional five sites had high potential for human impacts given their locations. Seven of the partially completed sites also exhibited a high potential for human impacts.

Replacement of wildlife habitat was the stated or inferred functional goal for many of the mitigation projects visited. The ability of compensatory wetlands to provide wildlife habitat was based on qualitative consideration of project size, the extent of surrounding natural habitat and the effects of current or future land uses.

Ten (50%) of the completed projects and seven (50%) of the partially completed projects showed potential to provide useful wildlife habitat as either stand-alone units, or as part of larger, natural landscape complexes. In addition, projects that successfully created wetlands should provide some amount of aquatic habitat, particularly for smaller organisms such as invertebrates. However, because baseline monitoring or ecological assessments of natural wetland are seldom conducted prior to the permitted impact, it is difficulty to compare the habitat value of compensatory wetlands and the natural wetlands they are intended to replace.

The removal of important water quality improvement functions resulting from permitted wetland impacts is of particular concern to wetland regulators, especially those administering the Section 401 water quality certification program (R. Ferrell, NCDEM, Water Quality Section, pers. com. 1994). The potential for compensatory wetlands to provide water quality benefits, such as nutrient uptake, sediment retention and shoreline stabilization, was assessed.
qualitatively by considering the type and relative landscape position of compensatory wetlands.

Eleven of completed projects and 10 of the partially completed projects showed the potential to provide some degree of water quality benefits. Five projects were of wetland types not generally thought to provide high degrees of water quality improvement due to their natural hydrologic regime and/or landscape position (i.e. pocosins or wet flats) (NCDEM 1994).
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LIST OF PATENTS AND PUBLICATIONS

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<tr>
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<td>Area of Environmental Concern</td>
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APPENDIX A:
PERMIT FILE EVALUATION SHEET

(circle all that apply)

I. PERMIT FILE

DEM #: ____________  COE #: ____________  DOT #: ____________

Applicant/Project Name: ____________________________________________

Project Description: ________________________________________________

Permit Type: After-the-Fact Individual NW____ GP____ CAMA

Contact: ____________________________________________________________ Phone:

Address: ____________________________________________________________

County: 
Quad. Map: _________________________________________________________

Direction to site: ______________________________________________________

Acres Requested (Public Notice): ______  Wetland Type: ______
Acres Permitted (404 Permit): ______  Functions Impacted: ________________

Date—Public Notice Issued: ______  404 Permit Issued: ______

II. MITIGATION PLAN

Is mitigation a specific permit condition?  no  yes  voluntary

Which agency requires mitigation?  DEM  COE  DCM  Voluntary

Is there a formal Mitigation Plan?  no  yes

Is an equivalent Mitigation Plan contained in correspondences or permits?  no  yes

Mitigation Plan prepared by:  Applicant  Consultant (name: ____________________)

Type of Mitigation:  Restoration  Creation  Enhancement  Preservation  Bank:  CS or PF

Mitigation Wetland Type: _________  in-kind  out-of-kind  both
Location of Mitigation: on-site off-site both
Timing of Mitigation: up-front concurrent after-the-fact
Mitigation Size: ___________ acres
Mitigation Ratio: ___________
Current Status: in planning planning complete no construction const. begun const. complete # growing seasons complete ___
Goals: None Acreage Wet. Type Function(s)

Are the Goals? _ Specific _ Measurable _ Attainable

III. SUCCESS CRITERIA

Vegetation: none (list)

Hydrology: none

Soils: none

IV. VEGETATION

What method of vegetation establishment was specified? natural reveg. planting both
Were plant species listed? no yes
Were "local" plants specified? no yes
Was appropriate plant spacing specified? no yes
Was community composition/species composition defined? no yes
Was a planting season specified? no yes
When did planting occur? (date)

V. HYDROLOGY
Is the water source specified? no yes
Are target elevations included in plan/drawings no yes

VI. LANDSCAPE CONSIDERATIONS
What land uses occur within a 1 mile radius (estimate % of each type):

VII. MONITORING
Is there a Monitoring Plan? no yes
Describe:

Are remedial actions specified? none what:

when:

Were/will "As-Built" plans provided? no yes

Are there provisions for long-term protection/management? none
Have responsible agencies made compliance checks? no yes
(date:_____________________)

Have enforcement actions been taken? no yes
APPENDIX B:

LETTER AND QUESTIONNAIRE SENT TO PERMITTEES

July 11, 1994

Philip A. Marsh
1000 Big Swamp Road
Anywhere, North Carolina 12345

Subject: Shopping Center

Dear Mr. Marsh:

The University of North Carolina Water Resources Research Institute, in conjunction with the North Carolina Division of Environmental Management, is currently conducting a study of wetland permitting and associated mitigation requirements in North Carolina. One of the primary objectives of this study is to assess the implementation of wetland creation and restoration efforts as compensatory mitigation for permitted wetland losses. This research is being funded by the Albemarle-Pamlico Estuarine Study.

A search of agency records indicates that conditions requiring wetland creation and/or restoration were included in the Section 404/401 permit for the above referenced project. In order to determine the degree of project implementation, as well as to provide a general assessment of the mitigation project’s success or potential for success, site visits will be conducted from mid-July through August. This letter is being sent to notify you of our intention to conduct a site visit during this period. If you would like to accompany us during the site visit, we will be happy to arrange our schedule accordingly. Please make your request to Mr. Ron Ferrell or myself at (919) 733-1786 by July 22.

Enclosed you will also find a card containing a few simple questions regarding the current status of your permitted project. Please take a few moments to answer these questions. Just drop the card in any mailbox, it is pre-stamped and addressed for your convenience.
The final report of our findings is scheduled to be completed this Fall and will be available upon request. If you have any questions, please do not hesitate to contact Mr. Ferrell or myself at the number provided above. Thank you for your cooperation and timely response.

Sincerely,

Chris Pfeifer
Graduate Research Assistant

Ron Ferrell
Wetlands & Technical Review Group

UNIVERSITY OF NORTH CAROLINA WETLAND MITIGATION STUDY

Project Name: _____________________________________________

Contact (your name): _______________________________________

Telephone:_________________________________________________

Please check the appropriate box yes no

1. Has the permitted wetland impact occurred? " "
2. Has wetland creation/ restoration work begun? " "
3. Has wetland creation/ restoration work been completed? " "

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APPENDIX C:
ON-SITE EVALUATION SHEET

ONSITE INSPECTION

Date of Site Inspection

General appearance of the wetland and surrounding site:

<table>
<thead>
<tr>
<th>A. Does the site meet wetlands criteria pursuant to the 1987 manual? (complete data form attached)</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES</td>
</tr>
</tbody>
</table>

B. VEGETATION

1. Vegetation Planted/Regeneration:

2. Assess survival of planted species, if possible:

3. Assess coverage of vegetation:

4. Are there any nuisance or undesired species present?

% composition Is it a problem?
C. SOILS

Physical Characteristics:


D. HYDROLOGY


1. Review of hydrology indicators for saturated soils pursuant to the NTCHS 22 March 1993 Guidelines / other indicators for flooded/ponded sites:


2. Does the site hydrology match the target wetland site?


E. WILDLIFE COMPONENT


1. General Observations:


2. Wildlife Accessibility:


F. Have success criteria been met?


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G. Will wetland functions be impaired by current or future land use?

__________________________

__________________________

__________________________

SUMMARY

Is the site a wetland?  
YES  NO  NA

Is the site the type of wetland designed?  
YES  NO  NA

Is the mitigation a success?  
YES  NO  NA

Describe:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________