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Wetlands Regulatory Assistance Program

Wetlands Management Handbook

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December 2000

Environmental Laboratory

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Contents

Preface

Publication of this report was authorized and funded by Headquarters, U.S. Army Corps of Engineers (HQUSACE), as part of the Wetlands Regulatory Assistance Program (WRAP). HQUSACE representatives for this report were Mr. Charles Hess, Chief, Operations Division (CECW-O); Mr. John Studt, Chief, Regulatory Branch (CECW-OR); and Mr. Ted Rugiel, Regulatory Branch (CECW-OR). Dr. Russell F. Theriot, U.S. Army Engineer Research and Development Center (ERDC), Environmental Laboratory (EL), was the WRAP Program Manager. Mr. Mike Smith, HQUSACE Regulatory Branch, was the wetland delineation point of contact. General supervision of this work was provided by Dr. Morris Mauney, Chief, Wetlands Branch, EL; Dr. Conrad Kirby, Chief, Environmental Resources Division, EL; and Dr. John Keeley, Director, EL.

The report was prepared by Ms. Carolyn Schneider, EL, and Dr. Steven W. Sprecher, U.S. Army Engineer District, Detroit, South Bend, IN.

This document was prepared for the Army Environmental Center to provide Army Natural Resource Managers with general guidance on the wetlands ecological principles and regulatory requirements that must be considered in the implementation of their installation's Integrated Natural Resources Management Plan. Although this overview includes numerous quotations from and citations of Federal regulations, the regulatory guidance is general in nature and should not be regarded as legal advice applicable to site-specific situations. The regulations of the Corps of Engineers and the Environmental Protection Agency are complex, and their interpretation is constantly evolving. Questions about application of specific regulations to specific sites should be addressed to the Regulatory Branch of the Appropriate Corps of Engineers District Office.

At the time of publication of this report, Dr. James R. Houston was Director of ERDC, and COL Robin R. Cababa, EN, was Commander.

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1 Introduction

Purpose and Objectives

Department of the Army Natural Resources Managers are faced with the challenge of balancing and integrating potentially conflicting uses of wetlands and other natural and cultural resources. These resources must be carefully managed to ensure continued availability of the natural features that are critical to total mission accomplishment, such as realism in training. In addition, land managers must comply with a number of environmental requirements in law to identify, protect, and manage significant biological, geophysical, and cultural resources. Development and implementation of such stewardship programs requires careful interdisciplinary planning and continuing adjustment to be effective.

This document addresses the wetlands facet of natural resources management in this broad spectrum of responsibilities of the Army land manager. The purpose of this handbook is to provide Army land managers with general guidance on basic ecological and regulatory issues that must be considered in wetlands protection and management. The objective of the handbook is to help land managers better fulfill their obligations for development and implementation of their installation's Integrated Natural Resources Management Plan, and to help installations comply with applicable wetlands laws and regulations.

Stewardship Versus Compliance

Fundamental to any successful natural resources stewardship program is the awareness that ecosystems are interconnected. Land managers will fail at stewardship if they manage landscape components in a piecemeal fashion, complying with individual environmental regulations but never tying the different parts of the ecosystem together into an integrated whole.

In order to properly manage wetlands, one must recognize their role in the landscape: they are the active interface between terrestrial and aquatic components of a drainage basin. Water, sediment, nutrients, toxins, organic matter, and seeds from upstream or upslope move into wetlands where they may be changed in energy or biochemical status before eventually being removed further downstream. Animals move in and out of wetlands, using them as

sources of food, water, and habitat, and transferring energy and chemical components between terrestrial and aquatic ecosystems. Because of these interrelationships, activities upstream or upslope have profound effects on wetlands and on aquatic sites downstream. Consequently, management activities within wetlands can have substantial impacts on communities downstream or within the radius of movement of organisms that use the wetland.

Active stewardship of wetlands, then, requires attention to activities elsewhere in the drainage basin. These activities may not be regulated under wetlands laws, or even substantially regulated under narrow interpretations of other environmental rules. However, impacts to wetlands may be considerable, especially as they accumulate over time. Particularly common impacts on wetlands are erosional sedimentation from upslope traffic or construction projects. Erosion is often greater than planned, and sediment may move further than anticipated or even than monitored. Nevertheless, when wetlands fill faster than natural erosion would cause, their ecological equilibrium with the surrounding landscape is disturbed and the wetland is degraded. All rules may have been complied with, but the stewardship mission has failed.

The interrelationships between wetlands and adjacent systems upstream and downstream are complicated enough that it is not practical to write quantitative regulations for integrative management of the entire landscape. It is the role of the professional resources steward to integrate activities in various components of the ecosystem so that those activities do not substantially degrade other components, even if that integration requires going to the extra lengths of managing activities more stringently than required by the formal regulations with which the base must comply.

Off-site impacts on wetlands are listed in Table 1. Although all of these activities can have significant impacts on wetlands, rules regulating them are seldom interpreted broadly enough to protect adjacent wetlands from such secondary impacts. It is the role of the professional resources steward to recognize site-specific implications of individual upstream activities and modify those activities so as to minimize the secondary wetland impacts.

Wetland Functions

In order to predict impacts on wetlands it is necessary to understand the functions that occur in these aquatic sites. Numerous authors have compiled lists of wetlands functions. No list is recognized as official or exhaustive. The National Wetlands Policy Forum (Conservation Foundation 1988) identified eight natural functions that wetlands may perform in the landscape: (1) nutrient removal and transformation, (2) sediment and toxicant retention, (3) shoreline and bank stabilization, (4) floodflow alteration, (5) groundwater recharge, (6) production export, (7) aquatic diversity and abundance, and (8) wildlife diversity and abundance.

It is important for natural resource managers to understand that the degree to which these functions are performed varies from one wetland to another. All

Table 1
Offsite Impacts on Wetlands

Activity	Nature of Impact
Traffic, including training, or construction upslope	Erosion carries sediment into wetland; stresses small plants; buries seeds deeper than would naturally occur; sediment may carry petroleum products and toxic compounds that stress plants; raised floor alters hydrologic regime.
Vehicle crossings in streams upstream of wetlands	Cause substantial sediment inputs into wetlands downstream and may alter water flows in streams feeding wetlands.
Dams and levees upstream	Significantly alter waterflow downstream, either drying out or flooding areas that were formerly wetlands.
Stream channelization.	Increases water speed and energy, thereby downcutting the channel; during dry periods lowers the water table within adjacent wetlands and dries them out.
Surfacing upslope areas	Increased runoff will accelerate waterflow into wetlands during storms and reduce subsurface flow from uplands after storms. This results in high amplitude and shorter duration water inputs into wetlands as well as shorter residence times. Runoff may carry petroleum products and other pollutants.
Clear-cutting upstream of wetlands	Increases storm runoff and decreases upland storage and post-storm release. Erosion and sedimentation will also be increased.
Frequent hot burns of upslope vegetation	Increases storm runoff and decreases upland storage and post-storm release. Erosion and sedimentation will also be increased.
Ordnance in wetlands	May release toxic compounds such as lead and white phosphorus into wetlands.

wetlands do not perform all functions. Nor are all of the listed functions unique to wetlands. Explanations of these eight natural functions follow; additional information can be found in Tables 19-27.

Nutrient removal and transformation

Nutrient removal and transformation are the major processes by which wetlands improve water quality. Nitrate and phosphorus from agricultural runoff are removed from the water column. Nitrate converts to gaseous nitrogen and phosphorus is immobilized; both may be taken up by wetland plants. Nutrient-rich sediments may also become trapped in wetlands.

Sediment and toxicant retention

Wetlands can remove from the water column sediments and any attached toxic chemicals, such as pesticides, heavy metals, or excess nutrients/fertilizers. These may decompose or become buried. Wetlands that provide this function are located downstream of the sediment source and retard water velocity sufficiently for suspended sediments to settle out.

Shoreline and bank stabilization

Wave or current erosion can be reduced by wetland plant roots binding together soil that would otherwise be eroded by water movement from an adjacent river, lake, or ocean. This protects adjacent upland sites from erosion and protects downstream sites from sedimentation.

Floodflow alteration

Wetlands on floodplains can delay discharge of peak runoff into streams and impede passage of overbank flow downstream during storm events. Riverine wetlands and depressional wetlands in the headwaters of streams both perform this function.

Groundwater recharge

Groundwater recharge occurs when water resides on the surface of the land long enough to percolate into the underlying aquifer. Most wetlands that perform this function are depressional wetlands in uplands. Riverine wetlands are usually sites of groundwater discharge rather than recharge, except in arid or semiarid regions where streams may contribute more water to the ground than they gain from it, resulting in a reduction in volume of water as the flow moves downstream.

Production export

Production export results when organic carbon of a wetland is transported out of the wetland and into the food chain downstream. This function is provided when the wetland supports highly productive vegetative and microbial growth. Such communities are usually mature and complex. This function is usually provided by aerated, flowing water that: (1) supports a highly productive community, and (2) transports the decaying organic matter out of the wetland where it can be used by dependent communities downstream.

Aquatic diversity and abundance

Aquatic diversity is provided when wetlands support thriving populations of aquatic animals, including fish, amphibians, mammals, and invertebrates. Water temperatures, aeration, pH, salinity, turbidity, velocity, etc., must all be appropriate. Consequently, wetlands that perform this function are often open to larger bodies of water and have sufficient currents to maintain aeration and temperatures adequate to support the aquatic life.

Wildlife diversity and abundance

Wildlife diversity is provided when wetlands support thriving populations of nonaquatic life; waterfowl have received the most attention in the popular literature, but other animals also benefit from wetlands for habitat or food. Wetlands that provide this function must be sufficiently large, diverse, and productive to support a variety of animals in their various life stages.

Wetland Values

Wetland functions are of value to society because of the services they provide to people. Two of the more tangible values society derives from wetlands include recreation and timber production. Less tangible benefits include nutrient export to downstream fisheries, flood attenuation, and improvement of water quality. Natural resource managers should be aware of the relations between natural functions of wetlands and the benefits they provide to people living nearby. Knowledge of these relationships not only increases a manager's ability to manage wetlands but also enhances his/her ability to explain the importance of wetlands to the non-specialist community.

Wetland attributes that benefit one sector of society may inconvenience another. For instance, areas that provide wildlife habitat and recreational hunting benefits may also harbor pests and vermin. Aquatic sites that retain nutrients and sediments may have to be dredged more frequently. Recreational sites may attract unwanted traffic. Wetland scientists and economists do not yet have readily usable tools to calculate the monetary value of wetland costs and benefits. Costs and benefits of various wetland siting options must therefore be analyzed with professional judgment rather than quantitative monetary estimates of wetland impacts. Once a siting decision has been made, it should be defended in terms of not only functions provided but also benefits provided to the installation, fishermen, civilians, and downstream communities. Adamus et al. (1991) provide a list of societal benefits accruing from particular wetland functions (Table 2).

Table 2
Wetland Functions and Benefits to Society[1]

Function	Benefit
Groundwater recharge	Increased water supplies; blockage or dilution of contamination
Floodflow alteration	Flood control
Sediment stabilization	Shoreline protection
Sediment/toxicant retention	Improved downstream environment
Nutrient removal/transformation	Tertiary waste treatment by nature (especially important for nonpoint sources)
Production	Food chain support
Aquatic diversity/abundance	Food chain support; source of aesthetic pleasure
Wildlife diversity/abundance	Recreational hunting and observation; source of aesthetic pleasure

[1] Adapted from Adamus et al. (1991).

2 Laws Affecting Wetland Management

Introduction

The Corps has authority to regulate activities in waters of the United States under three laws; the Clean Water Act, the Rivers and Harbors Act of 1899, and the Marine Protection, Research, and Sanctuaries Act of 1972, as amended. The Clean Water Act is the authority under which most Corps permits are issued. Many DA installations have significant port facilities whose maintenance requires permits under the Rivers and Harbors Act. The Marine Protection, Research, and Sanctuaries Act of 1972, also known as the Ocean Dumping Act, governs transport and dumping of dredged material at sea.

Department of Army installations are subject to several other regulations affecting use and management of wetlands, including Federal laws, executive orders (EO's), and Army Regulations (AR's). The most important of these are summarized below after brief discussions of the Clean Water Act, Rivers and Harbors Act, and Marine Protection, Research, and Sanctuaries Act.

Federal Laws Authorizing Corps Regulatory Programs

Clean Water Act (33 U.S.C. 1341 et seq.)

Background. The Clean Water Act is the law under which most Corps permits are issued for discharge of fill materials into waters of the United States. The majority of the act deals with water pollution, which is the purview of the Environmental Protection Agency (EPA). Responsibility for regulating the discharge of dredge and fill material was delegated to the Corps of Engineers because of the Corps' historic role in that arena, but the EPA still maintains ultimate responsibility for oversight of the Corps' program. The section of the Clean Water Act defining the Corps' regulatory responsibilities with regard to dredge and fill activities is Section 404.

The Secretary of the Army, acting through the Chief of Engineers, is authorized to issue or deny permits for the discharge of dredge or fill material into waters of the United States in accordance with guidelines developed by the EPA in conjunction with the Secretary of the Army; these guidelines are known as the 404(b)(1) Guidelines.

The Clean Water Act does not explicitly define the landward extent of Federal jurisdiction in the nation's waters. The question of jurisdiction -- including wetlands -- was raised in subsequent court cases. As a result of these court cases, EPA and Corps jurisdiction was expanded to include all wetlands whose alteration would affect interstate commerce. The two agencies rewrote their regulations in 1977, and revised them again in 1982 and 1986.

The Corps' regulations are published in the Code of Federal Regulations under 33 CFR 320-330; those of the EPA are published under 40 CFR 230 and are often referred to as Section 404(b)(1) Guidelines. Differences in philosophy between the Corps and the EPA have been addressed in several Memoranda of Agreement (MOA), the most frequently cited one being the Memorandum of Agreement on Mitigation, or "the Mitigation MOA." The Mitigation MOA stipulates that in applying the Section 404(b)(1) Guidelines to standard permits the Corps will follow a sequence in its analysis of first avoidance of wetlands impacts, followed by minimization of impacts, and finally appropriate compensation for unavoidable impacts.

Section 404 Permits. Section 404 of the Clean Water Act and supporting regulations prohibit discharge of dredged or fill material into waters of the United States (including wetlands) without a permit. The permit, often referred to as a Section 404 permit, requires that:

a. The filling project be located where U.S. waters will be least impacted (i.e., avoidance of aquatic and wetlands impacts).

b. If no practicable alternative site can be found, then project impacts must be minimized and mitigated (i.e., minimization of and compensation for unavoidable aquatic and wetlands impacts).

c. Other state and Federal laws must be obeyed, including requirements for state water quality certification and for coastal zone management consistency.

d. The public must be notified of the project and offered opportunity to comment before a permit can be issued.

The Corps has developed different kinds of Section 404 permits to regulate different levels of disturbance to the environment. Small disturbances with insignificant impacts can usually receive general permits with little, if any, paperwork. The best known general permits are nationwide permits; they received their public interest review and environmental impact assessment when first issued. Larger projects with substantial environmental impacts need

individual permits with more thorough analysis and documentation requirements. The different kinds of permits are described in greater detail in Chapter 6.

Exemptions. Exemptions for Section 404 permits are granted for normal agricultural, ranching, and silvicultural activities as well as maintenance of existing drains, farm ponds, and roads. Permit exemptions are discussed in greater detail in Chapter 6.

Responsible Federal agencies. The wetland permitting program is managed by the Corps, but the EPA has veto power over Corps permit decisions. The U.S. Fish and Wildlife Service and National Marine Fisheries Service have consultative rights. Enforcement authority is shared by the Corps and EPA. States may adopt administration of parts of the program from the Corps, with EPA oversight; currently Michigan and New Jersey are the only states to do so.

Other implications of the Clean Water Act. The Clean Water Act requires that a permit be obtained for each point source pollutant discharge into surface waters. Different activities require permits from different agencies. Dredge and fill activities require permits issued by the Corps. Most states have assumed the authority to issue permits for point source discharges within their boundaries (water quality certification).

Discharge of waste into waters of the United States is regulated under the National Pollutant Discharge Elimination System (NPDES), an EPA program established by the Clean Water Act that has been delegated to most states. Discharges of waste into waters of the United States are not normally regulated by the Corps unless navigation or anchorage in navigable waters will be substantially impaired (Section 402(b)(6) and 33 CFR 320.3(n)). Specific NPDES rules and procedures vary from state to state, and in some states may be written and administered by the EPA.

The Clean Water Act also requires that plans be developed to prevent spills of oil and hazardous substances and to clean up any spills that do occur. Pouring a pollutant down the drain or spilling it into the water may result in a violation of the Clean Water Act. Wastewater, too, must be treated so as to meet permit standards before it can be discharged. These activities are regulated under other sections of the act rather than under Section 404.

Point of Contact. Corps District Regulatory Branch for Section 404 issues (see Appendix F for a Corps District boundary map and list of telephone numbers for Corps District Regulatory Offices); EPA or State water quality agencies for NPDES permits.

Rivers and Harbors Act of 1899 (33 U.S.C. 401 et seq.)

The legislative origins of the Corps Regulatory Program are the Rivers and Harbors Acts of 1890 (superseded) and 1899. Various sections establish permit requirements to prevent unauthorized obstruction or alteration of any navigable water of the United States. The most frequently exercised authority is contained

in Section 10. Activities requiring Section 10 permits include construction of any structure in or over any navigable water of the United States, the excavation from or deposition of material in such waters, or otherwise affecting the course, location, condition, or capacity of such waters. Section 10 permits are required, for example, for docks, transmission lines, piers, bulkheads, weirs, jetties, pipelines, cables, etc., in, over, or under waters of the United States (33 CFR 320.2(b)). These permits are handled by the same office of the Corps that handles Clean Water Act Section 404 permits.

Section 9 of the Rivers and Harbors Act of 1899 requires permits from the Corps for construction of dams or dikes across navigable waters. The Department of Transportation has assumed responsibility for permitting bridges and causeways over navigable waters under the Rivers and Harbors Act; a Section 404 permit may also be required under the Clean Water Act (33 CFR 320.2(a)).

Point of Contact. Corps District Regulatory Branch (See Appendix F).

Marine Protection, Research, and Sanctuaries Act of 1972, as amended (33 U.S.C. 1413)

Section 103 of this act, also known as the Ocean Dumping Act, requires authorization from the Corps for "the transportation of dredged material for the purpose of disposal in the ocean" (33 CFR 320.2(g)). Section 103 permits may be issued after public notice and the opportunity for public hearing. Disposal sites for such discharges are selected in accordance with criteria developed by the EPA in consultation with the Secretary of the Army. If the dredged material is dumped for purposes of filling rather than dumping, then a Section 404 permit may be required rather than a Section 103 permit. In both cases, the point of contact would be the Corps District Regulatory Branch. The EPA has authority over dumping at sea of materials other than dredged material.

Point of Contact: Corps District Regulatory Branch (See Appendix F).

Other Federal Laws

Bald Eagle Protection Act of 1940 (16 U.S.C. 668-668d)

This act provides for the protection of the bald eagle and the golden eagle by prohibiting, except under certain specified conditions, the taking, possession, and commerce in such birds. The 1972 amendments increased penalties for violating provisions of the Act or regulations, and strengthened other enforcement measures.

Point of Contact. U.S. Fish and Wildlife Service is point of contact for the Bald Eagle Protection Act of 1940.

Coastal Zone Management Act of 1972, as amended (16 U.S.C. 1451 et seq.)

The Coastal Zone Management Act (CZMA) protects the nation's coastal environments through a program tailored to and implemented by individual states with coastal zones. The Coastal Zone Management Program is overseen by the National Oceanic and Atmospheric Administration (NOAA). Most states with coasts on the oceans or the Great Lakes have NOAA-approved coastal zone management programs.

Before a Section 404 permit can be issued by the Corps for fill activities within the coastal zone, the applicant must submit certification of consistency with the appropriate state Coastal Zone Management plan, unless national security considerations require noncompliance.

Coastal zones. The extent of the coastal zone is defined within each state's coastal management plan. Jurisdiction extends seaward to the outer limit of the state territorial sea and landward to the extent necessary to control activities that have significant impact on coastal waters, including shore lands and coastal marshes and wetlands. The coastal zone includes the Great Lakes to the international boundary.

Jurisdiction on Federal lands. The law contains language that can be construed to exclude Federal lands from jurisdiction (Section 304(1)). Nevertheless, NOAA's current regulations state that, except for oil and gas lease sales in outer continental shelf lands, Federal activities within and outside (seaward) of the coastal zone are subject to review (15 CFR 930.33).

Regulated activities. State Coastal Zone Management plans vary, but all address issues of resource protection (including archaeological resources) and water pollution. Major classes of regulated activities include:

- Agricultural, silvicultural, and urban runoff.
- Storm water and wastewater discharges.
- Marina operation and construction.
- Hydromodification (e.g., dams, levees, shoreline stabilization, channelization).
- Dredging and filling wetlands and submerged lands.
- Construction on barrier islands.
- Water withdrawal for industrial or large-scale consumptive uses.

Point of Contact. State Coastal Zone Management Authority.

Deepwater Port Act of 1974 (33 U.S.C. 1501 et seq .)

This act prohibits the ownership, construction, or operation of a deepwater port beyond the territorial seas without a license issued by the Secretary of Transportation. The Secretary of Transportation may issue such a license to an applicant if he determines, among other things, that the construction and operation of the deepwater port is in the national interest and consistent with national security and other national policy goals and objectives. An application for a deepwater port license constitutes an application for all Federal authorizations required for the ownership, construction, and operation of a deepwater port, including applications for Section 10, Section 404, and Section 103 permits, which may also be required pursuant to the authorities listed in 33 CFR 320.2 and 320.4.

Point of Contact. Department of Transportation.

Department of Defense Appropriations Bill of 1991 P. L. 101-511, Senate Report No. 101-521, Oct. 11, 1990

Section 8120(a) of the FY 1991 Department of Defense Appropriations Act established the Legacy Resource Management Program. The purpose of this program is to promote, manage, research, conserve, and restore the sensitive and significant biological, geophysical, cultural, and historical resources on Department of Defense land in a manner consistent with military requirements. The Act mandates the following specific actions:

- Establish a strategy, plan, and priority list for identifying and managing all significant biological, geophysical, cultural, and historic resources existing on or involving all Department of Defense lands, facilities, and property.

- Provide for the stewardship of all DoD-controlled or managed air, land, and water resources.

- Protect significant biological systems and species, including, but not limited to, those contained on the Federal endangered list and those that are candidates for that list.

- Establish a standard DoD methodology for the collection of all biological, geophysical, cultural, and historic resource information, which in the case of biological information, should be compatible with that used by state Natural Heritage Programs.

- Establish programs to protect, inventory, and conserve artifacts of Native American civilization, settler communities, and others deemed to have historical or cultural significance.

- Establish inventories of all scientifically significant biological, geophysical, cultural, and historical assets on DoD lands. In addition to the specific attributes of the assets, those inventories are to catalog their

scientific and/or cultural significance, as well as the interrelationship to the surrounding environment, including the military mission carried out on the land upon which they reside.

- Establish programs for the restoration and rehabilitation of degraded habitats.

Point of Contact. Office of Director of Environmental Programs-Conservation, (703-693-0677).

Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.)

This legislation prohibits adversely affecting endangered or threatened species of plants and animals or their critical habitats, as defined by the U.S. Fish and Wildlife Service (USFWS) or National Marine Fisheries Service (NMFS). Federal agencies that conduct such activities in either wetlands or uplands must consult with the USFWS or NMFS when a determination is made that a proposed project may affect a listed species or designated critical habitat. The Corps is responsible for contacting USFWS or NMFS when such activities may occur in wetlands where the Corps has regulatory jurisdiction. (See 50 CFR Part 17 and 50 CFR Part 402.)

Points of Contact. Corps District Regulatory Branch for Section 10, 103, or 404 permits (see Appendix F); U.S. Fish and Wildlife Service or National Marine Fisheries Service for potential impacts not requiring Corps permits.

Federal Power Act of 1920 (16 U.S.C. 791a et seq. 1), as amended

This act authorizes the Federal Energy Regulatory Agency to issue licenses for the construction, operation, and maintenance of dams, water conduits, reservoirs, powerhouses, transmission lines, and other physical structures of a hydropower project. However, where such structures will affect the navigable capacity of any navigable water of the United States (as defined in 16 U.S.C. 796), the plans for the dam or other physical structures affecting navigation must be approved by the Corps. In all cases involving the discharge of dredged or fill material into waters of the United States or the transportation of dredged material for the purpose of disposal in ocean waters, Section 404 of the Clean Water Act or Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972 will be applicable.

Point of Contact. Federal Energy Regulatory Agency and the Corps District Regulatory Branch (see Appendix F).

Fish And Wildlife Coordination Act (16 U.S.C. 661-666c)

Any Federal agency that proposes to control or modify any body of water must first consult with the U.S. Fish and Wildlife Service or the National Marine Fisheries Service, as appropriate, and with the head of the appropriate state agency exercising administration over the wildlife resources of the affected state. The Corps must consult the U.S. Fish and Wildlife Service or state wildlife agencies when evaluating permit applications, including mitigation proposals. Wildlife conservation shall receive equal consideration and be coordinated with other aspects of water resource development programs.

Points of Contact. U.S. Fish and Wildlife Service, National Marine Fisheries Service, and state counterparts.

Interstate Land Sales Full Disclosure Act (15 U.S.C. 1701 et seq.)

This act prohibits any developer or agent from selling or leasing any lot in a subdivision (as defined in 15 U.S.C. 1701(3)) unless the purchaser is furnished in advance a printed property report containing information which the Secretary of Housing and Urban Development may, by rules or regulations, require for the protection of purchasers. In the event the lot in question is part of a project that requires DA authorization, the property report is required by Housing and Urban Development regulations to state whether or not a permit for the development has been applied for, issued, or denied by the Corps of Engineers under Section 10 or Section 404 authority. The property report is also required to state whether or not any enforcement action has been taken as a consequence of nonapplication for or denial of such permit.

Point of Contact. Corps District Regulatory Branch (see Appendix F).

Marine Mammal Protection Act of 1972 (16 U.S.C. 1361 et seq.)

This act expresses the intent of Congress that marine mammals be protected and encouraged to develop in order to maintain the health and stability of the marine ecosystem. The Act imposes a perpetual moratorium on the harassment, hunting, capturing, or killing of marine mammals and on the importation of marine mammals and marine mammal products without a permit from either the Secretary of the Interior or Commerce, depending upon the species of marine mammal involved. Such permits may be issued only for purposes of scientific research and for public display if the purpose is consistent with the policies of the Act. The appropriate Secretary is also empowered in certain restricted circumstances to waive the requirements of the Act.

Points of Contact. U.S. Fish and Wildlife Service or National Marine Fisheries Service.

Migratory Bird Treaty Act (16 U.S.C. 703-711)

The act of July 3, 1918, implemented the 1916 Convention between the United States and Great Britain (for Canada) for the protection of migratory birds, thereby establishing a Federal responsibility for protection of the international migratory bird resource.

As amended by Public Law 86-732, September 8, 1960 (74 Stat. 866), the Act provides for regulations to control taking, selling, transporting, and importing migratory birds, their nests, eggs, parts, or products, when such items are included in the terms of any treaty, and provides enforcement authority and penalties for violations. In 1936 and 1974, Mexico and Japan were respectively added to the treaty.

Point of Contact. U.S. Fish and Wildlife Service.

National Environmental Policy Act (42 U.S.C. § 4321-4347)

The National Environmental Policy Act (NEPA) requires Federal agencies to analyze environmental impacts of their activities during activity planning. The most important step of the NEPA process with respect to wetlands regulation is alternatives analysis, which requires a determination of whether projected impacts will significantly harm the environment and whether project modification could reduce or avoid environmental impacts. Whether wetlands are present or not, Army installations must comply with NEPA for the entire proposed project. Army NEPA regulations are in AR 200-2 (32 CFR 651).

The analysis of environmental impacts and identification of alternatives are contained in three documents: the Record of Environmental Consideration (REC), the Environmental Assessment (EA), and Environmental Impact Statement (EIS). The NEPA requirements that the Corps considers when evaluating a permit application are explained in 33 CFR 325.2(a)(4) and 33 CFR 325, Appendix B.

Record of environmental consideration. A Record of Environmental Consideration (REC) must be filed in any of three cases:

a. A categorical exclusion applies to the proposed activity and no special circumstances preclude its use. Procedures for categorical exclusions are detailed in AR 200-2, Chapter 4 and Appendix A. Projects to which categorical exclusions apply do not require an EA or an EIS. Note that projects that would adversely affect wetlands would normally be considered to have special circumstances precluding the use of an otherwise available categorical exclusion.

b. An existing EA or EIS relating to the site adequately describes the proposed project and its impacts.

c. Some other law precludes full preparation of an EA or EIS (requires approval by legal office).

Environmental Assessment. An Environmental Assessment (EA) reports the results of an investigation of significance of project impacts. If the EA concludes that the project will not have a significant impact, then a two-page finding of no significant impact (FONSI) is published in the legal briefs in a local newspaper. If the environmental assessment concludes that impacts will be significant, an environmental impact statement is required.

Environmental Impact Statement. An Environmental Impact Statement (EIS) is a major document written by experts evaluating the impacts of a project and recommending alternatives. The EIS is published and opened to public review and comment, unless security reasons preclude.

Installation EA/EIS. Most installation activities occur on a routine or programmed basis. Continuing activities of this type may be described or analyzed in an installation "Ongoing Mission" EA/EIS. The Installation EA/EIS should remain valid unless there is a major change in mission. Proposals not appearing on the excluded list or not mentioned in the Installation EA/EIS would require a separate EA or EIS.

Points of Contact for Corps permit issues. Corps District Regulatory Branch; Army Environmental Hotline, 800-USA-EVHL.

National Fishing Enhancement Act of 1984 (P.L. 98-623)

This law provides for the development of a National Artificial Reef Plan to promote and facilitate responsible and effective efforts to establish artificial reefs. The Act establishes procedures to be followed by the Corps in issuing permits for artificial reefs. The Act also establishes the liability of the permittee and the United States. The Act further creates a civil penalty for violation of any provision of a permit issued for an artificial reef.

Point of Contact. Corps of Engineers.

National Historic Preservation Act of 1966 (16 U.S.C. 470)

This act created the Advisory Council on Historic Preservation to advise the President and Congress on matters involving historic preservation. In performing its function, the Council is authorized to review and comment upon activities licensed by the Federal Government which will have an effect upon properties listed in the National Register of Historic Places, or that are eligible for such listing. The concern of Congress for the preservation of significant historical sites is also expressed in the Preservation of Historical and Archeological Data Act of 1974 (16 U.S.C. 469 et seq.), which amends the Act of June 27, 1960. By this Act, whenever a federal construction project or federally licensed project, activity, or program alters any terrain such that significant historical or

archeological data are threatened, the Secretary of the Interior may take action necessary to recover and preserve the data prior to the commencement of the project.

Points of Contact. State Historic Preservation Office and Advisory Council on Historic Preservation.

Ocean Thermal Energy Conversion Act of 1980 (42 U.S.C. SECTION 9101 et seq.)

This act requires a license from the National Oceanic and Atmospheric Administration (NOAA) for the ownership, location, construction, and operation of ocean thermal energy conversion (OTEC) facilities. An application for an OTEC license from NOAA constitutes an application for Section 10, Section 404, Section 103, and other DA authorizations that may be required.

Point of Contact. National Oceanic and Atmospheric Administration.

Sikes Act (16 U.S.C. 670), as amended 11/18/97 by PL 105-85, title XXIX (Sikes Act Improvement Act of 1997)

This act requires that The Secretary of Defense "carry out a program to provide for the conservation and rehabilitation of natural resources on military installations." To facilitate the program, the Secretary of each military department is required to "prepare and implement an integrated natural resources management plan for each military installation in the United States under the jurisdiction of the Secretary, unless the Secretary determines that the absence of significant natural resources on a particular installation makes preparation of such a plan inappropriate."

The integrated natural resources management plan for which the Secretary is responsible is to be prepared "in cooperation with the Secretary of the Interior, acting through the Director of the United States Fish and Wildlife Service, and the head of each appropriate State fish and wildlife agency for the State in which the military installation concerned is located." The resulting plan is to "reflect the mutual agreement of the parties concerning conservation, protection, and management of fish and wildlife resources."

Consistent with the use of military installations to ensure the preparedness of the Armed Forces, the overall objectives of the program are:

a. The conservation and rehabilitation of natural resources on military installations.

b. The sustainable, multipurpose use of the resources, which shall include hunting, fishing, trapping, and nonconsumptive uses.

c. Subject to safety requirements and military security, public access to military installations to facilitate the use.

The deadline for submission of the integrated natural resources management plans is 3 years from the date of the submission of the required report to Congress, which reviews each military installation to determine which are required to prepare an integrated natural resources management plan.

The plans are to be reviewed as to operation and effect at least every 5 years, and to the extent appropriate and applicable, provide for:

a. Fish and wildlife management, land management, forest management, and fish- and wildlife-oriented recreation.

b. Fish and wildlife habitat enhancement or modifications.

c. Wetland protection, enhancement, and restoration, where necessary for support of fish, wildlife, or plants.

d. Integration of, and consistency among, the various activities conducted under the plan.

e. Establishment of specific natural resource management goals and objectives and time frames for proposed action.

f. Sustainable use by the public of natural resources to the extent that the use is not inconsistent with the needs of fish and wildlife resources.

g. Public access to the military installation that is necessary or appropriate for the use described in subparagraph f., subject to requirements necessary to ensure safety and military security.

h. Enforcement of applicable natural resource laws (including regulations).

i. No net loss in the capability of military installation lands to support the military mission of the installation.

j. Such other activities as the Secretary of the military department determines appropriate.

Points of Contact. U.S. Fish and Wildlife Service; State fish and wildlife agencies.

Water Resources Development Act of 1990 (33 U.S.C. 2201-2324)

This act provides for no net loss of the nation's remaining wetlands (Section 307(a)(1)). The act requires that the EPA, U.S. Fish and Wildlife Service, and other appropriate Federal agencies formulate a wetlands action plan to achieve the goal of no overall net loss of remaining wetlands.

Point of Contact. Corps District Regulatory Branch (see Appendix F).

Wild and Scenic Rivers Act (16 U.S.C. 1271-1287), as ammended

This act establishes the Wild and Scenic River System. No Federal agency shall assist in the construction of a water resources project having a direct and adverse effect on the values for which a river was designated as part of the Wild and Scenic River System. Corps District offices have lists of Wild and Scenic Rivers within their jurisdiction.

Point of Contact. Corps District Regulatory Branch (see Appendix F).

Executive Orders

Executive Order 11988: Flood Plain Management (May 24, 1977) as amended by E.O. 12148 (July 1979)

This Executive Order requires Federal agencies to "restore and preserve the natural and beneficial values served by floodplains" while managing Federal lands. Activities in floodplains must be evaluated for their impacts during project planning, and alternative sitings outside the floodplain must be considered.

Executive Order 11990: Protection of Wetlands (May 24, 1977) as amended by E.O. 12608

This Executive Order requires Federal agencies "to avoid .... adverse impacts associated with the destruction or modification of wetlands .... wherever there is a practicable alternative." Projects that must be conducted in wetlands should include "all practicable measures to minimize harm to wetlands...."

Executive Order 12088: Compliance with Pollution Control Standards (October 13, 1978)

This Executive Order requires Federal agencies to comply "with applicable pollution control standards," including those of the Clean Water Act. This requirement applies to "Federal facilities and activities under the control of the agency."

DoD and Army Regulations and Guidance

AR 200-1, Environmental Protection and Enhancement (1997)

This Army Regulation prescribes Department of the Army responsibilities, policies, and procedures to preserve, protect, and restore the quality of the environment, including compliance with applicable Federal, state, regional, and local environmental quality requirements.

Chapter 2 of AR 200-1 addresses DA compliance with provisions of the Clean Water Act, including Section 404 wetlands provisions concerning the discharge of dredge and fill materials into waters of the United States (section 2-4, item *j.*). Chapter 11 addresses various environmental restoration programs, both DoD and non-DoD based.

AR 200-2, Environmental Impacts of Army Actions (1988)

This AR prescribes Department of the Army procedures for compliance with the National Environmental Policy Act. It includes procedures for preparation of REC's, EA's, and EIS's. It also includes as an appendix a copy of the Council on Environmental Quality (CEQ) regulations (40 CFR 1500) on which all Federal agency NEPA regulations are based. The CEQ regulations supersede other agencies' regulations if there is any conflict. A new version of this regulation is being drafted but has not been finalized. For further information on the status of the new AR 200-2, users should contact Mr. Timothy Julious HQDA DAIM-ED (703) 693-0543, or check the Defense Environmental Network and Information eXchange (DENIX) Web site at: http://www.denix.osd.mil.

AR 200-3, Natural Resources: Land, Forest, and Wildlife Management (1995)

This AR sets forth Army policies, responsibilities, and procedures to wisely use, scientifically manage, and systematically restore renewable natural resources existing on Army lands consistent with the local military mission, national security, and current Federal laws pertaining to renewable natural resources and the quality of the environment. The scope of the AR includes the conservation, management, and utilization of soils, vegetation, water resources, croplands, range lands, forests, and fish and wildlife species. It states the DA policy of avoiding adverse impacts to existing aquatic resources and offsetting those adverse impacts that are unavoidable. It also states that the Army will strive to achieve a goal of no net loss of wetlands on Army-controlled lands. The DA will take a progressive approach towards protecting existing wetlands, rehabilitating degraded wetlands, restoring former wetlands, and creating wetlands in an effort to increase the quality and quantity of the nation's wetlands resource base. It also states that installations will identify and maintain a current inventory of their wetlands resources. Supporting guidance and details are provided in DA Pam 420-7.

DoD Instruction 4715.3, Environmental Conservation Program

This guidance implements policy, assigns responsibilities, and prescribes procedures for the integrated management of natural and cultural resources on property under DoD control. It requires the development and implementation of integrated natural resources management plans (INRMPs) and preparation of planning-level surveys.

Policy Memorandum, DAIM-ED-N, 21 Mar 97, Army Goals And Implementing Guidance for Natural Resource Planning Level Surveys (PLS) and Integrated Natural Resources Management Plan (INRMP)

This memorandum specifies Army goals and provides implementing guidance for completing natural resource PLSs and INRMPs and identifies PLS and INRMP projects as class 1 requirements. Installations must coordinate completion of the PLS and the INRMP with those offices responsible for developing real property master plans and mission operations. MACOMs will review and approve INRMPs.

DA Compliance with State and Local Laws

Approximately half of the states of the nation have enacted laws protecting their wetlands, and in areas experiencing long-term rapid growth, many municipalities have enacted laws, too. Federal agencies must comply with relevant local laws as well as with Federal laws. Federal laws do not supersede state and local laws; rather, both must be obeyed.

In the western states, compliance with western water law is a major concern when dealing with any type of water resource. Therefore, appropriate state agencies should be contacted whenever hydrologic impacts are anticipated.

Emerging Developments

Wetland laws and regulations, and interpretations thereof, are slowly changing in response to developments external to the Department of the Army. A recent series of court cases has resulted in changes in the Corps' policy with regard to protection of wetlands from artificial drainage as well as from discharge of fill. See the section in Chapter 6 titled "Regulated Activities," for a more detailed discussion of these developments. Also, the Corps Headquarters Regulatory Web site on the Internet can provide information on the latest developments in the regulatory arena. The address is:
http://www.usace.army.mil/lrc/reg/

Another good source for up-to-date environmental information, particularly as it relates to Army issues, is the DENIX (Defense Environmental Network and Information eXchange) Web site: http://www.denix.osd.mil.

3 Wetland Management Programs

Introduction

Army Regulation 200-3 stipulates that an "integrated natural resources management plan will be developed and maintained for all installations." The plan is used to assist planners and implementors of mission activities as well as natural resource managers. Components of the plan include Land Management and Grounds Maintenance, Forest Management, Fish and Wildlife Management, and Outdoor Recreation. The Integrated Natural Resources Management Plan (INRMP) is a component and supporting element of the installation's master plan.

The U.S. Army Environmental Center has published guidance for preparing INRMPs. This document (U.S. Army Environmental Center 1997) has been reproduced in Appendix H). While not an Army policy document, this document establishes a standard process and format for an installation INRMP. It is intended for use as guidance to help an installation adequately address management of natural resources on their lands while adequately integrating mission and NEPA requirements. The document can also be found in Microsoft Word format at the AEC Web site at: http://www.aec.army.mil/.

Due to the fact that the presence of wetlands may often influence management decisions made within the other components of the plan, there is a separate component of the INRMPs within the Natural Resources Management section that specifically addresses the issue of wetlands management.

The wetlands management section of the installation's INRMPs should identify and explain the following: (1) programs that improve the quality of wetlands, (2) identification and description of the installation's wetlands, (3) institutional resources available for wetlands management, and institutional circumstances that may limit or impede achievement of wetlands management goals, (4) integration of wetlands management with the other components of the installation's Natural Resources Management Plan, (5) regulatory issues, (6) natural resources opportunities and needs, including identification of sites that offer good to high potential for wetlands protection, improvement, or increase.

Objectives

General

Three general wetlands management objectives for installation wetlands management programs are as follows:

a. Maintain and, when practicable, improve the wetlands resource base of an installation, including achievement of the goal of "no net loss" of wetlands.

b. Maximize efficiency of natural resources management by integrating wetlands management with wetland-dependent components of the Integrated Natural Resources Management Plans.

c. Foster compliance with Federal, state, and local laws, and DA regulations, and/or policies - including "no net loss" of wetlands - in order to facilitate mission accomplishment.

Site-specific

Ecosystem-based functional objectives (e.g., waterfowl habitat, aquifer recharge, sediment entrapment) must be identified for each wetlands management location. To the extent practicable, these functional objectives should be set with consideration for total drainage basin or regional needs. The site-specific wetlands functional objectives will be influenced strongly by the level of emphasis placed on management of wetland-dependent species of plants and animals (e.g., bottomland hardwoods, waterfowl) and on sustaining or increasing biodiversity and ecological productivity on installation lands.

Description of the Installation's Wetlands

Developing a sound wetland management plan requires an understanding of the location, type, quantity, quality, and functions of the installation's wetlands. Necessary wetlands inventory tools and descriptors include:

a. A cartographic inventory of the wetlands on the installation property at the same scale as other installation resource inventories. Where installations have Geographic Information Systems (GIS), the wetlands maps should be incorporated into such systems, to facilitate rapid evaluation of alternative and integrated management strategies. The wetlands should be classified by the Cowardin System (Cowardin et al. 1979, also see page 28 of this report) to the level of Class. Other classification systems may be used in addition, if deemed appropriate.

b. Identification of the inventoried wetlands that will be impacted by installation activities within the next 5 years, and for which jurisdictional delineations will be needed.

c. A protocol for compiling baseline information; a wetland evaluation technique may be selected and modified to fit local needs. This baseline should identify wetland location, size, cover, hydroperiod, functions and values, threatened and endangered species, cultural sites, floodplains, migratory waterfowl habitat, soils.

d. A record of historical use of wetlands on base, including previous management practices, altered flow patterns, and biotic communities. Include, to the extent possible, a site-specific history of hazardous materials deposition, including date, location, composition, current hazard, and remedial or cautionary actions required.

In searching for or contracting for GIS data, it is likely that the term "metadata" may be heard. "Metadata" is a term that means "data about data." It is a description of the content, quality, condition, and other characteristics of the data. Metadata are used to organize and maintain data, and to provide information to data catalogues and clearinghouses. The Federal Geographic Data Committee (FGDC) approved the *Content for Digital Geospatial Metadata* in June 1994. Since then many organizations inside and outside the Federal Government have adopted the FGDC metadata standards. When contracting for GIS data, the contractor should be required to provide FGDC-compliant metadata along with the GIS data. For more information about metadata standards and to search for specific metadata sets, visit the FGDC Web site at http://www.fgdc.gov/

Institutional Resources and Constraints

Institutional resources and constraints to be considered in development of the installation's wetland management program include:

a. Lists of appropriate laws and regulations (Federal, state, local, DoD, DA, installation-specific).

b. Organizational chart of parties responsible for managing wetlands, including names, titles, street and e-mail addresses, phone and FAX numbers, and time allotted to wetlands duties. Include and identify personnel from other entities.

c. Existing agreements with outside entities, including other government agencies, the private sector, conservation and service organizations, that may preclude or limit management options.

d. Existing or potential agreements with outside entities, including other government agencies, the private sector, conservation and service

organizations, that can provide for partnering in either technical assistance or funding to implement installation wetlands management programs.

e. Requirements for personnel and matériel necessary to perform wetlands management activities, both in the office and in the field. Identify specific requirements, including planning, regulatory, field management, monitoring, and supervisory responsibilities.

f. Identify management activities to be performed by contract. Provide copies of typical contracts.

g. Funding sources, including appropriations, rents, permits.

h. Wetlands management training needs and opportunities, both within and outside of the Department of the Army.

i. Safety considerations, including hazards due to toxic and hazardous materials, unexploded ordnance, firing ranges. Also include lists of natural hazards such as plants, animals, inaccessibility. List provisions to deal with these hazards, taking into consideration activities that must be performed in the installation's wetlands.

Integration with Other Components of the Natural Resources Management Plan

Wetlands management programs must include a protocol to ensure that wetland and other natural resources management objectives are integrated to capture mutual benefits where feasible. An example of how such mutual benefits could be achieved is through programs for management of wetlands-dependent plants and animals, including endangered species. In addition, cumulative effects of the remaining land-use activities should be monitored to guard against wetland degradation. Protocols should be established to coordinate decision making, monitoring, and record-keeping regarding the following:

a. Land Management (e.g., planning projects to minimize disturbance of wetlands; control of erosion; watershed management; land rehabilitation; coordinating planning efforts with permit needs; coordinating with component plans such as transportation plans; coordinating mission activities to reduce habitat degradation; educating the user community; compliance with appropriate laws and regulations).

b. Forest Management (e.g., changes in habitat, erosion, hydrologic changes; permit exemptions; opportunities for enhancement).

c. Fish and Wildlife Management (e.g., enhancement or degradation of habitat; human impacts; scientific research and monitoring; wetland

mitigation implications; species management; compliance with appropriate laws and regulations).

d. Grounds Maintenance (e.g., potential discharge of contaminants or nutrients; traffic patterns; erosion control; recreational potential; restrictions of access).

e. Outdoor Recreation (location and possible permitting of structures, erosion control, habitat disturbance).

Regulatory Issues

Activities in wetlands are severely constrained by Federal, state, local, and DA regulations and/or laws that limit disturbance of wetlands. A wetlands program should facilitate compliance with these regulations and laws by including the following:

a. A protocol for coordinating planning efforts of different entities whose missions potentially impact wetlands.

b. A protocol for delineating wetlands.

c. A protocol for applying for permits from the Corps and other Federal, state, and local agencies.

d. A cartographic inventory of current and potential mitigation sites, and a written rationale for selecting those sites.

e. A protocol for performing wetland mitigation, including planning, construction, monitoring, and management. Mitigation banking should be addressed in this section.

Natural Resource Opportunities and Needs

Installations should write plans for solving installation-specific problems that need monitoring or correction. These may include activities such as the following:

a. An update of the National Wetland Inventory maps of wetlands on the installation, incorporating other cartographic, remotely sensed, and documentary information available.

b. Watershed protection and erosion control activities.

c. Inventories and management of important species that should be either protected or controlled, including management of noxious weeds often associated with wetlands.

d. Identification of degraded or threatened wetlands and riparian areas and plans for their restoration or protection.

e. Plans for control of birds or aviation in areas of potential bird - aircraft strike hazard.

f. Protocols for monitoring the installation's wetlands for specific chemical hazards such as oil and gasoline, lead, white phosphorus, etc.

g. Plans to utilize information resulting from ongoing monitoring efforts; design other monitoring programs as needed to achieve "no net loss."

h. Identification of sites that offer good to high potential for wetlands protection, improvement or increase.

Some helpful documents to refer to when addressing installation natural resource issues are: *Conserving Biodiversity on Military Lands: A Handbook for Natural Resources Managers* (Leslie et al. 1996) and *Military Land Management Research Tools: An Annotated Bibliography* (Balbach 1996).

Special Area Management Plans (SAMPs)

Special area management plans (SAMPs) are a relatively new mechanism for wetland regulation. The preparation of a SAMP typically involves Federal, state, and local government as well as the public, and therefore can be helpful in resolving conservation and development conflicts. Where applicable, funding may be available to states for preparation and implementation of SAMPs in coastal zones through the Coastal Zone Management Act (CZMA).

The Corps of Engineers has also adopted the SAMP concept and has incorporated it into its own regulatory policies (see Corps Regulatory Guidance Letter issued 2 Oct 1986 by the Office of the Chief of Engineers). Where applicable, SAMPs can be tailored to meet the needs and resources of a particular area and can provide a more consistent and efficient framework for permit decisions than does a case-by-case framework. SAMPs can lead to the development of comprehensive approaches to wetlands protection within a planning area and within the context of broader planning approaches. The SAMPs process can also be coordinated with other planning processes, acquisition efforts, etc. For more information about the possibility of creating a SAMP on an Army installation, contact the appropriate Corps Regulatory office, or where applicable, State Coastal Zone Management Office.

4 Classification of Wetlands

Wetland Classification Systems

Science's ability to classify wetlands into useful categories relies on the fact that different kinds of wetlands undergo different processes and therefore function differently in the landscape. Classification schemes that capture these differences can assist resource managers in at least three ways:

a. Wetland classification supports efforts to inventory natural resources, identify sensitive environments, and maintain biodiversity.

b. Resource managers can plan different activities around different kinds of wetlands because wetlands differ in their responses to management and impacts.

c. Compensatory mitigation policy encourages in-kind replacement of impacted wetlands.

Two less tangible benefits of wetland classification systems are that (1) a standard system facilitates communication among the user community, and (2) a process-oriented classification system promotes awareness of useful distinctions between different kinds of wetlands.

The most widely used formal wetland classification system in the United States is the U.S. Fish and Wildlife Service classification system developed by Cowardin et al. (1979). This system is described below, and is the basis for the National Wetlands Inventory maps.

An older system described in Circular 39 of the U.S. Fish and Wildlife Service (Shaw and Fredine 1956) is still used in some areas. The Cowardin system superseded Circular 39 in 1979.

In 1993 the Corps published a report titled "A hydrogeomorphic classification for wetlands" (Brinson 1993), whose purpose is to facilitate the development of improved models for evaluation of wetland functions by grouping functionally similar wetland types. The hydrogeomorphic (HGM) classification is not meant to replace other wetland classification systems.

Nontechnical English also makes numerous distinctions between different kinds of wet areas, but terms such as "swamp," "bog," and "slough" are too imprecise to be useful for work with significant legal and financial implications. Lists and definitions of such lay terms can be found in works by Mitsch and Gosselink (1993), and Meeks and Runyon (1990).

U.S. Fish and Wildlife Service "Cowardin System" of Wetland Classification (1979)

> Cowardin, L. M., Carter, V., Golet, F. C., and LaRoe, E. T. (1979). "Classification of wetlands and deepwater habitats of the United States," FWS/OBS-79/31, Reprinted 1992, U.S. Fish and Wildlife Service, Washington, DC. (Available from the Superintendent of Documents, U.S. Government Printing Office, Stock No. GPO 024-010-00665-0, or via the Internet at http://www.nwi.fws.gov)

The U.S. Fish and Wildlife Service National Wetlands Inventory (NWI) maps use the Cowardin system. It is a hierarchical classification based on hydrologic regime and vegetative community, and to a lesser extent on water chemistry and soils. The classification includes both wetlands and deepwater habitats. The Cowardin system and the Corps Section 404 regulations define wetlands differently. The most significant difference is that the Cowardin system defines wetlands to include mudflats and other wet areas that lack vegetation; the Corps and EPA define these as special aquatic sites. Both systems define areas normally inundated with more than 6.6 ft of water and devoid of rooted, emergent vegetation as deepwater habitats, not as wetlands.

The Wetlands Subcommittee of the Federal Geographic Data Committee (FGDC) has designated the Cowardin system of wetland classification (Cowardin et al. 1979) as the standard to use for mapping and inventory purposes. However, the use of this standard is not for regulatory purposes. For more information on the FGDC and other national data standards, go to the FGDC Web site at http://www.fgdc.gov/

Wetland Definition

According to the Cowardin classification, wetlands are defined as:

> ...lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For [the Cowardin classification system] wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil, and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year. (Cowardin et al. 1979, p. 3.)

Starting at the highest level of the hierarchy, the Cowardin taxonomy consists of Systems, Subsystems, Classes, Subclasses, Dominance Types, and Modifiers. The top of the classification system is reproduced from Cowardin et al. (1979) in Figure 1 below.

Systems

The highest level of the classification consists of five systems: marine, estuarine, riverine, lacustrine, and palustrine. These terms carry their standard English meanings. Marine systems are open to the ocean and receive minimal freshwater inputs; Estuarine systems are partly protected from the ocean (lagoons) or have significant freshwater inputs (mouths of rivers, etc.); riverine systems are freshwater areas between riverbanks that do not have emergent vegetation; lacustrine systems are areas in lakes that are greater than 20 acres in size that lack emergent vegetation; palustrine systems are all other wet areas. Most areas that the Corps defines as wetlands under the Section 404 program in the United States are palustrine systems according to the Cowardin classification.

Subsystems

Subsystems make hydrologic distinctions. Subsystems in Figure 1 are defined as follows.

a. Subtidal -- permanently inundated.

b. Intertidal -- exposed at low tide.

c. Tidal -- gradient low, water velocity fluctuates, oxygen deficiency may occur.

d. Lower perennial -- low velocity and low oxygen content.

e. Upper perennial -- high velocity and high oxygen content.

f. Intermittent -- flowing water seasonally absent.

g. Limnetic -- deeper than 2 m.

h. Littoral -- shallower than 2 m.

Classes and subclasses

Each subsystem is further divided into classes based on substrate and vegetation. Classes include rock bottom, unconsolidated bottom, aquatic bed, reef, streambed, rocky shore, unconsolidated shore, emergent, scrub-shrub, and forested. Many of the terms for classes are self-explanatory, although the classification system provides technical definitions for those who need them.

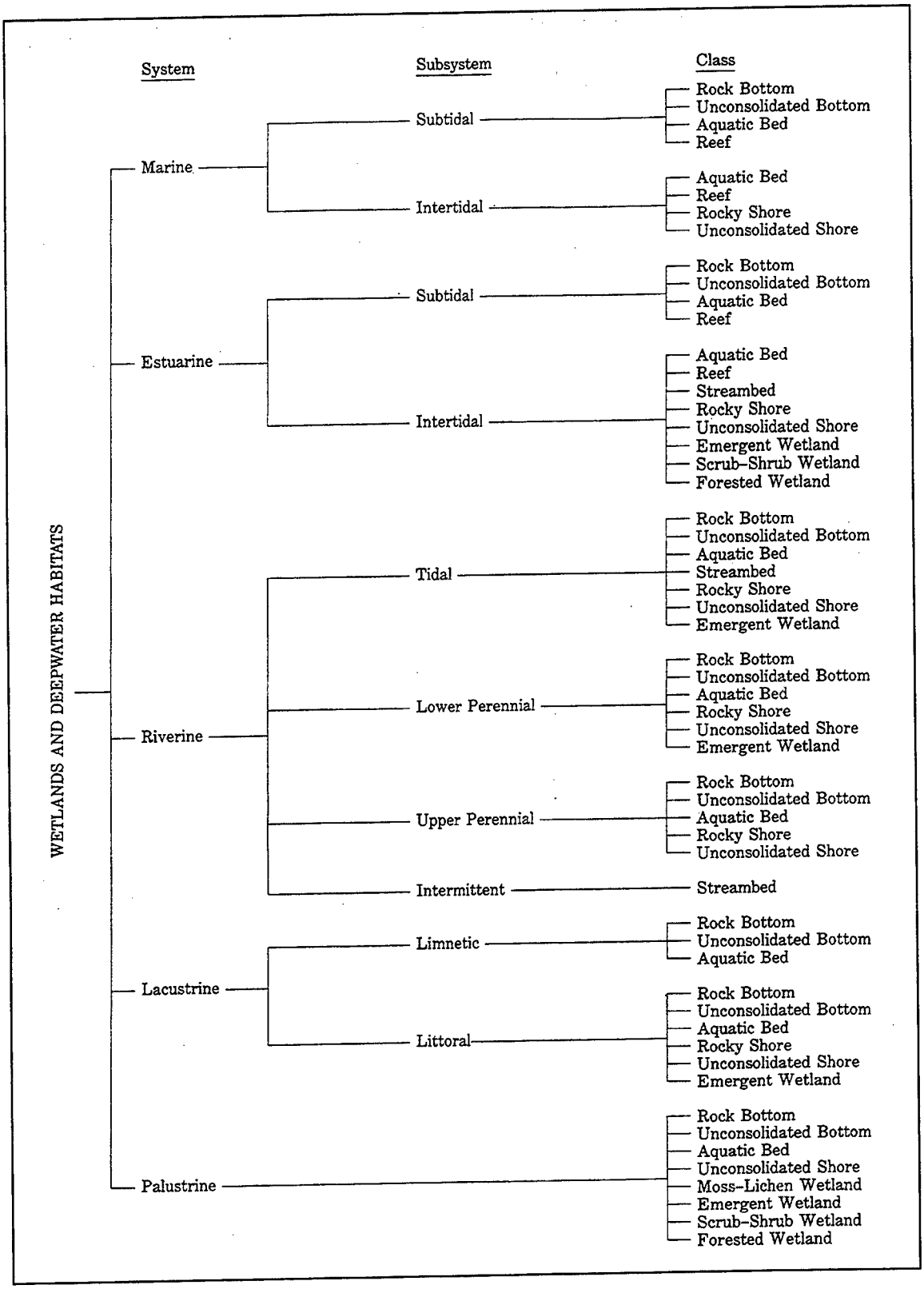

Figure 1. Classification hierarchy of wetlands and deepwater habitats, showing Systems, Subsystems, and Classes. The Palustrine System does not include deepwater habitats (from Cowardin et al. 1979)

Emergent wetlands are characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. Scrub-shrub wetlands are dominated by woody vegetation less than 20 ft tall. Forested wetlands are dominated by woody vegetation greater than 20 ft tall.

Subclasses are identified on the basis of cover type and using the classifications on National Wetlands Inventory maps:

a. Emergent Wetland Class.

(1) Persistent Subclass -- vegetation remains erect until next growing season.

(2) Nonpersistent Subclass -- vegetation falls at the end of the growing season.

b. Scrub-Shrub and Forested Wetland Classes.

(1) Needle-leaved Evergreen Subclass.

(2) Broad-leaved Evergreen Subclass.

(3) Needle-leaved Deciduous Subclass.

(4) Broad-leaved Deciduous Subclass.

(5) Dead Subclass -- dead woody plants dominate.

Dominance types

Dominance types are identified as the dominant vegetation found onsite. These are not listed on National Wetland Inventory maps, but may be included in technical literature that uses the classification system.

Modifiers

The Cowardin system also records other information if applicable. Modifiers used in the system are listed in Table 3.

Circular 39 of the U.S. Fish and Wildlife Service

Shaw, S. P., and Fredine, C. G. (1956). "Wetlands of the United States," Circular 39, U.S. Fish and Wildlife Service, Washington, DC.

This system preceded the Cowardin system and is still used occasionally. It identified 20 different wetland types on the basis of salinity, proximity to the ocean, and water depth (Table 4). Each type is discussed in terms of vegetation and wildlife habitat, particularly habitat of migratory waterfowl.

Table 3
Modifiers Used in the Cowardin Classification

Water Regime	Water Chemistry			Other
Tidal Subtidal Irregularly Exposed Regularly Flooded Irregularly Flooded	Inland Hypersaline Eusaline Polysaline Mesosaline Oligosaline Fresh	Coastal Hyperhaline Euhaline Polyhaline Mesohaline Oligohaline Fresh	Salinity (ppt) >40 30 – 40 18 – 30 5 – 18 .5 – 5 <.5	Excavated Impounded Diked Partly Drained Farmed Artificial
Nontidal Permanently Flooded Intermittently Exposed Semipermanently Flooded Seasonally Flooded Saturated Temporarily Flooded Intermittently Flooded Artificially Flooded	pH Acid <5.5 Circumneutral 5.5 - 7.4 Alkaline >7.4			Soil Organic Mineral

Table 4
Wetland Types Classified in Circular 39

Type No.	Wetland Type	Water Depth
	Inland Fresh Areas	
1.	Seasonally flooded flats	Few inches in upland Few feet along rivers
2.	Inland fresh meadows	Few inches after rains
3.	Inland shallow fresh marshes	Up to 6 in.
4.	Inland deep fresh marshes	Up to 3 ft
5.	Inland open fresh water	Up to 10 ft
6.	Shrub swamps	Up to 6 in.
7.	Wooded swamps	Up to 1 ft
8.	Bogs	Shallow ponds may be present
	Inland Saline Areas	
9.	Inland saline flats	Few inches after rain
10.	Inland saline marshes	Up to 2 ft
11.	Inland open saline water	Up to 10 ft
	Coastal Fresh Areas	
12.	Coastal shallow fresh marshes	Up to 6 in.
13.	Coastal deep fresh marshes	Up to 3 ft
14.	Coastal deep fresh water	Up to 10 ft
	Coastal Saline Areas	
15.	Coastal salt flats	Few inches
16.	Coastal salt meadows	Few inches
17.	Irregularly flooded salt marshes	Few inches
18.	Regularly flooded salt marshes	Up to 1 ft
19.	Sounds and bays	Up to 10 ft
20.	Mangrove swamps	Up to 2 ft

The two U.S. Fish and Wildlife Service classification systems (Circular 39 and Cowardin et al. (1979)) can be correlated with each other by use of Table 4 in Cowardin et al. (1979).

Hydrogeomorphic (HGM) Classification System

Brinson, M. M. (1993). "A hydrogeomorphic classification for wetlands," Technical Report WRP-DE-4, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

This document lays the theoretical groundwork for the classification of wetlands based on the external factors of (1) geomorphic setting (geomorphology), (2) water source, and (3) water flow patterns (hydrodynamics). Based on these three criteria, any number of functional wetland groups can be identified at different spatial or temporal scales. For example, at a broad continental scale, Brinson (1993) identified five hydrogeomorphic wetland classes. These were later expanded (Smith et al. 1995; Brinson et al. 1995) to the seven classes described in Table 5. The HGM Wetland Classification System is one component of the HGM Approach to Assessing Wetland Functions. The overall HGM approach is discussed in the section of Chapter 8 titled "Hydrogeomorphic (HGM) Approach to Assessing Wetland Function."

Table 5
Hydrogeomorphic Classes of Wetlands Showing Dominant Water Sources, Hydrodynamics, and Examples of Subclasses (Smith et al. 1995)

Hydrogeomorphic Class (geomorphic setting)	Water Source (dominant)	Hydrodynamics (dominant)	Examples of Regional Subclasses	
			Eastern USA	Western USA and Alaska
Riverine	Overbank flow from channel	Unidirectional and horizontal	Bottomland hardwood forests	Riparian forested wetlands
Depressional	Return flow from groundwater and interflow	Vertical	Prairie pothole marshes	California vernal pools
Slope	Return flow from groundwater	Unidirectional, horizontal	Fens	Avalanche chutes
Mineral soil flats	Precipitation	Vertical	Wet pine flatwoods	Large playas
Organic soil flats	Precipitation	Vertical	Peat bogs; portions of Everglades	Peat bogs
Estuarine fringe	Overbank flow from estuary	Bidirectional, horizontal	Chesapeake Bay marshes	San Francisco Bay
Lacustrine fringe	Overbank flow from lake	Bidirectional, horizontal	Great Lakes marshes	Flathead Lake marshes

Geomorphology

Geomorphology of a wetland is identified as either (1) depressional, (2) riverine, or (3) fringe. Depressional systems obtain water from precipitation or the immediately surrounding landscape. Riverine wetlands have dominantly unidirectional flow through them. Fringe wetlands -- shores of lakes or oceans -- have dominantly bidirectional flow (e.g., tides). These distinctions have great implications for seasonality, water chemistry, water energies, and vegetative growth.

Water source

Water source of a wetland is identified as (1) precipitation, (2) groundwater, or (3) surface flow. Wetlands driven primarily by precipitation are likely to dry out seasonally and to receive minimal inputs of nutrients. Groundwater inputs to wetlands are usually rich in nutrients; resulting wetlands are biologically productive, but suffer oxygen depletion without external flushing or turbation. Surface waters flowing into wetlands generally carry nutrient-rich sediments, support high biological productivity, and promote biological exchange with the surrounding drainage basin. Most wetlands have multiple sources of water.

Hydrodynamics

Hydrodynamics of a wetland are characterized in terms of (1) vertical fluctuations of inundation and water tables, (2) unidirectional flows of surface water, and (3) bidirectional flows of surface water. Vertically fluctuating water tables cause frequent cycles of oxidation and reduction. Unidirectional flows are often associated with flooding and accompanying sediment deposition and flushing. Bidirectional flows are often accompanied by high inputs of organic matter and flushing conducive to high productivity (e.g., salt marshes).

5 Wetland Delineations

Wetlands Versus Other "Waters of the U.S."

Under the authority of The Rivers and Harbors Act of 1899 and The Clean Water Act, the Corps of Engineers regulates all waters of the United States, not only wetlands. Wetlands are a subset of the waters of the United States; other classes of waters of the United States are rivers, lakes, mud flats, territorial seas, etc. The Code of Federal Regulations defines "Waters of the United States" as:

> (1) all waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide; (2) all interstate waters including interstate wetlands; (3) all other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce...; (4) all impoundments of waters otherwise defined as waters of the United States under the definition; (5) tributaries of waters identified in [items] (1)-(4) [of this definition]; (6) the territorial seas; (7) wetlands adjacent to waters (other than waters that are themselves wetlands) identified in [items] (1)-(6) [of this definition] (33 CFR 328.3(a)).

The term "wetlands" means:

> Those area that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. (33 CFR 328.3(b))

Only wetlands have a delineation manual. The other kinds of waters are delineated to the extent of the ordinary high water mark (OHW) or, for tidal waters, to the high tide line. The difference between wetlands and other waters of the United States is a frequent source of confusion on the part of land use managers, both within the military and outside. Most of this chapter discusses delineation of wetlands, but it is also necessary to mention delineation to the OHW.

The OHW is defined as:

> The line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank; shelving; changes in the character of soil; destruction of terrestrial vegetation; the presence of litter and debris; or other appropriate means that consider the characteristics of the surrounding area (33 CFR 329.11(a)(1)).

In practice, the lateral (landward) extent of ordinary high water can be determined by the presence of drift lines, water marks, or shelving along the shoreline of rivers, lakes, and streams. It is often difficult to find a distinct drift or litter line in intermittent systems, such as intermittent lakes in the western United States, but some reliable indicator of standing water should be found consistently on the ground in order to establish jurisdiction with OHW.

Note that there is no consistent relationship between the lateral extent of other waters and the upper limit of wetlands. Some wetlands may be waterward of the OHW, and others may be landward of the OHW. Many wetlands, such as prairie potholes or cypress domes, are isolated and are a great distance from the nearest OHW waters. Both wetlands and other waters are regulated and should be included in maps of installation natural resources.

Kinds of Wetland Delineations

Wetland delineation is the process by which one determines the geographic boundary of a wetland. There are two kinds of wetland delineations, jurisdictional and non-jurisdictional. Jurisdictional delineations establish boundaries for Section 404 permitting purposes and are legally binding; non-jurisdictional delineations are usually conducted for planning purposes and are not legally binding. One must identify the purpose of delineation before expending resources to plan and conduct the delineation. Both will probably be required at one time or another for fulfillment of DA wetlands management requirements (U.S. Army Engineering and Housing Support Center 1991).

Jurisdictional delineations

Jurisdictional delineations identify the legal boundaries of wetlands over which the Corps has regulatory jurisdiction under Section 404 of the Clean Water Act. Current methods and procedures for delineation of boundaries of such wetlands are described in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory, 1987; hereafter referred to as the 1987 Corps Manual) and in subsequent guidance issued by the Office of the Chief of Engineers. Jurisdictional delineations are legally binding and are usually conducted with resolution sufficient to allow ground survey and drawing of contractor's plans. They usually require on-site characterization of plants and soils and may also include hydrologic monitoring. Jurisdictional delineations can be quite expensive when done by a private consulting firm, depending on how large and complex the site is, and on the degree of resolution required.

The 1987 Corps Manual (available on the Internet at: http://www.wes.army.mil/el/wetlands/wlpubs.html.) provides methods and procedures for delineation of jurisdictional wetlands. However, the Corps regulates filling activities in all waters of the United States, of which wetlands are only one kind (see Chapter 6 of this document and 33 CFR 328.3). The 1987 Corps Manual does not address delineation of the ordinary high-water mark or the high-tide line, which define the boundaries for most other waters of the United States. Filling activities in these waters also require permits (see Chapter 6).

Non-jurisdictional delineations

Non-jurisdictional delineations are drawn for purposes other than establishing the legal boundaries of Corps regulatory authority in wetlands (e.g., identification of wetlands on a coarse-scale planning map or identification of wetlands that may influence timber harvest and replanting). Non-jurisdictional delineations should be based on the principles of jurisdictional delineation -- the three-parameter test of vegetation, soils, and hydrology -- but need not be constrained by all of the details described in the methods section of the 1987 Corps Manual.

Non-jurisdictional wetland delineations usually entail less effort and give lower resolution products than do jurisdictional ones. For instance, planning activities that use 7½-minute topographic maps require wetland delineations at a comparable scale. The minimum area inside of which one can encircle a map symbol on a 7½-minute quad sheet represents approximately 6 acres on the ground. This level of resolution is much too coarse for regulatory purposes but serves many planning needs adequately.

Delineation Procedure

The Corps' wetlands delineation procedure is based on three parameters: vegetation, soils, and hydrology. The objective of wetland delineation is to locate on the ground where these three parameters all meet the technical criteria for wetlands as defined in the 1987 Corps Manual (limited exceptions may occur).

The 1987 Corps Manual provides formal definitions of these three parameters. Regional committees of botanists under direction of the U.S. Fish and Wildlife Service have classified plants into groups reflecting frequency of occurrence in wetlands: upland, facultative upland, facultative, facultative wetland, and obligate wetland. The USDA/Natural Resources Conservation Service (NRCS, formerly the Soil Conservation Service, SCS) has compiled lists of hydric soils for each county mapped in the country. National hydrology criteria have been written based on frequency and duration of inundation or soil saturation, and season of biological activity in the topsoil.

The 1987 Corps Manual describes three levels of wetland delineation: (1) onsite inspection unnecessary because the delineator has sufficient information from sources such as aerial photography, environmental impact statements, tide or stage data; (2) onsite inspection necessary using the routine method of field inspection described in the 1987 Corps Manual; and (3) onsite inspection using the comprehensive method for complex areas. Guidance is also given for delineation of certain types of problem wetlands.

Most DA installations require two levels of delineation accuracy: low resolution for planning purposes, and high level accuracy for permitting purposes. The 1987 Corps Manual does not directly address low-resolution wetland delineation for planning purposes, though guidance for a level 1 delineation (above), where onsite inspection is not necessary, will help. Jurisdictional delineations generally involve onsite investigations using the method described in the section below.

Delineation Using Maps and Photographs for Planning Purposes

Current Army Regulations require each DA installation to have a general map of its wetlands for planning purposes. These maps are usually derived from U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) maps. Field experience with NWI maps indicates variable accuracy. **One should not depend on NWI maps alone for wetland delineation, even for planning purposes.** Table 6 lists other cartographic sources that can be used to supplement the NWI maps. Information is also available from non-cartographic sources, such as stream gauge and tidal data, environmental impact statements, former onsite delineations, and personal knowledge of an area.

Superimposition of base maps of different wetland parameters will reveal discrepancies. For instance, hydric soil boundaries may not coincide with NWI wetland boundaries. Ground-truthing will resolve contradictions if time and access permit. It is often difficult to visit all areas on base from the ground. Low-altitude aerial photography should be reviewed when ground access is impractical. All photo interpretation needs to be refined through an interactive process of ground-truthing.

Delineation on the ground

High-resolution, onsite delineations are usually required when applying for a Corps permit. The onsite delineation method presented here is the one most commonly used by Corps regulators; the routine method is described in more detail in the 1987 Corps Manual on pp. 57-69.

The routine method for delineating wetlands on the ground is based on plant communities. Plant communities are identified first and evaluated for presence or absence of hydrophytic vegetation. Areas with plant communities dominated by hydrophytic vegetation are then evaluated for the hydric soils and wetland hydrology parameters. The wetland boundary is defined by the areal extent of

Table 6
Aids for Office (Planning-Level) Delineations

Product	Scale	How to Use	Source
National Wetlands Inventory Maps	1:24,000	Wetlands already identified and classified.	USFWS 1-800-USA-MAPS
USDA/NRCS Soil Survey Maps	1:15,840 to 1:24,000	Areas with hydric map units may be wetlands; obtain hydric map unit lists from local USDA/NRCS.	USDA/NRCS District Offices
USGS Topographic Maps	1:24,000	Locate marsh symbols, lakes, ponds, rivers, etc.; wetlands are likely nearby.	USGS 1-800-USA-MAPS
Aerial Photos (Infrared, several seasons preferred)	Variable	Find known wetland on photo and hunt for other areas that have same photo signature. Also look for standing water and wet soils. Requires ground-truthing.	Various
Descriptions of Navigable Waters of the United States	NA	Must be drawn onto existing maps.	Corps Regulatory Office
Maps of Head-waters of Streams	1:24,000	Superimposed on other maps.	Corps Regulatory Office

hydrophytic plant communities growing on hydric soils where evidence of wetland hydrology is present.

Hydrophytic vegetation. Evaluation of the vegetation parameter in a routine wetland delineation involves five steps:

a. Locating the different plant communities onsite.

b. Noting the dominant kinds of plants in each community.

c. Identifying the dominant plants to the species level.

d. Determining the wetland indicator status of each dominant species.

e. Using the indicator status of dominants to determine whether hydrophytic vegetation is present.

The first step in determining whether an area has hydrophytic vegetation is to locate the different plant communities onsite. A plant community is a vegetative complex unique in its combinations of plants, usually determined by combinations of environmental influences. The upland, ecotone, and deep wetland are often occupied by different plant communities.

Second, one must identify the dominant plants in each community. Dominant species are determined separately within four strata: (1) trees, (2) saplings/shrubs, (3) herbaceous plants and small shrubs, and (4) woody vines. The dominant species in a stratum are those that cumulatively comprise more than 50 percent of the total in that stratum (using a measure of abundance such as areal cover, basal area, stem density, etc.) and any other species that individually occupy at least 20 percent of the total (using the same measure of abundance). Strata are defined as follows:

a. Trees are plants that have a diameter at breast height (dbh) of at least 3.0 in.

b. Saplings/shrubs are woody plants greater than 3.2 ft tall with a dbh less than 3.0 in.

c. Herbs include all nonwoody plants regardless of height and all woody plants less than 3.2 ft tall.

d. Woody vines are woody, climbing plants at least 3.2 ft tall.

Third, one must identify each of the dominants to the species level. Refer to standard regional floras, or ask an experienced field botanist for help.

Fourth, after plants have been identified, one must determine their indicator status, that is, whether they are Obligate Upland (UPL), Facultative Upland (FACU), Facultative (FAC), Facultative Wetland (FACW), or Obligate Wetland (OBL) plants (Table 7). This requires looking up the dominant species in a regional *List of Plant Species That Occur in Wetlands* (Reed 1988). Anyone delineating wetlands should obtain the plant list for their region from the U.S. Fish and Wildlife Service (available on the Internet at the National Wetlands Inventory (NWI) Web site: http://www.nwi.fws.gov.)

Table 7
Plant Indicator Status for Wetland Delineation

Indicator Status	Abbreviation[1]	Estimated Probability of Occurring in Wetlands
Obligate Wetland	OBL	Greater than 99%
Facultative Wetland	FACW	67% to 99%
Facultative	FAC	34% to 66%
Facultative Upland	FACU	1% to 33%
Obligate Upland	UPL	Less than 1%

[1] Presence of a "+" sign after an abbreviation indicates a frequency toward the higher end of the category (more frequently found in wetlands, e.g., FAC+), and a "-" sign after an abbreviation indicates a frequency toward the lower end of the category (less frequently found in wetlands, e.g., FAC-).

Finally, one must calculate the hydrophytic status of the community. The dominants and their indicator status are noted for each stratum. Species are counted for each stratum in which they are dominant, even if this results in a species being recorded more than once for the community (for example, note the method of counting species A and D in the example in Table 8 below). For a vegetative community to be hydrophytic, more than 50 percent of the dominant plant species from all layers combined must be FAC, FACW, or OBL. Note that this does not say 50 percent of the *plants*; it says 50 percent of the *dominant species*. The example shown in Table 8 should help clarify these rules.

The example in Table 8 is simple; however, it introduces a beginner to how the vegetation parameter is tested. (Please note that the 1987 Corps Manual describes alternatives and complications not found in this example.) In practice, dominant species often stand out so obviously that an experienced delineator can recognize hydrophytic vegetation without calculations, though a tally of species,

Table 8
Examples of Hydrophytic Vegetation Determination

Species	Indicator Status	Percent Areal Cover			
		Trees	Shrubs	Vines	Herbs
A	FACU	55	25	--	5
B	OBL	5	--	--	--
C	UPL	10	--	--	--
D	FACW	10	20	--	20
E	FAC	--	--	30	--
F	FACW		--	--	45
Dominants		A	A,D	E	D,F

Number of Dominants = 6 (A and D are counted twice, E and F once).
Number of OBL, FACW, and FAC = 4 (D twice, E, and F).
Number of FACU and UPL = 2 (A twice).
Status = Hydrophytic Vegetation, because more than 50 percent of dominant species are OBL, FACW, and FAC.

strata, and indicator status must still be recorded on field data forms. Beginners should go through each step of the procedure with calculations until they become familiar with it and with the wetland plant communities on their installation. The Corps' standard field data form for use in a routine wetland determination can be found in Appendix B. This data form was originally published in the 1987 Corps Manual, but was revised in 1992.

Hydric soils. "Hydric soils" is a name for soils that are commonly found in wetlands. Hydric soils are defined as soils that are "formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (U.S. Department of Agriculture Soil Conservation Service 1998). These soils are identified in the field mainly by morphological features such as color patterns and organic matter accumulation and/or by observation of inundation. A soil may be considered hydric if it is inundated (flooded or ponded) for at least one continuous week during the growing season in most years (greater than 50 percent probability).

Most hydric soil determinations are made by use of soil characteristics such as color and organic matter distribution. Soil color is quantified by comparing colors in the soil with colors of standard color chips in the Munsell Color Charts (Kollmorgen Corporation 1992; available from most environmental and forestry supply houses). The NRCS has lists of hydric soils, but it is preferable to make hydric soil determinations from lists of field indicators in the 1987 Corps Manual rather than from lists of hydric soils.

The dark-colored upper layer of the soil -- the topsoil -- is the "A horizon;" the lighter-colored layer immediately below the A horizon is the subsoil. Most hydric soils have subsoil colors of gray or gray-with-mottles. In order to inspect subsoil colors, it is usually sufficient to excavate the soil with a tile spade to a depth of 18 in. and remove a slice of soil on the blade of the spade. Soil colors should be determined in bright sunlight and without the use of dark glasses; if the soil is dry, it should be moistened.

The 1987 Corps Manual lists other field indicators of hydric soils such as high organic matter content in sandy soils and concretions. It also describes problem area soils and wetlands. Before making hydric soils determinations with these other characteristics, one should ask the Corps District Regulatory Branch or the local NRCS for onsite assistance.

Wetland hydrology. Wetland hydrology is the most difficult of the three parameters to check in the field because it is the most ephemeral and leaves the least reliable traces in the landscape after water tables or floods have receded. If wetland delineators can visit problem sites during the wet season, they can determine the hydrology parameter by observing actual water tables or inundation. Decisions made from "field indicators" during a drought are less reliable. In this regard, DA installation personnel have an advantage over most delineators because they have access to their installation's wetlands all year long.

The wetland hydrology criteria are not the same as the hydric soil water table criteria. For wetland hydrology to be present, the following criteria must exist:

a. The land must be inundated or saturated.

b. There must be good reason to believe that this saturation or inundation persists for more than 5 percent of the growing season.

c. Such inundation or long-duration saturation occurs in most years in the climatic cycle (greater than 50 percent probability).

The growing season can be estimated by consulting local county soil survey reports. In modern surveys one of the first tables in the report is a list of "Frost Free Dates." The growing season for regulatory purposes can generally be estimated as the time of the year when air temperatures do not drop below 28 °F in five years out of ten. However, in the South, a threshold of 32 °F may be used by some Corps Regulatory Offices. Personnel in Alaska or mountainous terrain should consult their Corps Regulatory Office for guidance on how to determine growing season dates.

If a site cannot be visited when high water tables or surface water are present, one must rely on field indicators to establish the hydrology parameter. In 1992, the Corps recognized primary and secondary indicators of hydrology. Presence of one primary indicator is sufficient to identify wetland hydrology; two secondary indicators are needed if primary indicators are missing.

Primary field indicators of wetland hydrology are:

a. Visual observation of inundation; there must be reason to believe the inundation will persist for 5 percent of the growing season in most years.

b. Visual observation of soil saturation; soil at 12 in. or shallower glistens with moisture, or exudes moisture when lightly shaken in the hand; there must be reason to believe the saturation will persist for 5 percent of the growing season in most years.

c. Watermarks from recent flooding, usually on woody vegetation or structures.

d. Drift lines of debris rafted in from flooding.

e. Sediment deposited from recent flooding.

f. Drainage patterns left from overland flow.

Any combination of two of the following secondary field indicators will suffice in lieu of the primary field indicators:

a. Oxidized root channels along living roots in the upper 12 in. of the soil.

b. Water-stained (blackened) leaves due to prolonged inundation.

c. Local soil survey map unit descriptions indicate that the soil floods or ponds, or the water table is within 12 in. of the soil surface during the growing season.

d. FAC-neutral test of the vegetation (the number of FACW and OBL dominant species exceed the number of FACU and UPL dominants).

It is often difficult to find field indicators of hydrology even when one is certain that an area is a wetland, particularly during the dry season in groundwater-driven wetlands. If the hydrology field indicators are weak, the plant and soil indicators should be strong. The 1987 Corps Manual has two sections that specifically address atypical situations and problem areas where one or more field indicators may be weak and/or lacking.

Tools needed to delineate wetlands

Equipment needed to delineate wetlands consists of field clothing, insect repellent, sunscreen, canteen, etc., for personal use, as well as the following:

a. Local plant identification key.

b. Regional edition of the U.S. Fish and Wildlife Service "National List of Plant Species that Occur in Wetlands" (Reed 1988).

c. Flagging tape and marking pen (if the wetland is to be surveyed).

d. Detailed site map or aerial photograph and marker (if wetland is to be delineated on a map).

e. Soil survey report.

f. Hand lens (for plant and soil inspection).

g. Tile spade or soil auger (depending on locale).

h. 3-in. or longer knife (for soil inspection).

i. Munsell soil color book.

j. Wetland delineation field sheets (Appendix B).

k. Compass, if terrain necessitates.

l. Field book and camera (depending on situation).

Obtaining a Wetland Delineation

The Corps of Engineers makes the majority of the jurisdictional determinations of wetland boundaries necessary for Section 404 permits; however, the EPA can assume this role in exceptional cases and has discretionary review and veto authority over Corps permit actions.

In practice, the process of delineating wetland boundaries is usually performed by the Corps District in which the project is located or by private environmental consulting firms who prepare the delineation and submit it to the Corps. If an installation has a competent delineation team trained in using the current wetlands delineation manual, these personnel can perform wetland delineations also. The Corps then verifies these boundaries or makes adjustments as needed prior to issuing an official jurisdictional determination.

Under an MOA between the USDA and the Corps, the local NRCS delineates wetland boundaries on land in agricultural use for USDA program participants. These delineations also serve for Food Security Act issues. Due to differences in statutory requirements, NRCS delineations may differ from the Corps' Section 404 delineations.

Cost of wetland delineations

Cost of wetland delineations done by private consultants varies greatly with complexity of terrain, economy of the region, and purpose of the delineation. Rates for field work vary from $80 to $200 per hour (possibly even higher in large urban areas) for a professional; technicians may cost 20 to 50 percent less. Wetland boundaries usually are delineated at rates of 5 to 10 acres of wetland per day. Costs of administration and report writing can add another 150 percent to the bill over and above field costs. With these assumptions, it may cost anywhere from $15,000 to $75,000 to delineate 100 acres of wetlands under 1998 conditions.

Jurisdictional delineation is often a trade-off between acreage and money. Many environmental consulting firms are accustomed to performing the extra field work necessary to challenge the Corps and EPA in court. This extra effort

is quite costly. Most DA installations would probably prefer to work in cooperation with the Corps and keep costs down. This should be discussed up front when negotiating with a prospective consulting firm.

Contesting a delineation

Corps delineations are occasionally questioned. The best approach to resolving differences regarding a wetland delineation is to talk with the Corps representative in the field during the delineation itself, before any decision has been committed to writing. If differences are still irreconcilable, technically sound arguments should be presented to the Corps.

Wetland Delineator Certification Program (WDCP)

In March 1993 the Corps proposed the establishment of a wetland delineator certification program (WDCP) in accordance with Section 307(e) of the Water Resources Development Act of 1990. The intent of the program is: (1) to improve the quality and consistency of wetland delineations submitted to Corps Districts, and (2) to expedite consideration and acceptance of delineations performed by certified delineators.

As of October 2000, the WDCP is on hold until publication of the final regulations. The final regulations have not been published and there is no proposed date for publication. Therefore, there is no effective date of certification. The previously published written test dates for the winter of 1997 were canceled and none have been rescheduled. Further information, including updates, will be posted on the Corps Headquarters Regulatory Internet Web page: http://www.usace.army.mil/lrc/reg/

6 The Corps Regulatory Process[1]

Regulated Activities and Waters

The Corps of Engineers regulates the discharge of fill or dredged material into waters of the United States as well as activities that could affect the course, condition, or navigable capacity of navigable waters of the United States. Wetlands are considered to be waters of the United States and in some cases navigable waters of the United States, and therefore are regulated for discharge of fill or dredged material. The Corps' regulatory program is authorized by Congress through Section 404 of the Clean Water Act, Section 10 of the Rivers and Harbors Act of 1899, and Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972; the Corps shares responsibility for the Section 404 and Section 103 programs with the EPA.

In exercising these regulatory responsibilities the Corps may issue permits authorizing such fill or construction activities. Hereafter these permits will be referred to as "Corps permits." These different activities will be discussed concurrently because (1) the Corps' regulations for all three laws are discussed in 33 CFR 320-330 and require the same permit application, and (2) work in navigable waters (Section 10) may entail a regulated discharge such as filling of adjacent wetlands (Section 404 or possibly Section 10). Section 103 Permits will not be discussed further except in passing because transportation of dredged material to ocean sites is beyond the purview of this document.

Regulated activities

The Rivers and Harbors Act of 1899 and the Clean Water Act regulate two separate kinds of activities. Activities requiring Section 10 permits include construction of structures (e.g., piers, wharves, breakwaters, bulkheads, jetties, weirs, transmission lines) and work such as dredging or disposal of dredged material, or excavation, filling or other modifications to the navigable waters of the United States. Activities requiring Section 404 permits are limited to

[1] Parts of this chapter were taken, with minor modification, from the Code of Federal Regulations (CFR) and from *Department of the Army Regulatory Program: An Overview* (USACE 1990).

discharges of dredged or fill materials into the waters of the United States. Section 404 discharges include return water from dredged material that is disposed of on upland sites as well as most fill material (e.g., rock, sand, dirt) used to construct fast land for site development, roadways, erosion protection, etc. No longer included is "incidental fallback" of material during excavation activities. By interagency agreement with the EPA, the discharge of dredged material in the territorial seas is regulated under Section 103 criteria rather than those developed for Section 404.

The following actions all require Corps permits as described in the cited regulation:

a. Emplacement of dams or dikes in navigable waters: 33 CFR 321.

b. Other excavation, dredging, or disposal activities in navigable waters: 33 CFR 322.

c. Activities that alter the course, condition, capacity, etc., of navigable waters: 33 CFR 322.

d. Construction of artificial islands, installations, and other devices on the outer continental shelf: 33 CFR 322.

e. Discharges of dredged or fill material into waters of the United States: 33 CFR 323.

The term "fill" is defined as "any material used for the primary purpose of replacing an aquatic area with dry land or of changing the bottom elevation of any water body. The term does not include any pollutant discharged into the water primarily to dispose of waste, as that activity is regulated under section 402 of the Clean Water Act" (33 CFR 323.2(e)). Discharge of fill is "the addition of fill material into waters of the United States" (33 CFR 323.2(f)).

At the time of this writing, the "discharge of dredged material" means "any addition of dredged material into, including redeposit of dredged material other than incidental fallback within, the waters of the United States." Under this definition, in certain circumstances, excavation in a wetland may not be considered a regulated activity. However, in the last few years, regulations and court rulings have forced policy back and forth on this issue. Prior to 1993 the Corps considered the regulation of wetland excavation activities outside of its regulatory authority unless there was more than an "incidental" discharge of fill associated with the activity. A lawsuit filed against the Corps by the North Carolina Wildlife Federation challenged the Corps' interpretation of their Section 404 regulatory authority (North Carolina Wildlife Federation v. Tulloch, Civil No. C90-713-CIV-5-BO (E.D.N.C. 1992)). In the settlement of that suit, the Corps agreed to redefine "discharge of dredged material" to include discharges associated with excavation activities. In the 25 August 1993 Federal Register (58 FR 45008), the Corps and EPA jointly issued a revised definition of "discharge of dredged material." This new definition is known as the "Excavation Rule," or the "Tulloch Rule."

In a subsequent lawsuit, the American Mining Congress challenged the Excavation Rule (American Mining Congress v. United States Army Corps of Engineers, No. 93-1754 SSH). The U.S. District Court for the District of Columbia handed down a decision (23 January 1997) which held that the revised definition of "discharge of dredged material" (Excavation Rule) was outside the agencies' statutory authority and contrary to the intent of Congress to the extent that it asserted Clean Water Act (CWA) jurisdiction over activities where the only discharge associated with the activity is incidental fallback. (The court defined incidental fallback as the incidental soil movement from excavation, such as the soil that is disturbed when dirt is shoveled, or back-spill that comes off a bucket and falls into the same place from which it was removed. Incidental fallback does not include soil movements away from the original site.) That is, the court ruled that excavation of a wetland (even if the intent is to drain the wetland) should not be subject to the Corps' Section 404 regulatory authority.

On 25 June 1997, the U.S. Circuit Court for the District of Columbia granted a temporary stay of the District Court decision, thus allowing the Corps to enforce the Tulloch Rule. However, a final ruling was handed down by the U.S. Court of Appeals for the District of Columbia Circuit on 19 June 1998. That decision nullified the Tulloch Rule (Excavation Rule) and has forced the Corps to return to its pre-1993 definition of "discharge," which exempts *de minimis* or incidental discharge associated with dredging or excavation in a wetland. As of this writing, the Corps has decided not to appeal the decision to the Supreme Court. As a result, the Excavation Rule at 33 CFR 323.2(d) is no longer in effect. The latest guidance on this issue for all Corps Regulatory Offices was published on 10 May 1999 in the Federal Register (Volume 64, Number 64). For a copy of the latest guidance and any updates on this matter, check the Corps' Headquarters Regulatory Web page at: http://www.usace.army.mil/lrc/reg/. If there is any question of whether an activity is regulated, contact the Corps' Regulatory Office for an official determination.

Regulated waters

The geographic jurisdiction of the Rivers and Harbors Act of 1899 includes all navigable waters of the United States. The Clean Water Act uses the term "navigable waters," which is defined in the Act as "waters of the United States, including the territorial seas" (Section 502(7)). Thus, Section 404 jurisdiction is defined as encompassing Section 10 waters plus their tributaries and adjacent wetlands and isolated waters where the use, degradation, or destruction of such waters would affect interstate or foreign commerce.

Waters of the United States. The Clean Water Act regulates discharge of fill into waters of the United States. "Waters of the United States" is broadly defined to include all waters whose alteration could or does influence interstate or international commerce, including migratory bird habitat. These waters include navigable waters, interstate waters, intrastate lakes, rivers, streams (including intermittent streams), mud flats, sand flats, wetlands, sloughs, prairie

potholes, wet meadows, playa lakes, or natural ponds that could affect interstate commerce (33 CFR 328.3).

The geographic extent of waters of the United States extends landward to the ordinary high-water mark in nontidal systems, to the high-tide line in tidal systems, and to the landward extent of wetlands that may lie upslope of the ordinary high-water mark or high-tide line.

Navigable waters of the United States. Section 10 permits are required for activities within navigable waters of the United States. "Navigable waters of the United States are those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. A determination of navigability, once made, applies laterally over the entire surface of the water body, and is not extinguished by later actions or events which impede or destroy navigable capacity" (33 CFR 329.4).

The landward extent of navigable waters is defined by the ordinary high-water mark in nontidal systems and the mean high-water line in tidal systems. The Regulatory Branch at the appropriate Corps District Office may be able to provide a list of navigable waters on an installation.

Ordinary high-water mark, high-tide line, and mean-high-water lines. These lines minimally define the landward extent of "waters of the U.S." or "navigable waters of the U.S." (see sections titled "Waters of the United States" and "Navigable waters of the United States," above). Waters of the United States may extend landward of these lines when wetlands are present.

The ordinary high-water mark is defined as "the line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank; shelving; changes in the character of soil; destruction of terrestrial vegetation; the presence of litter and debris; or other appropriate means that consider the characteristics of the surrounding area" (33 CFR 329.11(a)(1)).

The high-tide line is defined as "the line of intersection of the land with the water's surface at the maximum height reached by a rising tide.... The line encompasses spring high tides and other high tides that occur with periodic frequency but does not include storm surges...." (33 CFR 328.3(d).

The mean (average) high-water line in tidal systems is defined as "the available tidal datum, preferably averaged over a period of 18.6 years" (33 CFR 329.12(a)(2)). A period of 18.6 years is a complete lunar cycle.

Special aquatic sites. Section 404 of the Clean Water Act applies to waters of the United States, including special aquatic sites as defined in the EPA's Section 404(b)(1) Guidelines. Special aquatic sites are defined as "geographic areas, large or small, possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values. These areas are generally recognized as significantly influencing or

positively contributing to the general overall environmental health or vitality of the entire ecosystem of a region" (40 CFR 230.3(q-1)). The Guidelines list the following as special aquatic sites: sanctuaries and refuges, wetlands, mud flats, vegetated shallows, coral reefs, and riffle and pool complexes (40 CFR 230.40-.45).

Although the Corps' and EPA's definition of wetlands does not include unvegetated aquatic areas, such areas may be regulated the same as wetlands under the rubric of special aquatic sites.

Wetlands. Corps jurisdiction may extend landward of the ordinary high-water mark or mean high-water line if wetlands are present. Special regulations and technical manuals have been written to define wetlands. Corps and EPA regulations implementing the Clean Water Act define wetlands as:

> ...those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. (33 CFR 328.3(b) and 40 CFR 230.3(t))

This definition of wetlands is narrower than that of the U.S. Fish and Wildlife Service (USFWS) in that the Corps and EPA exclude nonvegetated flats from the definition of wetlands (the USFWS definition is given in Section 4.2.1 of this document). The Corps' wetlands delineation manual (Environmental Laboratory 1987) provides procedures for identifying the landward extent of Federal jurisdiction in wetlands. These procedures are discussed in Chapter 5.

Activities exempted from Corps regulation

Three classes of activities are exempted from Section 404 permitting regulations: unregulated or exempted activities, activities in unregulated water bodies, and activities that occurred before certain dates. Table 9 enumerates those exemptions of most interest to DA installations.

A WORD OF CAUTION: *Contact the appropriate Corps District Regulatory Branch for details of permit exemptions. Although the activities listed in Table 9 are usually exempted from regulation under Sections 10 or 404, they may be regulated under other laws.*

Types of Corps Permits

The Corps issues two kinds of permits: individual permits and general permits.

Table 9
Exemptions from Corps Regulation

Activity Not Regulated	Citation
NOT REGULATED BY SECTION 404 OF THE CLEAN WATER ACT	
Federal projects specifically authorized by Congress and for which environmental impact statements have been submitted prior to filling activities.	Section 404(r)
Ongoing agricultural, silvicultural, and ranching activities.	Section 404(f)(1)
Maintenance of currently serviceable structures such as dikes, dams, levees, bridge abutments, and transportation structures.	Section 404(f)(1)
Construction of farm ponds and irrigation or drainage ditches.	Section 404(f)(1)
Construction of temporary sedimentation basins at construction sites.	Section 404(f)(1)
Construction of farm or forest roads using best management practices.	Section 404(f)(1)
Other programs approved by a state (contact the Corps for details).	Section 404(f)(1)
De minimis, incidental soil movement during normal dredging if no degradation to wetland results; state rules may vary. (See 6.1.1 for an explanation of Excavation Rule).	33 CFR 323.2(d)
Non-point source discharges, e.g. erosion.	Section 404(a)
Superfund clean-up activities.	REGL 85-7, 89-2, 94-2
NOT REGULATED BY SECTION 10 OF RIVERS AND HARBORS ACT OF 1899	
Bridges and causeways regulated by the U.S. Coast Guard.	33 CFR 320.2(a)
Removal and planting of vegetation.	REGL 84-1
WATER BODIES NOT CONSIDERED WATERS OF THE UNITED STATES	
Non-wetland areas above the ordinary high-water mark or mean-high-water line.	33 CFR 329.12(a)(2)
Waters beyond the territorial seas.	33 CFR 329.12(a)
Areas not considered wetlands according to current Federal wetlands delineation procedures, even though other classification systems may consider them to be wetlands.	33 CFR 328.3(b)
Agricultural fields determined by the USDA/NRCS to be prior converted cropland.	33 CFR 328.3(a)(8)
Following areas excavated in uplands: nontidal drainage and irrigation ditches; irrigated areas; single use settling basins and irrigation and stock watering ponds; and ornamental pools. The Corps may on a case-by-case basis determine these to be waters of the United States.	51 Federal Register, p. 41217; 11/13/86
Waste treatment ponds or lagoons.	33 CFR 328.3(a)
ACTIVITIES OCCURRING BEFORE CUT-OFF DATES	**Date**
Section 404 fill in wetlands adjacent to navigable waters.	25 July 1975
Section 404 fill into primary tributaries and adjacent wetlands.	1 September 1976
Section 404 fill into other waters of the U.S.	1 July 1977
Section 10 activities shoreward of Federal harbor lines.	27 May 1970
Other Section 10 activities that do not disturb navigation.	18 December 1968

Individual permits

Individual permits are "issued following a case-by-case evaluation of a specific project" in accordance with full project and public interest review procedures discussed in 33 CFR 320, 323, and 325. There are two kinds of individual permits: standard permits and letters of permission.

Standard permits. A standard permit requires a full-length application procedure and project review. All other forms of permits are abbreviations of the standard permit process. Most major projects entailing substantial wetland impacts and mitigation require a standard permit. Public notice is required for standard permits; public hearings are held as necessary. The application procedure is described in the section of this chapter titled "Applications for Individual Permits" and in 33 CFR 325.

Letters of permission. The letter of permission is an abbreviated form of the standard permit. Letters of permission may be used where, in the opinion of the District Engineer, the proposed work would be minor, not have significant individual or cumulative impact on environmental values, and should encounter

no appreciable opposition. In such situations, the proposal is coordinated with all concerned fish and wildlife agencies, and generally adjacent property owners who might be affected by the proposal, but the public at large is not notified. The public interest balancing process is again central to the decision-making process on letters of permission.

General permits

General permits require less paperwork than individual permits and generally require less review time. They are written for activities that cause only minimal individual and cumulative environmental impacts; permitted activities are substantially similar and/or are already regulated by another Federal, state, or local agency (33 CFR 323.2(h)). General permits are subjected to public interest review at the time of issuance; consequently, public notice is not usually required for specific projects to which general permits apply. There are three kinds of general permits: regional, programmatic, and nationwide permits.

Regional permits. Regional permits "may be issued by a Division or District Engineer after compliance with other procedures in [33 CFR 325]. If the public interest so requires, the [Corps] may condition the regional permit to require a case-by-case reporting and acknowledgment system. However, no separate applications or other authorization documents will be required" (33 CFR 325.5(c)(1)). Negotiation of such a permit(s) could be part of a base wetlands management plan. See Appendix G for an example of a Regional Permit successfully negotiated for erosion control activities at Ft. Carson in Colorado.

Programmatic permits. Programmatic permits may be developed by each Corps District to provide Corps authorization for minor activities adequately regulated under local, state, or other Federal law. States with strong wetlands programs are more likely to have programmatic permits than those with minimal wetland protection. Contact the appropriate Corps District Regulatory Branch for descriptions of any programmatic permits that may apply to an installation (33 CFR 325.5(c)(3)).

Nationwide Permits (NWP). Nationwide permits constitute a special class of general permit that allows "certain activities to occur with little, if any, delay or paperwork" (33 CFR 330.1). Nationwide permits are granted for both special activities and special sizes of impact. There are 43 different nationwide permits, numbered 1-25 and 27-44 (listed in Table 10).

The entire text of Nationwide permits 1-2, 4-6, 8-11, 13, 15-25, and 28-38 can be found in the Federal Register (Vol. 61, No. 241, 65873-65922, December 13, 1996). The text of the recently modified and new Nationwide permits can be found in their entirety in the Federal Register (Vol. 65, No. 47, 12885-12899, March 9, 2000). NWP 26 will expire on June 7, 2000, unless otherwise modified or revoked. Not all NWPs have blanket Water Quality Certification or Coastal Zone Consistency approval in all 50 states. In those cases, a permit application is required. Contact the appropriate Corps' Regulatory Branch for information concerning any specific activity that might appear to qualify under an NWP.

Table 10
Nationwide Permits

Permit Number	PCN Required[1]	Activity
1		Navigation aids meeting Coast Guard standards.
2		Structures in previously authorized artificial canals in residential developments.
3	Yes	Maintenance and repair of previously authorized fill or structures, or any currently serviceable structure or fill; maintenance dredging and beach restoration are NOT authorized by this permit.
4		Fish and wildlife harvesting, enhancement, and attraction devices and activities.
5		Scientific measurement devices.
6		Survey activities, including core sampling, bore holes, etc.; Exploratory drilling for gas and oil is NOT exempted.
7	Yes	Outfall and associated intake structures.
8	Yes	Offshore oil and gas rigs that meet other applicable rules.
9	Yes	Coast Guard-approved buoy, float, anchorage, and moorage structures.
10	Yes	Noncommercial, single-boat, mooring buoys.
11	Yes	Temporary water recreation structures.
12	Yes	Utility line activities.
13	Yes	Bank stabilization that: a. Is necessary for erosion control. b. Is less than 500 ft long. c. Averages less than 1 yd^3 per running ft. d. Is not placed in wetlands. e. Does not impede water flow to or from wetlands. f. Will not erode under expected high flows. g. Is a single and complete project.
14	Yes	Linear transportation crossing (construction, expansion, modification or improvement of highways, railways, trails, and airport runways and taxiways.
15	Yes	Discharges incidental to construction of U.S. Coast Guard-permitted bridges.
16		Return water from authorized dredge disposal sites in uplands.
17		Fills from licensed small hydropower projects.
18	Yes	Minor discharges, provided: a. Less than 25 yd^3 of fill is discharged below the plane of high tide. b. Loss of less than 1/10 acre of wetlands. c. Fill is not placed for the purpose of stream diversion.
19	Yes	Minor dredging of less than 25 yd^3 in navigable waters.
20		Work associated with cleanup of oil or hazardous substances under National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR 300).
21	Yes	Work associated with authorized surface coal-mining activities.
22	Yes	Temporary structures or minor discharges of dredged or fill material required to remove wrecks, snags, etc. in navigable waters.
23	Yes	Activities undertaken by other Federal agencies that have been categorically excluded by agreement with the Corps.
24		Activities permitted by states administering the 404 program.
25	Yes	Discharge of concrete for construction of standard pile-supported structures.
26		Expired on June 7, 2000
27	Yes	Stream and Wetland Restoration Activities.
28	Yes	Modification of existing marinas; dredging and expansion are NOT covered.
29	Yes	Single-family housing where no more than 1/4 acre of nontidal waters including nontidal wetlands is lost.
30	Yes	Moist soil management for wildlife on Federally or State-owned or managed lands.
31	Yes	Maintenance of existing flood-control facilities.
32		Completed enforcement actions on Section 404 or Section 10 cases.
33	Yes	Temporary structures, access roads, etc., necessary for construction of permitted activities.
34	Yes	Cranberry production activities.
35		Maintenance dredging of existing marina basins and channels, provided dredged material is disposed of in uplands.
36	Yes	Boat ramps less than 20 ft wide and requiring less than 50 yd^3 of stone, gravel, etc., provided no fill is placed in a wetland.

(Continued)

[1] Preconstruction Notification (PCN) is required for some, but possibly not all activities that qualify for authorization under these NWPs. See Federal Register Vol. 65, No. 47, 12885-12899, March 9, 2000 for details of PCN Thresholds.

Table 10 (Concluded)

Permit Number	PCN Required[1]	Activity
37	Yes	Emergency watershed protection and rehabilitation work done by NRCS or Forest Service.
38	Yes	Authorized hazardous and toxic waste cleanup activities.
39	Yes	Residential, Commercial and Institutional Developments.
40	Yes	Agricultural activities (for the purpose of improving agricultural production and the construction of building pads for farm buildings).
41	Yes	Reshaping existing drainage ditches (the capacity of the ditch must be the same as originally designed and it cannot drain additional wetlands or other waters of the United States).
42	Yes	Recreational facilities (construction or expansion).
43	Yes	Stormwater management facilities (construction and maintenance of stormwater ponds, retention basins, water control structures, emergency spillways, etc.).
44	Yes	Mining activities (hard rock/mineral mining from subsurface locations).

A WORD OF CAUTION REGARDING NATIONWIDE PERMITS:
Although the language of the Corps' regulations may tempt one to conduct permitted activities in waters of the United States without consulting the Corps, most government agencies and large land holders contact the Corps anyway whenever they impact wetlands. Corps regulations are complicated enough that it is unwise to assume compliance without written Corps approval.

Preconstruction Notification (PCN). Effective June 7, 2000, preconstruction notification (PCN) is a requirement for most nationwide permits. PCN requires that "the prospective permittee must notify the District Engineer as early as possible and shall not begin the activity" until (1) so authorized by the Corps, (2) informed by the Corps that an individual permit is required, or (3) 45 days have passed since the District Engineer's receipt of the complete notification and the Corps has not responded (65 FR 47, 12890 Section 13(a)(1)-(3)).

After review of a PCN, the Corps may require that a standard permit be obtained for the activity. Even if a nationwide permit is granted, restrictive conditions or mitigation may be imposed.

Thirty of the nationwide permits require preconstruction notification (see Table 10), and some also require wetland delineations. Some of these nationwide permits have thresholds of disturbance below which notification is not required. However, please note that some Corps Districts may add regional conditions to NWPs. Please contact the appropriate Corps District Regulatory Branch for specific requirements pertaining to proposed activities at a particular installation which might fall under the purview of an NWP.

Applying for a Corps Permit

Application procedures vary with the kind of permit appropriate to the fill activity. Individual permits require a formal application. Some general permits require preconstruction notification to the Corps. Some general permits are granted automatically without contacting the Corps. For the latter, it is best to

inform the appropriate Corps District Regulatory Branch of the proposed activity anyway.

Applications for general permits

Regional and programmatic permits. Application procedures for regional and programmatic permits vary from District to District within the Corps. Contact the appropriate Corps District Regulatory Branch to learn their specific rules.

Nationwide permits. Although some nationwide permits may require no paperwork, it is prudent to consult with the Corps District Regulatory Branch whenever wetlands are impacted by Federal projects. Most nationwide permits require preconstruction notification to the Corps as well as the Corps' authorization to proceed with the activity. A preconstruction notification letter to the Corps must be in writing and must include the elements listed in Table 11 (Federal Register Vol. 65, No. 47, 12894, March 9, 2000.

Table 11
Elements to Include in a Preconstruction Notification (PCN)[1]

No.	Element
1.	Name, address, and telephone number of prospective permittee
2.	Location of the proposed project
3.	Brief project description, including a. Project purpose. b. Direct and indirect adverse environmental impacts. c. List of other Corps permits used or intended to be used for any portion of the project or related activity.
4.	Delineation of special aquatic sites, including wetlands, required for NWLs 7, 12, 14, 18, 21, 34, 38, 39, 40, 41, 42, 43, and in some cases for NWP 29
5.	Additional information requirements for NWP 7, 14, 21, 27, 29, 31, 33, 39, 40, 43, 44
6.	Mitigation or restoration plans as required in NWP 14, 21, 33, 39, 40, 43, and 44
7.	List of Federally listed threatened and endangered species that may be affected (if any)
8.	Historic properties to be affected by proposed work (if any)

[1] Please contact the appropriate Corps District Regulatory Office for details.

ENG Form 4345 (the standard individual permit application form) may be used for the preconstruction notification (PCN), but users must indicate that they are applying for a nationwide permit under the PCN requirement rather than for an individual permit. A letter may also be used. Multiple copies of a preconstruction notification should be submitted so the Corps can more rapidly send them to the U.S. Fish and Wildlife Service, EPA, state water quality agencies, etc.

Applications for individual permits

Applying for an individual permit entails submitting to the appropriate Corps District Regulatory Branch an Application for Department of the Army Permit (ENG FORM 4345, OMB Approval No. OMB 0710-003), accompanied by required attachments, such as drawings and maps (see 33 CFR 325.1, also 33 CFR 325.2(e)). In some states, ENG FORM 4345 is modified to allow joint

application for Federal, state, and local wetlands permits in the same application. Contact the appropriate Corps District Regulatory Branch for the version of the form used in a particular state. The official Federal form, ENG FORM 4345, is available for downloading from the Corps Headquarters Regulatory Web page: http://www.usace.army.mil/lrc/reg/, or see Appendix C for the form and instructions.

Corps regulations require the following information in an application:

> ... a complete description of the proposed activity including necessary drawings, sketches, or plans sufficient for public notice (detailed engineering plans and specifications are not required); the location, purpose, and need for the proposed activity; scheduling of the activity; the names and addresses of adjoining property owners; the location and dimensions of adjacent structures; and a list of authorizations required by other federal, interstate, state, or local agencies for the work, including all approvals received or denials already made. (33 CFR 325.1(d)(1))

After receiving an application, the Corps may request additional information. Applicants should try to meet with their Corps District Regulatory Branch before submitting an application to discuss both the project and the information they will need to process the application. Ask the Corps representative for copies of public notices they have issued to serve as a "go-by" for completing an application.

Steps in the application process. The steps in the permit application process are enumerated in Table 12.

Time necessary to obtain an individual permit. Practical experience on the part of military installations shows that standard permits take 3 to 6 months to process for normal projects with reasonably complete initial applications and minimal public comment. The more complex a project is, the longer it takes to obtain a permit. Projects requiring an environmental impact statement may take years to complete. Factors that delay permit processing include (1) number of other permits needed, (2) complexity of project, (3) public hearings, (4) NEPA documentation, and (5) failure on the part of the applicant to supply requested information in a timely manner.

Preapplication meeting. "The district staff element having responsibility for [a permit] shall be available to advise potential applicants of studies or other information foreseeably required for later federal action" (33 CFR 325.1(b)). This preapplication meeting is one of the most important parts of the application process. In fact, the preapplication meeting should be considered part of the project planning process, since the Corps often requires project modification before issuing a permit. The Corps may invite any other Federal or state agencies that may be significantly involved, especially the U.S. Fish and Wildlife Service and EPA. This meeting is particularly important for large projects with substantial impact on wetlands. The preapplication meeting serves (1) to make necessary project changes early in a project rather than after engineering plans

Table 12
Steps in Obtaining an Individual Permit (33 CFR 325)

Step	Action	Time
1.	Pre-application meeting (optional)	
2.	Applicant revises plans in response to preapplication meeting	
3.	Applicant submits ENG FORM 4345 (or equivalent) to Corps District Regulatory Branch	
4.	Corps receives, reviews, and assigns identity number to application	
5.	Corps requests additional information	Within 15 days of #4
6.	Applicant supplies requested additional information / jurisdictional determination completed	
7.	Corps issues public notice	Within 15 days of #6
8.	Corps receives comments from public, government agencies	Within 15 to 30 days of #7; not to exceed 60 days total.
9.	Corps reviews comments and gives copies to applicant along with Corps position or recommendation	"Earliest practicable time"
10.	Applicant optionally responds to comments	Up to 30 days.
11.	Environmental Assessment or Environmental Impact Statement initiated	EA 1-30 days; EIS 1-2 years
12.	Corps consults with other Federal agencies as appropriate	Concurrent with NEPA investigations
13.	Corps requests further information, if necessary	
14.	Public hearing held, if needed	At least 30 days after announcement
15.	Section 404(b)(1) compliance determination	
16.	Corps evaluates NEPA documents and makes Record of Decision or Statement of Findings	
17.	Corps makes permit decision	Within 60 days of receiving all requested information; within 90 days if comment period extended
18.	Corps issues or denies permit	

have been formalized, and (2) to facilitate communication between the Corps and the applicant.

Public notice and public hearing. "The decision whether to issue a permit [is] based on an evaluation of the probable impacts, including cumulative impacts, of the proposed activity and its intended use on the public interest" (33 CFR 320.4(a)). In order to better evaluate the detriments and benefits of a project to the public, input is solicited from the public at large.

The major tools used to interact with the public are the public notice and public hearing. The public notice is the primary method of advising all interested parties of a proposed activity for which a permit is sought and of soliciting comments and information necessary to evaluate the probable beneficial and detrimental impacts on the public interest. Public notices on proposed projects always contain a statement that anyone commenting may request a public hearing. Public hearings are held if comments raise substantial issues that cannot be resolved informally and the Corps decision maker determines that information from such a hearing is needed to make a decision (see 33 CFR 327). Public notices are used to announce hearings. The public is also informed by notice on a monthly basis of final permit decisions.

After receipt of a complete permit application, the Corps solicits input from other interested parties by notifying other government agencies, adjacent property owners, business and conservation organizations, etc., and by providing notification of the application for work to neighboring post offices and appropriate newspapers that a project has been proposed (see 33 CFR 325.3). The Corps gives copies of any comments received to the applicant, who may then respond to the comments. When the Corps acts on the permit application it considers comments received as well as any responses the applicant may submit to the Corps.

Deadlines of the public notice process are as follows:

a. Public notice issued within 15 days of receipt of all requested information to make an application complete.

b. Comments in response to public notice are accepted for 15 to 30 days, unless the U.S. Fish and Wildlife Service or the EPA requests and is granted an extension. The comment period is not to exceed 60 days.

c. Public hearings usually require a separate notice; the hearing may not occur earlier than 30 days from the date of that notice.

Permit decision criteria. The Corps must take the following into consideration when making the decision to issue or deny a permit for Section 404 activities:

a. Public interest determination. "The decision whether to issue a permit will be based on an evaluation of the probable impacts, including cumulative impacts, of the proposed activity and its intended use on the public interest." (33 CFR 320.4(a)).

b. Coastal zone consistency determination. Generally, no permit will be issued until it is determined that the proposed activity is consistent with the appropriate state Coastal Zone Management Plan (33 CFR 320.3(b)).

c. Compliance with the Section 404(b)(1) guidelines as found in 40 CFR 230.10 and .11.

d. Water Quality Certification. Section 401 of the Clean Water Act (33 U.S.C. 1362(3)) requires that the District Engineer obtain a certification from the applicable state that water quality standards will not be violated as a result of a discharge of fill material. This requirement is reiterated in the 404(b)(1) guidelines.

NEPA documentation for Corps permits. The National Environmental Policy Act (NEPA) has broad application to projects in wetlands, including those on DA installations. NEPA stipulates that environmental impacts of projects be considered in the permit process (33 CFR 325.2(a)(4 and 6)). The Corps decides the level of NEPA review that is necessary for specific permit applications. Standard permit applications include an environmental assessment in addition to

the public interest review. Environmental assessments for Corps permits usually result in "Findings of No Significant Impact" (FONSI). Environmental impact statements are required on about 1 percent of the applications.

Roles of Other Agencies

Water quality certification and coastal zone consistency

Applicants for Section 404 permits must obtain certification of compliance with state water quality regulations and determination of consistency with the State Coastal Zone Management (CZM) Plan, if appropriate.

Water quality certification. Section 401 of the Clean Water Act requires a state water quality certificate prior to issuance of a Section 404 permit. In most states applicants do not need to submit a separate application for water quality certification because the Corps automatically informs the state water quality agency whenever it receives an application for a wetlands permit. If a state denies a water quality certificate, the Corps will deny a Section 404 permit. Policies on water quality certificates vary from state to state. Check with the appropriate Corps District Regulatory Branch for details (Section 401 of the Clean Water Act; 33 CFR 320.4(d)).

Coastal zone management consistency. Before a Corps permit can be issued in a state with an approved Coastal Zone Management Plan, the applicant must attempt to comply with the state's CZM plan (Section 307(c) of the Coastal Zone Management Act of 1972, as amended (16 U.S.C. 1456(c)); 33 CFR 320.3(b), 33 CFR 320.4(h), and 325.2(b)(2)(ii)). The mechanism for certifying compliance with the Coastal Zone Management Act varies by state and by the type of Federal action involved. Should the state determine that the proposed work is not consistent with the approved Coastal Zone Management Plan, the Corps will deny a Section 404 permit. The Corps initiates the CZM paperwork for Federal projects:

> [T]he district engineer shall forward a copy of the public notice to the agency of the state responsible for reviewing the consistency of federal activities. The federal agency applicant shall be responsible for complying with the CZM Act's directive for ensuring that federal agency activities are undertaken in a manner which is consistent, to the maximum extent practicable, with the approved CZM Programs. (33 CFR 325.2(b)(2)(i)).

Role of the EPA

The EPA has authority to interpret and implement the Clean Water Act, but the Corps has responsibility to administer the permit program under Section 404. This has led to the confusing situation where two agencies have joint responsibility for wetland protection under the same law.

In practice, this seeming confusion is resolved by giving the Corps day-to-day responsibility for Section 404 issues and giving the EPA review and policy responsibilities. An installation submits its application for a permit to the Corps District Regulatory Branch, and the EPA reviews the permit application. Various memoranda of agreement between the Corps and the EPA assure that the two agencies interpret the law similarly. The best-known of these memoranda is the Memorandum of Agreement on Mitigation, or the Mitigation MOA. As of this writing, the most recent update of the Mitigation MOA was issued on 6 February 1990 (55 FR 9211).

The EPA also has enforcement responsibilities to ensure compliance with the Clean Water Act. The EPA pursues violations of Section 404 when no permit has been granted, and the Corps pursues permitted projects that violate the terms of the permit. In practice, the Corps conducts most enforcement activities.

Where state governments have taken over the Section 404 program, the EPA oversees the state program. As of this writing only the states of Michigan and New Jersey have taken over administration of the program.

Mitigation MOA: The Memorandum of Agreement between the Corps and the EPA brings Corps policy into conformity with EPA policy. The Corps' regulations are found in 33 CFR 320-330, and the EPA's are found in 40 CFR 230. Both regulations have the force of law.

The Mitigation MOA identifies a sequence to follow in reviewing Section 404 applications: avoidance, minimization, and compensation. Project applicants should first try to avoid causing deleterious impacts to wetlands. If impacts cannot be avoided, they should be reduced to the maximum extent practicable. Finally, any unavoidable impacts should be compensated for by replacing the impacted functions elsewhere (preferably onsite, in-kind; see the section in Chapter 7 titled "Compensatory Mitigation").

General mitigation ratios are also stipulated. Mitigation projects should replace impacted wetlands at a 1:1 ratio based on lost and replaced functions. This means that replacement acreage ratios may be greater than 1:1 if lost wetlands are more productive than replacement wetlands or if mitigation success is in doubt. By the same token, ratios may be less than 1:1 if replacement wetlands are of a higher functional value than those impacted by the project. Other questions addressed in the MOA include mitigation banks and the definitions of "practicable" and "appropriate" mitigation.

EPA veto power. The Corps administers the day-to-day activities of the Section 404 Program, but the EPA--having ultimate authority for the Clean Water Act--can overrule the Corps in Section 404 permit decisions. The EPA has exercised its override power only rarely. The EPA authority comes from Section 404(c) of the act.

Role of the U.S. Fish and Wildlife Service and National Marine Fisheries Service

The U.S. Fish and Wildlife Service has an interest in Corps permits through the Fish and Wildlife Coordination Act and the Endangered Species Act. The Fish and Wildlife Coordination Act states that "Federal agencies shall give full consideration to the report and recommendations of the Secretary of the Interior ...on the wildlife aspects of [Corps permit] projects." The Corps seeks comments from the U.S. Fish and Wildlife Service during the permitting process to assure that the proposed activity will cause no significant damage to wildlife or wildlife habitat.

The Corps is not bound by the comments of the U.S. Fish and Wildlife Service, but USFWS may request that the permit decision be reviewed by higher authority within the Corps if they disagree with the issuance of a permit. Whenever an installation plans large construction projects in wetlands, the U.S. Fish and Wildlife Service should be invited to the preapplication meeting by the Corps.

The National Marine Fisheries Service may comment on activities in tidal areas.

7 Mitigation

Introduction

The term "mitigation" is used both broadly to mean reduction of net loss of wetland resources and narrowly to mean wetland creation, restoration, etc., to compensate for a permitted wetland loss. The term will be used in its broadest sense in this manual: "avoiding, minimizing, rectifying, reducing, or compensating for resource losses" (33 CFR 320.4(r)).

Mitigation in the application of the Section 404(b)(1) Guidelines is a procedure for reducing net losses of the nation's wetlands. The procedure is formally explained in the EPA's 404(b)(1) Guidelines, and implemented by the Corps when reviewing permit applications. The sequential review of steps to (1) avoid, (2) minimize, and (3) compensate is an integral part of the review of all standard Section 404 permits. This means that wetland projects must avoid impacting wetlands whenever possible, must minimize impacts if they cannot be avoided, and must compensate for impacts that cannot be further minimized. Some projects may degrade wetland resources so extensively that permits will be denied regardless of the level of proposed compensation.

Required compensation is stipulated in the conditions of a permit. There are both technical and regulatory aspects of mitigation. This chapter considers the regulatory issues. The technical issues are considered in Chapter 9.

Avoidance and Alternatives Analysis

The EPA's Section 404(b)(1) Guidelines specify that "no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences" (40 CFR 230.10(a)). In other words, in the review process, the least environmentally damaging practicable alternative is sought.

Water dependency

A decision to move a project out of a wetland and into an upland location is based on (1) the purpose of the project, and (2) an analysis of available alternative sites. A site is water-dependent if "the activity associated with a discharge which is proposed for a special aquatic site... [requires] access or proximity to or siting within the special aquatic site in question to fulfill its basic purpose" (40 CFR 230.10(a)(3)).

If the purpose of a project does not require siting in waters of the United States, then every effort should be made to move it out of such waters. For instance, a training range does not need, per se, to be located in wetlands; a training range for swamp warfare, on the other hand, would need to be located in wetlands. The Corps would try to move a standard training range out of wetlands, and would require minimization and compensation for the training range for swamp warfare. Similarly, docking facilities in a marina are water-dependent, but the marina's approach roads and parking lot are not.

Practicable alternatives

After water dependency has been determined, alternative locations are evaluated. The Section 404(b)(1) Guidelines require permit denial if the project can be practicably moved to another site where less damage is done to wetlands (40 CFR 230.10(a)). "Practicable" is defined for the purposes of Section 404 mitigation as "...available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes" (40 CFR 230.3(q)).

Alternative site selection

A project must be relocated to an alternative site if (1) it is practicable to relocate the project, and (2) there will be less environmental damage at the alternative site. Once practicable alternative sites have been selected, they should be compared using the following factors:

a. Red Flag issues, such as

(1) Rare and endangered species.

(2) Archaeological sites.

(3) Cemeteries, etc.

b. Habitat quality.

c. Cultural resources.

d. Alteration of the hydrologic regime.

e. Water quality.

f. Size of wetlands.

The level of effort required to compare alternative sites depends on the size and complexity of the sites. Alternatives analysis is usually done informally using professional judgment. Complex cases, however, may require a formal wetland evaluation. Methods for evaluating wetlands are discussed in Chapter 8 of this document.

Minimization

Minimization is a process used to reduce impacts to wetlands as much as possible when it is not practicable to locate the project entirely outside of wetlands: "no discharge of dredged or fill material shall be permitted unless appropriate and practicable steps have been taken which will minimize potential adverse impacts of the discharge on the aquatic ecosystem" (40 CFR 230.10(d)).

Before redesigning a project to minimize impacts, it is necessary to evaluate the wetland functions to be impacted. This wetland evaluation can be either formal or informal, depending on the complexity of the project. After the project has been redesigned to minimize impacts, then compensatory mitigation can be planned.

Subpart H of the Section 404(b)(1) Guidelines lists numerous examples within the following categories of actions that can be used to minimize adverse effects to wetlands (40 CFR 230.70 et seq.):

a. Actions concerning the location of the discharge; for example, not disrupting inundation patterns.

b. Actions concerning the material to be discharged; for example, selecting chemically inert fill.

c. Actions controlling the material after discharge; for example, erosion control measures.

d. Actions affecting the method of dispersion; for example, using silt screens to reduce turbidity.

e. Actions related to technology; for example, using pilings, not foundations, for structures.

f. Actions affecting plant and animal populations; for example, maintaining circulation patterns or corridors.

g. Actions affecting human use; for example, discharging fill away from water supply intakes.

These design and construction decisions require knowledge of both wetland functions and the processes that produce those functions. Most projects are small enough that the Corps District Regulatory Branch will be able to help with such minimization decisions. Large projects may require that professional consultants or environmental engineering firms be hired to properly design the project.

Compensatory Mitigation

Compensatory mitigation is the activity of compensating for loss of wetland functions at one location by replacing them at the same or another location. It is the intent of the Corps and EPA to require compensation for authorized losses of wetland functions whenever practicable (Mitigation MOA §II.C.3[1]). Compensatory mitigation, if required, will be stipulated and defined in a Corps permit, and compliance with the permit will require completion and maintenance of the stipulated mitigation.

Compensatory mitigation acreage is calculated on the basis of functional replacement rather than areal extent:

> In most cases a minimum of 1 to 1 acreage replacement of wetlands will be required to achieve no net loss of functions and values. However, this ratio may be greater where the functional values of the area being impacted are demonstrably higher and the replacement wetlands are of lower functional value or the likelihood of success of the mitigation project is low. Conversely, the ratio may be less than 1 to 1 for areas where the functional values associated with the area being impacted are demonstrably low and the likelihood of success associated with the mitigation proposal is high. (Mitigation MOA §III.B-footnote)

A policy of "no overall net loss" of wetlands sets the goal of maintaining the nation's wetland resource base. It recognizes that although the overall goal is to maintain the nation's wetlands resources, no net loss of wetlands function and value may not be achieved in each and every permit action (Mitigation MOA §II.B).

Kinds of compensatory mitigation

The numerous kinds of compensatory mitigation can be grouped into the following categories: "in-kind" and "out-of-kind" mitigation, "onsite" and "offsite" mitigation, "restoration," "enhancement," "creation," "preservation," and "mitigation banking."

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[1]Memorandum of Agreement between the Environmental Protection Agency and the Department of the Army concerning the determination of mitigation under the Clean Water Act Section 404(b)(1) Guidelines, 54 FR 51320 December 14, 1989, amended at 55 FR 1726, January 18, 1990, revised at 55 FR 9211, March 12, 1990. (Mitigation MOA).

In-kind mitigation. Refers to the case where the impacted wetland and the compensation tract are both of the same wetland classification: for instance, replacing an impacted cypress dome by repairing another cypress dome. In-kind mitigation is likely to replace impacted functions and values. **Out-of-kind mitigation** replaces an impacted wetland with a wetland of a different kind: for instance, compensating for damage to a cypress dome by expanding a backwater flood plain. Out-of-kind mitigation is less likely to replace impacted functions.

Onsite mitigation. Refers to mitigation on the same parcel of land as the impacted wetland. It is preferable to **offsite mitigation**, where the impacted functions are replaced in a different landscape and ecosystem. If mitigation must be performed offsite, it should be located within the same drainage basin if possible. Some functions are dependent on location within a drainage basin and cannot be replaced offsite: for instance, flood flow attenuation upstream of a compound cannot be replaced with mitigation downstream of the compound.

Restoration. Returns a former wetland to its pre-disturbance conditions. Restoration is encouraged because of high probability of success. For instance, it may be possible to restore a marsh by plugging drainage ditches. **Creation**, in contrast, tries to establish a wetland in an area not previously a wetland; successful creation is more difficult to achieve than successful restoration, usually because an artificial source of water is required, and a new biologic buffer zone must establish itself.

Enhancement. Tries to increase the value of the impacted wetland by manipulating its functions and processes: for instance, a stagnating backwater may be enhanced for wildlife habitat by manipulating water levels, durations, and flows.

Preservation. Attempts to replace an impacted wetland by protecting a different existing wetland from future disturbance. The Corps discourages preservation as mitigation because preservation does not compensate for current wetland losses but just reduces future impacts. Furthermore, wetlands proposed for preservation should, in theory, be protected by current laws anyway.

Mitigation banking. Establishes a large mitigation project to replace smaller, anticipated disturbances elsewhere on base. Subsequent construction projects compensate for their wetland impacts by debiting acreage from the already existing mitigation bank. Mitigation banking is somewhat controversial -- compensatory acreage is often offsite and out-of-kind -- and should be discussed with the Corps District Regulatory Branch as part of an installation-wide Integrated Natural Resources Management Plan. Appendix D of this document provides a sample scope of work for the development of a wetland mitigation bank. The example given is for a mitigation bank program on Aberdeen Proving Ground. "Federal Guidance for the Establishment, Use and Operation of Mitigation Banks" is published in the November 28, 1995 Federal Register (Vol. 60, No. 228).

Factors to consider when planning compensatory mitigation

The basic goal of compensatory mitigation is to replace degraded wetland functions and values; compensation for absolute acreage lost is secondary. For example, an acre of flood attenuation value lost from a riparian wetland should not be replaced with an acre of aquifer recharge value in a created pothole; the overall benefits to society may be comparable but wetland science has no acceptable way to compare values of different functions.

The major factors to consider in designing compensatory mitigation include:

a. Wetland functions to be replaced.

b. Likelihood of success.

c. Relationships to other landscape components.

(1) Hydrologic connections.

(2) Biologic connections.

(3) Impacts by and on people.

d. Low maintenance.

e. Cost-effectiveness.

f. Acreage to be replaced.

Preferred methods of compensatory mitigation

Restoration is preferred over creation because wetland functions and values are more likely to be replaced in a wetland landscape position. Onsite mitigation is preferred over offsite mitigation, and in-kind mitigation is preferred over out-of-kind mitigation (Mitigation MOA §II.C.3). Likelihood of success must also be considered in mitigation planning. Restoration is preferred over creation because restoration is more likely to succeed. If successful mitigation projects are currently accessible, every effort should be made to contact project managers and learn from their experience. Other factors to consider are cost-effectiveness, low-maintenance requirements, and economies of scale. Technical aspects of wetland restoration are considered in Chapter 9 of this document.

Preservation of existing wetlands is seldom acceptable as a method of compensatory mitigation because the wetlands to be preserved should in theory be preserved anyway through the current regulatory program.

8 Wetland Evaluation

Purposes of Wetland Evaluation

Wetland evaluation refers to procedures specifically designed to characterize wetland functions and values and impacts thereto. Wetland evaluations are conducted in order to:

a. Gain site-specific knowledge about how the installation's wetlands function so that stewardship and management decisions can be made based on scientifically sound information.

b. Comply with requirements of NEPA or the Clean Water Act.

c. Conduct scientific research and educational outreach.

Wetland evaluation and stewardship

Installation Integrated Natural Resource Management Plans direct numerous activities that are conducted either in or adjacent to wetlands. These activities not only impact the wetlands and thereby other activities downstream, but the activities themselves are in turn impacted by the wetland environment in which they are conducted. In order to properly manage these reciprocal impacts, resource managers must understand wetland functions and processes on a site-specific basis.

A thorough understanding of how individual wetlands function within the surrounding landscape will enhance fulfillment of component parts of the Integrated Natural Resources Management Plan. Some wetlands are more sensitive to impacts than others. Some may be easier to restore or enhance than others. Some are more tolerant of disturbance than others. All such judgments must be made with adequate information about the individual site. The purpose of wetland evaluation is to provide the needed site-specific information. Although many of the procedures and concepts discussed in this chapter are presented in the context of permitting, they can and should be utilized for natural resource stewardship and management as well.

Wetland evaluation and permitting

Within the context of Corps permitting, wetland evaluation is required (1) in the several steps of the permitting sequence of alternatives analysis, minimization, and compensation (see Chapter 7), and (2) to gather information needed to complete an environmental assessment for NEPA compliance. Once wetlands have been evaluated at the beginning of the permitting process, it is not necessary to evaluate them again in later stages unless further information is required.

Alternatives analysis. Requires wetland evaluation when there are alternative sites available for a project in "waters of the U.S." Wetland evaluation is then used to determine where the least degradation would occur. This is conceptually one of the most difficult tasks in the permitting process because evaluations must compare projected impacts at several sites rather than just one. In practice, differences between alternative sites are usually great enough that wetland evaluations of the sites involved can be completed quickly and informally.

Minimization. Entails wetland evaluation in order to gain knowledge of how a particular wetland functions. This is a narrower task than evaluation to quantify magnitude of impact. The information about how the wetland functions is then used to rationally adjust project design details in order to minimize impacts. Minimization activities are listed in greater detail in Chapter 6 and in the Section 404(b)(1) Guidelines (40 CFR 230.70).

Compensatory mitigation. Entails wetland evaluation in order to identify impacted functions that need to be replaced by mitigation and to design the mitigation project so that it will provide those functions. This process is covered in greater detail in Chapters 7 and 9.

NEPA documentation. Requires wetland evaluation to determine how extensive projected impacts may be and, hence, whether the project can be issued a "Finding of No Significant Impact" (FONSI or FNSI).

Wetland Evaluation Process

Wetland evaluations should include the following steps:

a. Screen for "red flag" features such as endangered species.

b. Characterize the wetland and its surroundings.

c. Assess wetland functions under baseline conditions.

d. Identify projected impacts.

e. Determine effects of the projected impacts on the baseline functions.

Step 1: Identification of "Red Flag" features

At the beginning of wetland evaluation one must identify features that will prevent project activities onsite. It may be impossible to locate a project at a chosen site and yet comply with such laws as the Threatened and Endangered Species Act, Historic Preservation Act, Wild and Scenic Rivers Act, National Parks Act, etc. Features protected by these and similar laws are "red flag" features that must usually be protected even at the expense of a project.

Step 2: Characterization of the wetland

The site and its surroundings should be described with both narratives and maps. These should bring together information on physical, biological, and chemical features that determine the way a wetland functions in the landscape. The base map should include the following:

a. Project area.

b. Infrastructure (roads, etc.).

c. Surface water features (streams, etc.).

d. Elevation contours.

e. Plant communities.

f. National Wetlands Inventory boundaries.

g. Jurisdictional wetland boundaries.

h. Map legend.

This base map should be accompanied by a narrative describing the geographic setting, including:

a. Climate.

b. Geomorphology.

c. Land-use patterns.

d. Water budgets and hydroperiods.

e. Surficial geology and water sources.

f. Animal communities.

g. Wetland classification after Cowardin et al. (1979).

h. Hydrogeomorphic characteristics after Brinson (1993).

Step 3: Characterization of baseline functions

Wetland evaluations are performed in order to allow comparisons between pre- and post-disturbance conditions as well as comparisons between alternative sites. In order to make these comparisons, one must first characterize the predisturbance site proposed for the project. This is the baseline.

The baseline can be characterized by applying appropriate procedures described in the section of this chapter entitled "Survey of Selected Wetland Evaluation Procedures." Most of the available procedures were developed for use in specific regions of the country or evaluation of specific wetlands functions. It may be appropriate to choose one method that emphasizes a particular function and to complement that formal evaluation with onsite measurements and professional judgment regarding other functions.

The following functions should be included in a baseline characterization, even if only informally through best professional judgment:

Biological functions.

a. Wildlife diversity and abundance.

b. Floral diversity and abundance.

c. Diversity and abundance of aquatic habitat.

d. Threatened and endangered species.

e. Productive export (spatial and temporal).

Hydrologic Functions.

a. Flood-flow alteration.

b. Groundwater recharge.

c. Shoreline or bank stabilization.

Water Quality Functions.

a. Sediment and toxicant retention.

b. Nutrient removal and transformation.

Societal Values.

a. Recreation.

b. Timber production.

c. Education and research.

d. Historic and cultural resources.

e. Aesthetics.

Step 4: Identification of potential impacts

Installation activities impact wetlands directly, indirectly, and cumulatively.

Direct impacts. Direct impacts to wetlands can generally be calculated from the wetland acreage filled. For instance, a 2-acre filling project would directly cause losses of two acres of habitat, 2 acres of flood storage potential, 2 acres of nutrient transformation potential, etc. A wetland evaluation should further determine the quality of the lost functions. For example, if 2 acres of wildlife habitat had a suitability score of 0.6, then the loss of those 2 acres could be calculated as: 2 acres X 0.6 score = 1.2 units lost.

Indirect impacts. Indirect impacts to wetlands are secondary consequences of the direct impacts. A cascade of indirect impacts from 2 acres of fill in a wetland might start with alteration of water flow patterns within the wetland; due to reduced circulation, waters may stagnate adjacent to the project; the stagnant portion of the wetland may suffer loss of oxygen; loss of oxygen may alter aquatic community composition; altered habitat may reduce the wetland's ability to export productivity downstream; the stagnant area may also reduce aesthetic benefits; etc. It is much more difficult to quantify secondary impacts than it is direct ones, but they need to be included in wetland evaluations for purposes of both natural resource stewardship and permitting.

Cumulative impacts. Cumulative impacts to wetlands are the sum of direct and indirect impacts integrated over time. Although any single project may have relatively little effect on the drainage basin's natural resource base, many such small projects may cumulatively have tremendous impact. Assessing cumulative impacts requires long-term records of land use and wetland characteristics over the entire drainage basin in which the project is located. One of the procedures reviewed in the section of this chapter titled "Synoptic Approach to Cumulative Impact Assessment: A Proposed Methodology" (Leibowitz et al. 1992) is specifically designed to guide evaluations of cumulative impacts on wetlands.

Step 5: Reevaluation after impact

The final step in the evaluation process is a wetland evaluation of the post-disturbance wetland. This step essentially repeats Steps 2 and 3 above: site characterization and assessment of functions. The extent of impact is the difference between pre- and post-disturbance evaluations.

There are at least three significant theoretical problems associated with the quantification of impacts. First, there is a large element of subjectivity involved when rating the quality of a wetland's functions and values. Second, impacts may not be linearly additive; for instance, some animal habitats cannot be provided on small tracts. Third, it is highly questionable whether rating scores for different functions can be meaningfully summed into a single score to characterize the entire wetland.

Kinds of Wetland Evaluation

Informal versus formal

Wetland evaluation techniques range from informal judgments by experienced professionals to formal investigations requiring quantitative measurements. Most wetland evaluations are informal because formal procedures are either too expensive or unknown to the investigator. Informal evaluation is often referred to as "best professional judgment." Formal methods try to systematically organize and document the information-gathering and decision-making processes used by experienced professionals making their best professional judgment.

Single versus multiple function

Several wetland evaluation techniques only characterize wildlife habitat. Some methods also evaluate other wetland functions such as pollution abatement, flood control, and aquifer recharge but exclude societal values. Others evaluate a broad range of both functions and values.

Nationwide versus regional methods

Few evaluation methods have been designed for use and tested around the nation. Rather, most methods have been developed and tested in specific regions or states. Some of these are regionally modified from nationally applicable methods.

Survey of Selected Wetland Evaluation Procedures[1]

The most widely used method of wetland evaluation is informal professional judgment on the part of an experienced professional. The overwhelming majority of Corps permits employ informal evaluations in the various mitigation steps of alternatives analysis, minimization, and compensation. Of the formal methods, the Habitat Evaluation Procedures (HEP) and the Hydrogeomorphic (HGM) approach to assessing wetland function are among the most widely used. One method (*Handbook for Environmental Impact Analysis* (Urban, and Stacey 1974)), was written especially for impact assessment on DA installations. Several other methods are also discussed briefly. However, it should be noted that there are many other methods that are used in various regions and by various local, state, and Federal agencies as well as by private organizations, consultants, and businesses. The following is NOT meant to be an all-inclusive list nor should it be considered an endorsement of these methods over other available wetland assessment methods.

A good overall review of 40 wetland assessment procedures, including many of those found below, can be found in the recently published manual "A Comprehensive Review of Wetland Assessment Procedures: A Guide for Wetland Practitioners" by Candy Bartoldus (Bartoldus 1999). This publication contains a two- to three-page profile and outline of each of the 40 procedures.

Habitat Assessment Technique (HAT)

Cable, T. T., Brack, V. Jr., and Holmes, V. R. (1989). "Simplified Method for Wetland Habitat Assessment," *Environmental Management* 13, 207-213.

HAT is based on the premise that habitats containing larger numbers of species and uncommon species of birds are of greater regulatory concern. Comprehensive inventories of birds are obtained during breeding season in the target wetland. A score that reflects diversity and uniqueness is calculated based in part on a comparison of site-specific data with background data about the regional status of each species.

[1] Much of this section was adopted from *Statewide Wetlands Strategies: A Guide to Protecting and Managing the Resource* (1992), which was funded by the U.S. Environmental Protection Agency, conducted through Contract 68-C8-006 to ManTech Environmental Technology, Inc., written by Paul R. Adamus, ManTech Environmental Technology, Inc., U.S. EPA Environmental Research Laboratory, 200 SW 35th Street, Corvallis OR 97333, and published by the World Wildlife Fund, Island Press, Washington, DC.

Habitat Evaluation Procedures (HEP)

U.S. Fish and Wildlife Service. (1980). "Habitat evaluation procedures (HEP) manual," Ecol. Services Manual 102, U.S. Fish and Wildlife Service, Washington, DC. (Available from USFWS.)

The method is applicable to wetlands and uplands nationwide but only to questions of fish and wildlife habitat. It is one of the most widely used methods of habitat evaluation.

HEP is an accounting system used to rate the quality and quantity of fish and wildlife habitat in order to quantify the impacts of land and water development projects.

The method derives an overall habitat score for a parcel of land by summing the results of habitat analyses for at least five indicator species found on the tract. Individual species habitats are independently evaluated on the basis of measurable habitat parameters. The resulting value is a number between 0.0 and 1.0, which is called a Habitat Suitability Index (HSI). Guidance is provided in selecting the targeted species. Separate USFWS publications present HSI models for a variety of fish and wildlife species. These HSI models provide a list of habitat features that should be measured for each indicator species, and protocols for measurement of habitat structural features.

HEP may be used for planning projects, assessing impacts, determining mitigation, managing habitat, and monitoring through two types of comparisons: (1) the relative value of different areas at the same point in time, and (2) the relative value of the same area at future points in time.

Standard steps in the HEP process include: 1) determining the applicability of HEP; 2) conducting prefield activities (e.g., form a HEP team, define study area and objectives, select evaluation elements, locate or develop HSI models); 3) evaluating current conditions and determine HSIs and Habitat Units (HUs); 4) designing and comparing proposed actions/areas; 5) determining HSI scores and HUs for proposed conditions; 6) developing compensation plans if appropriate; and 7) developing recommendations, such as monitoring.

It is advisable to use a team approach for decision making, which helps to assure an unbiased product. The HEP team usually consists of three members representing different agencies and viewpoints; however, some situations may call for additional representatives. Training in HEP is available from the USFWS through Colorado State University.

Handbook for environmental impact analysis

Jain, R. K., Urban, L. V., and Stacey, G. S. (1974). "Handbook for environmental impact analysis," Technical Report E-59/ADA006241, U.S. Army Engineer Construction Engineering Research Laboratory, Champaign, IL.

This method was written to help DA personnel write environmental assessments and environmental impact statements for DA installations. It is an open matrix impact assessment system; one axis of the matrix lists environmental attributes and the other representative Army actions that may impact the environment (Table 13).

Table 13
Activities and Environmental Attributes Used in *Handbook for Environmental Impact Analysis* (Jain, Urban, and Stacey 1974)

Resource Activity	Air	Water	Land	Ecology	Sound	Human	Economic
Construction							
Operation, Maintenance, Repair							
Training							
Mission Change							
Real Estate							
Procurement							
Industrial Activities							
R & D, Test and Evaluation							
Administration and Support							

Each environmental attribute is characterized in detail via a "descriptor package." For instance, the ecology attribute descriptor package provides detailed instructions for assessing (1) large animals, (2) predatory birds, (3) small game, (4) fish, shellfish, and water fowl, (5) field crops, (6) threatened species, (7) natural land vegetation, and (8) aquatic plants. Each descriptor package characterizes the resource and how it may be influenced by Army activities. No special descriptor package was written for wetlands, though such a package could be written for wetlands on a particular installation by a resource manager familiar with the assessment area.

The matrix may be used as a bookkeeping aid to assure that all significant combinations of activities and resource components are assessed for environmental impact. The method provides suggestions for rating impacts within each cell and methods for rating impacts.

Wetland Evaluation Technique (WET), Version 2.0

Adamus, P. R., Stockwell, L. T., Clairain, E. J., Jr., Morrow, M. E., Rozad, L. P., and Smith, R. D. (1987). "Wetland evaluation technique (WET)," Vol. II, Technical Report Y-87, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

This method is applicable to all wetland types around the nation. It characterizes baseline conditions but provides no mechanism for estimating impacts. The technique involves answering some 80 questions about the wetland tract and its surroundings in order to determine a wetland's ability to provide specific functions. Scores are derived for the individual functions, but no method is provided for deriving overall wetland scores as a composite of individual function scores. This method has largely been replaced by regional assessment

methods and the newer HGM Approach (see the section titled "Hydrogeomorphic (HGM) Approach to Assessing Wetland Function" below).

Evaluation for Planned Wetlands (EPW) (Formerly Wetland Replacement Evaluation Procedure (WREP))

Bartoldus, C. C., Garbish, E. W., and Kraus, M. L. (1994). "Evaluation for Planned Wetlands (EPW)," Environmental Concern, Inc., St. Michaels, MD. (Available from Environmental Concern, Inc., P.O. Box P., St. Michaels, MD 21663; ph. 410-745-9620.)

A rapid assessment procedure for determining whether a planned wetland has been adequately designed to achieve defined wetland function goals. EPW should not be used as a substitute for assessment techniques such as HEP, Hollands-Magee, HGM, etc., which are applicable to the earlier stages in the permitting process of impact and alternatives analysis. EPW should only be used during the wetland planning process, where through the mitigation process it has been determined that compensation for unavoidable project impacts is required within the context of the Corps regulatory program.

Functions that are evaluated include: shoreline bank erosion control, sediment stabilization, water quality, wildlife, fish, and uniqueness/heritage.

Synoptic approach to cumulative impact assessment: A proposed methodology

Leibowitz, S. G., Abbruzzese, B., Adamus, P. R., Hughes, L. E., and Irish, J. T. (1992). "A synoptic approach to cumulative impact assessment: A proposed methodology," EPA/600/R-92/167, U.S. Environmental Protection Agency Environmental Research Lab, Corvallis, OR.

With additional information and corrections to the above provided in:

Abbruzzese, B., and Leibowitz, S. G. (1997). "Environmental auditing: A synoptic approach for assessing cumulative impacts to wetlands," *Environmental Management*, Vol. 21, No. 3, pp. 457-475.

This methodology is applicable to all wetland types and addresses hydrologic, water quality, and life-support functions of wetlands. However, it is designed to assess cumulative impacts for regions or drainage basins, not individual wetlands.

This procedure is not a ready-to-use program; instead, it provides guidance for developing a cumulative impact assessment procedure for one's specific goals and location. The method categorizes landscape units rather than individual wetlands for the purpose of providing a landscape perspective to complement site-specific evaluations.

The method uses existing maps and data sets, so no site visits are required. Input data may include elements such as acreage of wetlands and hydric soils, precipitation, land cover, slope, length of channels and polluted streams, land-use history and projections, etc. Output is determined by the user's objectives and is presented as thematic maps showing wetlands capacity, cumulative loss, landscape input to wetlands, etc., depending on user goals.

A geographic information system (GIS) is helpful but not required. It requires weeks to months to conduct, depending on desired resolution, number of indicators, and quality of available data.

Hydrogeomorphic (HGM) approach to assessing wetland function

Smith, R. D., Ammann, A., Bartoldus, C. C., and Brinson, M. M. (1995). "An Approach for Assessing Wetland Functions Using Hydrogeomorphic Classification, Reference Wetlands, and Functional Indices," Technical Report WRP-DE-9, U.S. Army Engineer Waterways Experiment Station Vicksburg, MS.

The hydrogeomorphic (HGM) approach to wetland classification and assessment is a collection of models that are based on geomorphology and hydrologic regimes. Although still in the developmental stages, HGM assessment models evaluate the ability of a wetland to provide wetland functions by comparing field characteristics of the wetland with those of reference wetlands in the same region. This methodology differs from other evaluation systems in its conceptual framework of geomorphology and hydrologic regime and in its attempt to develop regionally specific models for the entire nation. It also specifically addresses the issue of impacts to wetland functions, which is a part of the permit decision-making process of the Corps' 404 Regulatory Program (see Chapter 6 of this document).

Working documents for some regional wetland classes have been released for use in the field. Updates on the availability of regional guidebooks can be obtained from the Regulatory Branch of the local Corps of Engineers District, and at the HGM Internet site: http://www.wes.army.mil/el/wetlands/hgmph.html.

The conceptual framework for the HGM approach (Smith et al. 1995) identifies seven geomorphic settings (wetland classifications) with characteristic wetland hydrologic regimes (see Table 5, page 34). The different hydrologic regimes determine different functions that the wetlands perform in the landscape. For example, depressional wetlands tend to be closed systems with relatively little flow of surface water to outside water bodies; on the other hand, riverine wetlands can provide many functions to water systems downstream, such as providing nutrients, entrapping sediment from upslope erosion, and storage of floodwaters. Subclasses exist within each larger class; for example, some depressional wetlands receive most of their water from precipitation or runoff and are groundwater recharge areas, whereas other depressional wetlands have significant input from the groundwater system and serve as groundwater discharge systems.

Within each region of the country, the wetlands of each subclass are being analyzed for the functions they provide to the ecology of the region. Reference wetlands are being evaluated within each subclass across the range of conditions in which they are found, from pristine to drastically disturbed. These evaluations form the baseline data set against which other wetlands are to be compared using the HGM models.

An HGM model is being developed for each wetland function within a regional subclass; the collection of models for a regional subclass constitute a "regional guidebook." As an example, for western Kentucky riverine wetlands, the functions considered (Ainslie et al. 1999) are: (1) temporary storage of surface water, (2) retaining and retarding subsurface water movement, (3) cycling of nutrients, (4) removal and sequestration of elements and compounds, (5) retention of particulates, (6) export of organic carbon, (7) providing an environment for native plant community; and,(8) providing wildlife habitat (Table 14). The number of assessment variables to be measured for each of these seven functions varies from two to twelve. For example, the function "cycling of nutrients" would require field data for the following assessment variables: (1) tree basal area, (2) shrub and sapling density, (3) percent ground cover, (4) soil detritus, and, (5) woody debris. Specifics on the collection of data and use of the data will be available in the regional guidebooks.

Table 14
Examples of Functions and Assessment Variables Used to Evaluate Those Functions for HGM Models (Ainsle et al. 1999)

Function	Assessment Variables	
Temporary storage of surface water	1. Frequency of overbank flooding 2. Floodplain storage volume	3. Floodplain slope 4. Floodplain roughness
Retaining and retarding subsurface water movement	1. Subsurface water velocity 2. Water table slope	3. Subsurface storage volume 4. Water table fluctuation
Cycling of nutrients	1. Tree biomass 2. Understory vegetation biomass 3. Percent ground cover	4. Soil detritus 5. Woody debris
Removal and sequestration of elements and compounds	1. Frequency of overbank flooding 2. Soil clay content 3. Redoximorphic features in the upper soil profile	4. Soil detritus 5. Water table depth
Retention of particulates	1. Frequency of overbank flooding 2. Floodplain slope	3. Floodplain roughness 4. Floodplain storage volume
Export of organic carbon	1. Frequency of overbank flooding 2. Surface water connections with adjacent stream channel	3. Percent cover of litter layer 4. Woody debris biomass
Maintaining characteristic plant community	1. Plant species composition 2. Tree biomass 3. Density of trees 4. Frequency of overbank flooding	5. Depth of water table 6. Soil integrity
Providing wildlife habitat	1. Frequency of overbank flooding 2. Macrotopographic relief 3. Plant species composition 4. Tree density 5. Tree biomass 6. Log biomass	7. Snag density 8. Litter layer 9. Wetland tract area 10. Interior core area 11. Connections to adjacent habitat types

HGM field assessments are designed to take from ½ day to several days depending on the size of the wetland. The product of a field evaluation for each particular function is called a "functional capacity index," which is a number ranging from 0.0 (for a nonfunctioning, drastically disturbed wetland) to 1.0 (for one functioning at least as well as an undisturbed pristine wetland in the region). These functional capacity indices can then be used to compare wetland functions in various ways. For example, comparisons could be between alternative project sites, or at the same site using data for impacts with and without a proposed project. Another possible comparison could be over time at a given site such as before and after project construction. However, it should be noted that functional capacity indices for different factors are not additive; therefore, it is not valid to use HGM to derive a single disturbance index for the composite functioning of a wetland.

Status of HGM models in early 2000. The HGM project is still in the developmental phase, but some products are available for several wetland types and regions. The schedule of planned release is provided in Table 15. Although the titles of the regional guidebooks found in Table 15 would imply a small geographic coverage for each, in fact, these guidebooks should apply to much larger areas after regional testing is completed. Guidebooks are planned for approximately 20 other regional subclasses of wetlands in the next 5 years.

Selected regional assessment methods

The following methods are only a few of the many methods that have been created or adapted for regional use.

Hollands-Magee (Normandeau) Method.

Hollands, G. G., and Magee, D. W. (1985). "A method for assessing the functions of wetlands." *Proceedings of the National Wetland Assessment Symposium.* J. Kusler and P. Riexinger, ed., Association of Wetland Managers, Berne, NY. (Available from Dennis Magee, Normandeau Associates, ph. 603-472-5191.)

This method is applicable to systems of nontidal wetlands for watershed-level planning in New England and some Midwestern states. The method does not place wetlands in categories of high, moderate, or low, but rather assigns a decile score to a wetland relative to other wetlands so evaluated. Hence, the method requires either (1) use of the Hollands-Magee database available from Normandeau Associates, or (2) evaluation of several dozen wetlands on base. This method is very similar to the Larson/Golet Method below.

Larson/Golet Method.

Larson, J. S. (1976). "Models for assessment of freshwater wetlands," Publ. No. 32, Water Resources Research Center, University of Massachusetts, Amherst, MA. (Available from Water Resources Research Center, U. Mass., ph. 413-545-2842).

Table 15
Status of Development of Regional Guidebooks

Component	Projected Completion
National Documents	
A Hydrogeomorphic Classification for Wetlands	Aug 93
An Approach for Assessing Wetland Functions Using Hydrogeomorphic Classification, Reference Wetlands and Functional Indices	Oct 95
National Action Plan for Implementing the Hydrogeomorphic Approach for Assessing Wetland Functions	Jun 97
Guidelines for Developing Regional Guidebooks Using the Hydrogeomorphic Approach	Aug 99
National Guidebooks	
A Guidebook for Application of Hydrogeomorphic Assessments to Riverine Wetlands	Jan 00
A National Guidebook for Application of Hydrogeomorphic Assessments to Fringe: Estuarine Wetlands	Dec 98
A Guidebook for Application of HGM to Depressional Wetlands	Sep 99
A Guidebook for Application of HGM to Slope Wetlands	Oct 99
Regional Slope Guidebooks	
Slope Wetlands in Pennsylvania	Dec 98
Forested Slope Wetlands of New England -Massachusetts, New Hampshire, Vermont	Jun 99
Slope Wetlands in the Northern Rockies	Sep 01
Regional Riverine Guidebooks	
Southern California Coastal and Transverse Range - Low Gradient, 1st- to 6th-order streams	Dec 99
Lower Mississippi Valley Batture (Land Between the Levees)	Jul 98
Lower Mississippi Valley Low Gradient River – Protected Land Behind Levees	Sep 98
Low-gradient Wetlands, 2nd- to 4th-order Streams in Western Kentucky	Dec 99
Low-gradient 2nd- to 4th-order Streams in the Northern Rockies - Montana	Dec 99
Riverine/Slope Wetlands of Southeast Alaska	Oct 99
Riverine Wetlands in 1st- to 2nd-order Headwater Reaches in Pennsylvania and Maryland	Mar 99
Riverine Wetlands Along Broad Floodplains Associated with Streams Greater than 2nd order in Pennsylvania and Maryland	Mar 99
Flow-through and Impounded Riverine Wetlands in Washington	Sep 98
Low-gradient Riverine Wetlands of the Great Colorado Plateau and Rocky Mt. Region	Mar 98
Riverine Wetlands of Kenai Watershed-Alaska	Sep 98
Low Gradient Riverine Black-Water Wetlands in Peninsular Florida	Jun 00
1st- and 2nd-Order Headwater Streams in South Carolina	Sep 01
Regional Depressional Guidebooks	
Prairie Potholes - North Dakota	Sep 99
Depressions in Peninsular Florida	Jun 00
Vernal Pools of the Central Valley of California	Sep 00
Herbaceous Depressions of the Northern Rockies - Montana	Sep 99
Flow-through and Closed Depressions in Washington	Jan 98
Depressions in Pennsylvania	Dec 98
Depressions in Northern Mariana Islands	Dec 99
Central Tennessee Depressions	Sep 01
Isolated Depressions in the Mid-Atlantic Coastal Plains	Dec 99
Regional Fringe: Coastal Guidebooks	
Coastal Wetlands of the Texas Coast	Sep 99
Tidal Freshwater Marshes of the Hudson River, New York	Dec 98
Regional Fringe: Lacustrine Guidebooks	
Lacustrine Fringe Wetlands Along Reservoirs in Oklahoma	Jun 00
Regional Flats Guidebooks	
Herbaceous Flats in Peninsular Florida	Jun 00
Flats in the East Everglades of Florida	Dec 99
Pine Flatwoods of the Southeastern U.S.	Nov 99
Regional Flats on Discontinuous Permafrost in Interior Alaska	Dec 99
Mineral Flats in Lower Mississippi Valley	Dec 99

This method is applicable to systems of nontidal wetlands for watershed-level planning in Massachusetts and neighboring states. It is very similar to the Hollands-Magee Method (see section above titled "Hollands-Magee (Normandeau) Method."

Minnesota Routine Assessment Method for Evaluating Wetland Functions (MnRAM) Version 2.0.

Minnesota Interagency Wetlands Group. Draft dated 6 Oct 1997. For more information or to receive a copy, contact John Jaschke at the Minnesota Board of Water and Soil Resources, (612) 297-3432.

This qualitative methodology was developed by an interagency group representing a variety of state and Federal agencies within the State of Minnesota. It uses a system where 10 wetland functions (and related values) are evaluated and compared to reference wetlands. Each function is given a Low, Medium, High, or Exceptional rating based on comparison with a reference wetland.

This method is intended for routine wetland assessment applications, not for complex or controversial sites where multiple site visits or a more elaborate method may be required. MnRAM requires training and experience in wetland science before it can be accurately applied. When possible, it is recommended that a diverse team of trained and experienced wetland professionals conduct the evaluation together.

Pennsylvania Modified HEP (PAMHEP).

Pennsylvania Game Commission. (1985). "Pennsylvania modified 1980 habitat evaluation procedure," Pennsylvania Game Commission, Millville, PA. (Available from Pennsylvania Game Commission, Millville, PA, 717-783-4919).

This method is applicable to nontidal wetlands in Pennsylvania and similar areas for evaluation of wildlife habitat. It is similar to HEP (see section above titled "Habitat Evaluation Procedures (HEP)") but regionally specific and simplified.

Connecticut/New Hampshire Method.

Amman, A. P., Franzen, R. W., and Johnson, J. L. (1986). "Methods for the evaluation of inland wetlands in Connecticut." Bulletin No. 9, Connecticut Department of Environmental Services, Concord, NH.

Amman, A. P., and Stone, A. L. (1991). "Method for the comparative evaluation of nontidal wetlands in New Hampshire." NHDES-WRD-1991-3, New Hampshire Department of Environmental Services, Concord, NH. (Available from the New Hampshire Department of Environmental Services, Water Resources Division, Wetlands Bureau, P.O. Box 2008, Concord, NH 13302 (603/271-2147).

Applicable to nontidal wetlands in Connecticut and New Hampshire and possibly other areas of the northeast, this method is conceptually similar to the Hollands-Magee method. However, it is not suitable for assessing a single wetland, but instead is used to rank a series of wetlands. Fourteen functions or values are addressed.

Wetland Rapid Assessment Procedure (WRAP).

Miller, R. E., Jr., and Gunsalus, B. E., (1997). "Wetland Rapid Assessment Procedure (WRAP)." Technical Publication REG-001, Natural Resource Management Division Regulation Department, South Florida Water Management District, South Palm Beach, FL. (Available from the South Florida Water Management District, West Palm Beach, FL, (561)686-8800).

WRAP is a rapid assessment technique that was developed for use in south Florida to assist in the regulatory evaluation of mitigation wetland sites that have been created, enhanced, preserved, or restored. The method involves the use of a matrix to establish a numerical ranking for individual ecological and anthropogenic factors (variables) that can strongly influence the success of mitigation projects. The numerical output for the variables is then used to evaluate the current wetland condition. The matrix can be used to evaluate a wide range of wetland/upland systems (e.g., emergent marsh, wet prairie, hardwood swamp, wet pine flatwoods, etc.) but it is not intended to compare different wetland community types (i.e., marsh to wet prairie) to each other.

Avian Richness Evaluation Method (AREM).

Adamus, P. R. (1993). "User's Manual: Avian Richness Evaluation Method (AREM) for Lowland Wetlands of the Colorado Plateau." EPA/600/r-93/240. EPA Research Laboratory, Corvallis, OR.

AREM is an evaluation tool used to forecast site biodiversity and evaluate relative habitat suitability for each species. It can be used as a local-level complement to regional-level biological surveys and ecosystem planning. It can also be used with HEP (see section above titled "Habitat Evaluation Procedures (HEP)") to assess watersheds, complete impact analyses, or to monitor mitigation/restoration projects.

Bottomland Hardwood Forest Habitat Evaluation Model (BLH Model).

Schroeder, R. L., O'Neil, L. J., and Pullen, T. M., Jr. (1993). "A Wildlife Community Habitat Evaluation Model for Bottomland Hardwood Forest in the Southeastern United States." USAE Waterways Experiment Station, Vicksburg, MS.

A community-based model developed to evaluate ecological impacts within an ecosystem using Habitat Suitability Index (HSI) modeling techniques (see section above titled "Habitat Evaluation Procedures (HEP"). It can be used alone or in HEP as a tool to conduct impact assessments, inventory/baseline evaluations, monitoring, alternative comparisons, mitigation planning, and land acquisition planning for water resource projects.

9 Wetland Restoration and Creation

Introduction

Over half of the nation's wetlands have been drained or filled since Colonial times, and more wetlands are being lost every year, even since passage of the Clean Water Act. In order to balance some of these losses, society has begun to actively create or restore wetlands so as to minimize and even reverse this trend in loss of wetland resources. There are several different strategies to strengthen the wetland resource base (see section in Chapter 7 titled "Compensatory Mitigation"), including wetland restoration and creation. This chapter will discuss the technical factors of restoring or creating wetlands, and cite several sources of further assistance.

Wetland restoration is the procedure by which a former wetland is returned to its natural, predisturbance conditions. This usually requires reestablishment of hydrology by removal of water control structures or blockage of drainage ditches/tiles. In some cases restoration is simple enough that it can be inexpensively pursued as a stewardship activity to increase the acreage of wetlands on an installation. **Wetland creation** is the process of artificially constructing a wetland in a non-wetland site. As a rule, creation is more difficult and expensive than restoration.

The condition of wetlands on DA properties varies greatly, both on individual bases and around the nation; some wetlands are practically undisturbed while others are highly degraded. An installation's natural resource management activities should include restoration of degraded wetlands wherever practicable, especially in drainage basins where there has been extensive disruption of the wetlands resource. Not only will training missions benefit from more realistic training environments, but other missions that depend on land resources will also benefit by being able to use a more resilient, fully functioning natural resource base.

Wetlands are also restored and created in compliance with conditions of Corps permits. The procedures stipulated in permit conditions are usually the minimum necessary to increase likelihood of project success and should be followed or exceeded in stewardship projects as well. Policies associated with

compensatory mitigation are discussed in Chapter 7. This chapter introduces the technical aspects of wetland restoration and creation without going into great detail concerning the specifics of how to accomplish these tasks. Such detail would require much more space than allowed in this document. ***Resource managers should be sure to consult reference materials and local restoration experts before attempting to restore or create a wetland.***

Design Sequence for Wetland Restoration or Creation

Wetland restoration and creation projects will not be successful unless adequately planned before construction, the plan carefully implemented, and then conscientiously managed afterward. Too often, these project plans consist of simply excavating a shallow hole in the ground, connecting it to a nearby water source, planting it with some readily available nursery stock, and hoping a wetland will form. The steps listed below present a logical progression for the design process. These steps do not guarantee a successful wetland restoration or creation, but are presented as a general framework to which site-specific details must be added.

The suggested design sequence steps are:

a. Identify impacted wetland functions that need replacement and define project goals (section below titled "Identification of Functions to be Replaced").

b. Screen alternative project sites and select the best one (section below titled "Site Selection").

c. Characterize the baseline of the project site; this may be concurrent with step 1 (section below titled "Site Evaluation and Baseline Determination").

d. Define success criteria (section below titled "Defining Objectives and Success Criteria").

e. Design the project (section below titled "Project Design").

f. Construct the project to specifications (section below titled "Construction").

g. Monitor and manage the project (section below titled "Monitoring and Management").

Appendix E outlines the major elements that should be included in a proposal to the Corps for a compensatory mitigation project as part of a Section 404 permit. This list is comprehensive and can serve as a checklist for successful restoration planning outside of the wetland permitting arena, too.

The concept of **functional replacement** plays a central role in every step of wetland restoration and creation. The objective of wetland restoration projects should be to restore the functions of wetlands and not just acreage and vegetation. This emphasis on replacement of functions is not only Corps and EPA mitigation policy (Mitigation MOA §III.B) but is also a sound land management practice.

The first few design steps listed above are almost entirely devoted to identifying the functions that the restoration or creation project should supply. Once these functions have been identified, they must be designed into the project. After construction, the new wetland will be managed for the functions and monitored to assure that functions are being performed. Several lists of wetland functions have been compiled. Table 16 presents lists compiled by the Conservation Foundation (1988), the USDA Soil Conservation Service (1992), and the U.S. Army Corps of Engineers, Waterways Experiment Station (Smith et al. 1995).

Table 16
Wetland Functions

Conservation Foundation (1988)	USDA-Soil Conservation Service (1992)	U.S. Army Corps of Engineers, Waterways Experiment Station, Hydrogeomorphic (HGM) Approach (Smith et al. 1995)
Nutrient removal/transformation	Education and research	Short-term storage of surface water
Sediment/toxicant retention	Erosion control	Long-term storage of surface water
Shoreline stabilization	Fish and shellfish habitat	Storage of subsurface water
Floodflow alteration	Flood conveyance	Moderation of groundwater flow or discharge
Groundwater recharge	Flood storage	Dissipation of energy
Production export	Food production	Cycling of nutrients
Aquatic diversity and abundance	Historic, cultural, archaeological resources	Removal of elements and compounds
Wildlife diversity and abundance	Open space and aesthetic values	Retention of particulates
	Recreation	Export of organic carbon
	Sediment control	Maintenance of plant and animal communities
	Threatened, rare, endangered species habitat	
	Timber production	
	Water quality	
	Water supply	
	Wildlife habitat	
	Other _____	

Identification of functions to be replaced

The first step in a wetland restoration or creation project is to identify the wetland functions to be restored or replaced (see Section in Chapter 8 titled "Step 3: Characterization of Baseline Functions"). For natural resource stewardship projects, this will require functional evaluation of the restoration site, extrapolating when possible to predisturbance conditions. It may be necessary to conduct a wetland evaluation of a reference wetland that is thought to be similar to the predisturbance site being restored. This biological benchmark or

"bio-benchmark" can then be used both as a target for design objectives and as a standard against which to measure the success of the proposed wetland creation or restoration project.

For restoration or creation projects conducted in compliance with Corps permit conditions, functions to be replaced will depend in large part on the nature of the wetland originally disturbed. Wetland functions in a restoration project should replace those of the impacted wetland. This will require a wetland evaluation of the permitted project before impacts commence. The actual wetland evaluation technique employed will depend on availability of suitable techniques and personnel resources. Chapter 8 discusses some of the available wetland evaluation procedures.

When identifying target functions, project managers should also consider wetland functions that are needed in the drainage basin. If two wetland types predominate in a drainage basin and one has been severely degraded, restoration efforts should give priority to the more severely degraded wetland type, all other considerations being equal.

Site selection

Once impacted and needed functions have been identified, it is necessary to select the restoration site that will best supply those functions, to characterize that site, and to establish project goals. These three steps (see sections in this chapter titled "Site Selection," Site Evaluation and Baseline Determination," and "Defining Objectives and Success Criteria") are interdependent and must be performed simultaneously and interactively, for seldom are restoration sites available that can supply all target functions.

Site selection alternatives are usually limited by land availability and policies giving priority to onsite and in-kind mitigation. All available alternative sites should be evaluated for potential to supply needed functions, even if these evaluations are conducted informally. When possible, the selected site should have soils similar to those of the impacted wetland and, if objectives allow, a passive water source, so maintenance can be minimized. The best sites are former wetlands that have been artificially drained, since wetland topography, soils, and often, seed banks, already exist.

Proximity to sources of disturbance should be considered, as there are many influences from surrounding areas. For example, sedimentation from erosion sources should be avoided, and location near housing or recreation areas will invite unwanted traffic. One should also consider impacts of the proposed mitigation project on adjacent tracts and on the drainage basin downstream. A new wetland in a landscape may alter flooding and drainage patterns, wildlife communities, seed sources, and human traffic patterns.

Site evaluation and baseline determination

Site evaluation involves collecting quantitative baseline information on (1) the restoration site, (2) the reference wetland, if one is used, and (3) the impacted wetland, in the case of mitigation projects. This baseline information should be collected before construction begins and is used to establish success criteria and to identify and correct problems during and after construction.

Baseline data should be gathered about vegetation, wildlife, hydrology, and soils. Table 17 lists baseline elements to be collected.

Table 17
Items to Include in a Baseline Survey for Mitigation (USDA-Soil Conservation Service 1992)

Item Check-off	Baseline Element
	Survey landscape context to determine landscape corridors that link habitat areas such as stream zones, ephemeral wet areas, woodlots, and others.
	Site investigation of soils to determine permeability, texture, slope, and hydric soil boundaries.
	Soil testing for nutrients, pH, and possible contaminants (residual pesticides, heavy metals).
	Drainage basin information such as drainage area, channel slopes, water storage capacity, location of depressions or potholes.
	Existing drainage systems.
	Existing and converted wetland areas and boundaries.
	Engineering and topographic surveys.
	Vegetative surveys, including elevations and species noted in the area.
	Fish and wildlife habitat evaluations.
	Threatened and endangered species habitat evaluation.
	Landscape use and aesthetic quality evaluations.
	State, federal, and local regulations.
	Water quality data.
	USGS topographic maps or aerial photographs.
	Sources of nonpoint source pollution, such as upland sediment delivery.

Particular attention should be paid to hydrologic parameters. Duration and seasonality of water levels and water tables are essential information in order to identify proper locations for different plant species within the new wetland. These data should preferably be collected onsite and in reference wetlands for a year or more during planning and permit processing, if they have not already been collected as part of an ongoing wetland management program. Reference wetlands are wetlands of the same general classification located in the same region, that are used to identify target hydrology, plant species, and plant/water relationships. Reference wetlands may also be referred to as bio-benchmarks.

Hydraulic models should be applied, if available, to calculate water flow energies through diversion structures, because scouring and sedimentation can severely alter wetland bottom topography and plant survival. Assistance with hydraulic modeling can be obtained from professional consultants with a background in hydrodynamics or hydraulic engineering, or from the Corps of Engineers. Water quality, source, movement, and loss/outflow must be noted, as these influence almost all wetland functions.

Vegetative parameters to measure include species composition, relative elevation, and cover. Exotic and pioneer species should be noted both onsite and at adjacent seed sources. Vegetative strata (canopy, shrubs, herbaceous layers) and ages should be noted to successfully plan revegetation sequences for the target wetland.

Soils in the project site should be evaluated for organic matter content, texture, and permeability, for many created wetlands must have an impermeable layer to retain surface water inputs; on the other hand, wetlands dependent on groundwater inputs need substrata with higher hydraulic conductivities. Soil horizonation, organic matter content, and structural stability should also be determined to assist proper stockpiling and subsequent use at mitigation sites. Soil nutrients should be similar to reference wetlands -- fertilization may be required to establish plants in an infertile system. Soil with high contents of herbicides, pesticides, fungicides, and salts should be avoided for use as planting media.

Wildlife and fish populations should be noted to determine habitat needs of targeted species at the mitigation site. Both terrestrial and aquatic species from neighboring areas may graze wetland plantings before they can establish and grow. Beaver, nutria, and muskrat all may interfere with flow-control structures, and feral swine may destroy planted beds.

Defining objectives and success criteria

Project objectives are the functional performance standards targeted for the restored or created wetland. **Success criteria** are easily measurable external attributes that the wetland should exhibit to indicate that project objectives have been met. Success criteria usually differ from project objectives because it is difficult to actually measure functional performance.

The baseline characterization in Step 3 (Site Evaluation and Baseline Construction) should be used to determine success criteria and project objectives. Mitigation objectives should ideally be to replace the functions lost at the site of wetland disturbance. Nevertheless, possible target functions for a restoration or creation site will be limited by the site's external characteristics, which may not allow for perfect replacement of functions lost at an impact site.

Two works that can help identify restoration and creation objectives within the constraints of the landscape are *A Hydrogeomorphic Classification for Wetlands* (Brinson 1993) and *A Guide to Wetland Functional Design* (Marble 1992; summary tables appended to the end of this chapter). Some of the evaluation techniques listed in Chapter 8 are designed for wetland mitigation projects and can also assist in setting objectives within the constraints of a project site. Success criteria should be written in quantitative terms stipulating ranges of acceptable hydroperiods, water depths, animal populations, and vegetative coverage and composition, as appropriate.

Project design

One must know the relationship between wetland functions and characteristics in order to design for project objectives. It can be very difficult to tailor a wetland to arbitrarily chosen combinations of functions because interactions between external factors and internal processes are so complex. However, general guidelines can be given to help design wetlands to provide specific functions. Tables 19-26 at the end of this chapter list general guidelines for wetland functional design. These are discussed in greater detail in *A Guide to Wetland Functional Design* (Marble 1992).

Tables 19-26 are organized by function for which the wetland is to be designed. Wetland characteristics and design considerations are listed for each function. Wetland characteristics are physical, hydrologic, or biotic properties that can be manipulated or chosen during the design process. Chapter 13 in *Wetland Restoration, Enhancement, or Creation* (USDA/Soil Conservation Service 1992) is particularly helpful with more technical details.

When designing wetlands for mitigation it is usually necessary to compensate for several different functions, but some of these functions may not be compatible with each other in the same wetland. For instance, in most parts of the country it would be difficult to construct a wetland that performs functions of both sediment retention and groundwater recharge, for riverine wetlands are usually points of groundwater discharge rather than recharge. Table 27 displays compatibility of different functions for wetland mitigation.

The key elements of successful wetland design are proper plant selection and proper hydrology: water depth, duration, timing, and flow. If the hydrologic regime and planted species are not tailored to each other, the project will fail.

Water depth. Depth of groundwater and surface water is critical to the survival of most wetland plant species. Design for these depths requires control of elevations of both substrate and water inlets and outlets. The contours of the wetland floor must be designed and constructed to accommodate the requirements of the vegetation to be planted. Note whether species to be planted tolerate different water depths at different life stages. This is particularly important during the first years of plant establishment, for woody species that may regenerate only during drier years, and for seeding which requires exposed conditions until the plants are tall enough to tolerate inundation.

Some management objectives require periodic drawdowns of the wetland. In these cases active control structures may need to be incorporated into the design, and water depths can be manipulated as management requirements dictate.

Many created wetlands rely on groundwater and precipitation to supply wetland hydrology. In these projects the wetland is excavated to intercept the water table. Exact depths and durations of water tables are much more difficult to predict than stage levels of streams. Therefore, in such projects water tables and precipitation should be monitored with shallow wells and rain gauges for a year or two before wetland contours are designed.

In all cases, existing hydrologic constraints should be noted, including hydrologic controls, existing drainage systems, and channel grades. One or more permanent benchmarks should be emplaced and professionally surveyed for elevation to allow accurate construction and monitoring. Permanent staff gauges and monitoring wells should also be installed as appropriate.

Water duration. Duration of water depth can be actively manipulated if control structures are placed at points of inflow and outflow. In passively controlled systems, hydroperiod must be designed by matching anticipated inflow and outflow rates with bed topography and wetland volumes. This requires detailed information about hydroperiods of water sources. It is rarely practicable to control inflow rates in groundwater-driven wetlands, though maximum water depth within the wetland may be controlled at the outflow point.

Because long-term restoration and creation projects are often neglected, it is not advisable to rely on active structures to control wetland water depths and durations unless the wetland will be actively managed for other purposes, such as waterfowl habitat. Wetlands lacking active professional management for immediately tangible resource goals are more likely to succeed over the long run if targeted hydroperiods are integrated with hydrologic changes in the drainage basin.

Hydrologic timing. Wetland plant requirements must be accommodated when water levels are artificially controlled. Passively controlled systems must be planned so that plant species will thrive under the local hydrologic cycle. Native species have accommodated themselves to local seasonal changes and should be used whenever possible. On shores of reservoirs where hydroperiods are out of cycle with plant needs and beyond project control, it may be impossible to maintain perennial vegetation.

Water flow. Where applicable, water flow rates should be designed so that (1) scour does not occur along artificial channels and at intake points, and (2) adequate flushing occurs throughout the wetland to prevent stagnant conditions from developing (though for some wetlands, a stagnant condition is desirable). Standard engineering practices should be followed to meet these design needs. Wetlands constructed on shorelines need to be protected from wave action of boat wakes or winds. Such wetlands need to be built in sheltered embayments or behind breakwaters (for more information, refer to the Corps' 1987 Engineering Manual, *Beneficial Uses of Dredged Material*, EM-1110-2-5026 (USACE 1987).

Revegetation. Revegetation efforts involve either natural plant establishment or imported plant stock. **Natural establishment** of plants requires a natural source of propagules such as seeds, rhizomes, etc. When former wetlands are to be restored, the natural seed bank found in the soil may still be viable. The longer such former wetlands have been drained, the less viable is the native seed bank. When relying on natural seed banks, care must be taken that the restored wetland hydrology matches predisturbance conditions as closely as possible in order for the natural vegetation to survive.

Another natural source of wetland plants is colonization from adjacent wetlands. This has the advantage of employing locally adapted species but the disadvantage of encouraging species that favor disturbed sites. Such species are often considered nuisances and may need to be controlled rather than encouraged.

If the restoration or creation project has a source of wetland topsoil, such as from the impacted wetland in mitigation projects, that topsoil can be relocated to the restoration project to take advantage of the seed bank residing therein. The advantages of using topsoil from a currently thriving wetland are that the soil already has a seed bank of locally adapted species and the soil is biologically, physically, and chemically adequate to support that seed bank. Such a topsoil source can be emplaced in the new wetland as plugs if too little is available for blanket coverage of the entire wetland project. It may be helpful to disk or harrow the wetland topsoil into the new project site, depending on the soil present in the new wetland site, hydrologic regime, and the types of plants to be grown. If topsoil is borrowed from an existing wetland, care should be taken to transfer soil to areas with hydrologic regimes similar to those from which it was taken. Use of existing wetland topsoil for revegetation may be more successful for herbaceous species than for trees. The downside of using donor topsoil is that it is often difficult to place donor topsoils in locations comparable to the area from which they were taken. As a result, seed banks may not respond as desired.

Artificial establishment of plants requires transplanting or seeding with stock imported from offsite. Whole plants may be transplanted from the impacted wetland in mitigation projects. Otherwise, it may be necessary to use stock from commercial nurseries or USDA Natural Resources Conservation Service Plant Materials Centers. Personnel from these facilities may be able to give site-specific advice, as well. If wetlands are to be artificially planted, one should use a variety of species with differing habitat requirements. Regardless of the source of stock, hydroperiods must be maintained to facilitate establishment. Many woody species cannot tolerate inundation during the growing season, especially during establishment.

Constructed wetlands are often taken over by unwanted species such as loosestrife (*Lythrum salicaria*) and cattail (*Typha sp.*). These plants may reduce diversity and wildlife habitability but at least provide cover and erosion control. Once established, they are difficult to remove. Herbicides can be applied, but must be used at the proper time of the year and carefully enough that desired species are not affected. Some projects have had success with burning followed by flooding to control pest species. In forested wetlands, trees may eventually shade undesirable herbaceous species out.

Whenever possible, one should consult local experts with experience in wetland creation and restoration. The Corps District may be able to provide names of people who can provide assistance. Specific details of plant tolerances and planting techniques are discussed in several texts, including the following: Schnick et al. 1982; Teskey and Hinkley 1977a,b,c; Teskey and Hinkley 1978a,b,c; Whitlow and Harris 1979.

Soils. Wetland soils (1) provide a medium for plant growth, and (2) affect wetland hydrology by either perching surface water within or conducting groundwater to the wetland. If topsoil from a nearby wetland is used, it should be stockpiled separately from subsoil and should be emplaced as soon as practicable to retard organic matter decomposition and accompanying compaction and fermentation.

If the target wetland is to have a perched water table, it will be necessary to reduce water losses due to infiltration. The substrate can be sealed through standard engineering practices (Hayes et al. 2000). Noncompacted material will need to be placed above the seal to allow root growth.

When project wetlands are excavated to the current water table, care must be taken to characterize the soils in which the water table resides. These deeper subsoil layers probably lack sufficient available nutrients for plant establishment, so it may be necessary to replace the topsoil or supply organic amendments with low ratios of carbon/nitrogen.

Site complexity. Topographic, hydrologic, and vegetative complexity should be designed into the wetland to provide the variety of habitats found in the reference wetland. Sinuous edges rather than smooth edges provide variety. The impacted wetland may be able to supply topsoil rich in seeds of native species that will provide vegetative diversity. Bottom contours should be designed at grades between 1:6 and 1:10 in order to supply hydroperiod diversity and reduce water velocity. Islands can be placed throughout the wetland to increase diversity; however, they may become predator havens, so use with caution.

Habitat diversity not only encourages complexity of wildlife and vegetation but also increases likelihood of project success. Vegetation may fail to establish in parts of the created wetland; a diversity of habitats can minimize such failure. The greater diversity implicit in larger areal extent may explain why some workers have found larger wetlands to be more successful than small ones, too.

Adjacent features. Created wetlands cause changes in the landscape as well as receive inputs from it. These effects on the drainage basin should be anticipated during planning. *The Engineering Field Handbook* (USDA/Soil Conservation Service 1992) identifies impacts on neighboring areas that are frequently overlooked in wetland design:

a. Extent of flooding of lands outside the wetland or easement area.

b. Impact on roads, utilities, or other infrastructure.

c. Effect on existing drainage, both upstream and downstream.

Construction

Construction of wetlands requires greater attention to detail than do most other earth-moving projects. Contracts need to specify exact elevations, grades,

construction tolerances, materials, and techniques. Flexibility must be written into the contract to allow modifications as the project develops. Planting materials need to be specified as to species, planting density, location, and method. Contractors need to be made aware of the need for attention to detail.

Actual wetland construction will probably require dewatering of the site; methods may include diversion of inflow, ditching, pumping, and construction during the dry season of the year. Use of heavy equipment onsite should be dictated by the condition of the substratum and whether it is dry enough to support the traffic. If it is not practicable to dewater a site, species must be selected that will tolerate a wide range of inundation regimes, for elevations and grades are more difficult to establish in wet sites than in dry ones.

Construction activities often cause erosion and site pollution. Care should be taken to:

a. Minimize area of disturbance.

b. Divert runoff from work, storage, and borrow areas.

c. Construct roads on contours to minimize erosion.

d. Leave as much vegetation intact as practicable.

e. Use culverts or bridges at stream crossings.

f. Filter sediment with vegetation, settling basins, silt fences, or straw bales.

g. Control and dispose of lubricants, transmission fluid, oil, asphalt, grease, etc., with sealed sumps, tanks, etc.

h. Place sanitary facilities away from all water sources.

i. Prevent fires and the spreading of fires.

j. Comply with all state and Federal construction codes.

If the site is to be disked or harrowed, this should be done just prior to planting. Planting materials should be brought to the site only as needed. Storage of planting stock onsite should assure cool, moist, or saturated conditions to suit specific needs. Actual planting should be supervised by local experts knowledgeable about requirements of individual species. Diversity should be maintained through mixes of different species, within the tolerances of hydroperiod and site conditions. Temporary irrigation may be necessary to ensure establishment before the wetland is inundated. Planting methods are described in detail in *Reservoir Shoreline Revegetation Guidelines* (Allen and Klimas 1986).

Monitoring and management

After construction, it is necessary to monitor a wetland in order to detect and correct problems. Most problems originate from altered hydrologic regime but reveal themselves as vegetative failure. Vegetation may have to be replanted or even changed. Water intakes and outlets may have to be raised or lowered. Often the wetland has to be dewatered and the wetland floor recontoured. Generally, the sooner a problem is detected, the easier it is to rectify.

Created and restored wetlands should be compared to success criteria through time. Permanently placed staff gauges and monitoring wells will facilitate collection of hydrologic data. Monitoring visits should be documented with a photographic record from common vantage points to note changes over time. Items to monitor on a periodic schedule include:

a. Surface and groundwater elevations.

b. Elevation of wetland floor at critical points.

c. Physical integrity of outlets and inlets.

d. Vegetative community composition and coverage.

e. Plant health.

f. Nuisance species.

g. Wildlife species (if a targeted function).

h. Water quality (pH, turbidity, dissolved oxygen, salinity, as appropriate).

i. Erosion of adjacent uplands.

j. Human disturbance.

Problems discovered during monitoring need to be corrected using techniques described above for (1) wetland evaluation - to assess the problem and its ecological basis, (2) identification of objectives - to modify the project as dictated by unforeseen outside factors, (3) design - to correct the problem, and (4) construction - to implement design modifications. It may be necessary to revise the monitoring program as well. Responses to project setbacks must be flexible and based on a thorough analysis of probable causes.

The monitoring phase may last years as wetland plants mature and community composition changes. There is no sharp break between project completion and post-restoration management. As wetland plants become more fully established and natural diversity increases, management options will be dictated less by concerns for restoration success and more by mission objectives of the Integrated Natural Resources Management Plan.

Technical Sources on Wetland Restoration

It is beyond the scope of this document to provide quantitative construction guidelines. These are available in more technical works. The following references are particularly useful for technical details:

Allen, H. H., and Klimas, C. V. (1986). "Reservoir shoreline revegetation guidelines," Technical Report E-86-13. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Bartoldus, C. C., Garbisch, E. W., and Kraus, M. L. (1994). *Evaluation for Planned Wetlands (EPW)*, Environmental Concerns Inc., St. Michaels, MD.

Crabtree, A., Day, E., Garlo, A., and Stevens, G. (1992). "Evaluation of wetland mitigation measures: Vol. 1, final report," FHWA-RD-90-083. U.S. Dept. of Transportation/Federal Highway Administration, McLean, VA.

Davis, M. M. (1994). "Decision sequence for functional wetlands restoration," *Water, Air and Soil Pollution* 77: 497-511.

Dunne, K. P., Rodrigo, A. M., and Samanns, E. (1998). "Engineering specifications for wetland plant establishment and subgrade preparation," Technical Report WRP-RE-19. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Galatowitsch, S. M., and van der Valk, A. G. (1994). "Restoring Prairie Wetlands." Iowa State University Press, Ames IA.

Garbisch, E. W. (1986). *Highways and wetlands; compensating wetlands losses.* U.S. Department of Transportation, Federal Highway Administration.

Hammer, D. A. (1992). *Creating freshwater wetlands.* Lewis Publishers, Boca Raton, FL.

Hayes, D. F., Olin, T. J., Fischenich, J. C., and Palermo, M. R., compilers. (2000). "Wetlands Engineering Handbook," Technical Report ERDC/EL TR-WRP-RE-21, U.S. Army Engineer Research and Development Center, Vicksburg, MS.

Kentula, M. E., Brooks, R. P., Gwin, S. E., Holland, C. C., Sherman, A. D., and Sifneos, J. C. (1992). *An approach to improving decision making in wetland restoration and creation.* A. J. Hairston, ed., EPA/600/R-92/150. Environmental Protection Agency, Environmental Research Laboratory, Corvallis, OR.

Kusler, J. A., and Kentula, M. E., ed. (1989). "Wetland creation and restoration: The status of the science. Vol. I: Regional reviews," EPA/600/3-89/038a, U.S. Environmental Protection Agency Environmental Research Laboratory, Corvallis, OR (available from Island Press, Washington, DC).

Landin, M. C. (1992). "Achieving success in wetland restoration, protection, and creation projects." *Fourth International Wetlands Conference, INTERCOL IV.* September 1992, Columbus, OH.

Marble, A. D. (1992). *A guide to wetland functional design.* Lewis Publishers, Boca Raton, FL.

Schnick, R. A., Morton, J. M., Mochalski, J. C., and Beall, J. T. (1982). *Mitigation and enhancement techniques for the upper Mississippi River system and other large river systems,* U.S. Fish and Wildlife Service Resource Publication 149, U.S. Fish and Wildlife Service, Washington, DC.

Teskey, R. O., and Hinkley, T. M. (1977a). "Impact of water level changes on woody riparian and wetland communities; Vol. I, Plant and soil responses," FWS/OBS-77/58, U.S. Fish and Wildlife Service, Washington, DC.

Teskey, R. O., and Hinkley, T. M. (1977b). "Impact of water level changes on woody riparian and wetland communities; Vol. II, The southern forest region," FWS/OBS-77/59, U.S. Fish and Wildlife Service, Washington, DC.

Teskey, R. O., and Hinkley, T. M. (1977c). "Impact of water level changes on woody riparian and wetland communities; Vol. III, The central forest region," FWS/OBS-77/60, U.S. Fish and Wildlife Service, Washington, DC.

Teskey, R. O., and Hinkley, T. M. (1978a). "Impact of water level changes on woody riparian and wetland communities; Vol. IV, The eastern deciduous forest region," FWS/OBS-78/87, U.S. Fish and Wildlife Service, Washington, DC.

Teskey, R. O., and Hinkley, T. M. (1978b). "Impact of water level changes on woody riparian and wetland communities; Vol. V, The northern forest region," FWS/OBS-78/88, U.S. Fish and Wildlife Service, Washington, DC.

Teskey, R. O., and Hinkley, T. M. (1978c). "Impact of water level changes on woody riparian and wetland communities; Vol. VI, Plains grassland region," FWS/OBS-78/89, U.S. Fish and Wildlife Service, Washington, DC.

U.S. Army Corps of Engineers. (1987). "Beneficial uses of dredged material," Engineer Manual 1110-2-5026. U.S. Army Corps of Engineers, Washington, DC.

U.S.D.A. Soil Conservation Service. (1992). "Wetland restoration, enhancement, or creation," Chapter 13, *Engineering Field Handbook,* U.S. Dept. of Agriculture Soil Conservation Service, Washington, DC.

Whitlow, T. H., and Harris, R. W. (1979). "Flood tolerance in plants," Technical Report E-79-2, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

A good source of case studies and background information about mitigation is:

Kusler, J. A., and Kentula, M. E., ed. (1989). *Wetland creation and restoration: The status of the science.* Island Press, Washington, DC.

Table 18
Wetland Functions and Design Criteria:
Nutrient Removal/Transformation (adapted from Marble (1992))

Wetland Characteristic	Design Consideration
Theory	The wetland should trap moderate loadings of nutrient-rich water and sediment in a low-velocity system. Rich vegetation will retard water movement and take up nutrients in a variety of forms and over different seasons of the year.
Wetland Types	Estuarine, riverine, lacustrine, and palustrine.
Location	In a drainage basin with moderate nutrient loadings.
Water Source	Surface water to carry nutrients.
Hydroperiod	Permanently flooded or saturated if nontidal. Intermittently flooded if tidal.
Soils	High in Al, Fe, or Ca to facilitate PO_4 immobilization. High biological activity will facilitate nitrate removal.
Water Velocity	Low velocity to allow settling.
Outlets	Constricted outlet to increase retention time.
Vegetation	Complex community of forested, scrub/shrub, or persistent emergent in wide stands.
Size	Low wetland-to-drainage basin ratio.

Table 19
Wetland Functions and Design Criteria:
Sediment/Toxicant Retention (adapted from Marble (1992))

Wetland Characteristic	Design Considerations
Theory	Heavy sediment load containing contaminants needed. Water velocity should decrease on entering wetland and stay low to drop sediments. Vegetation should be dense to retard water movement.
Wetland Types	Estuarine, lacustrine, palustrine.
Water Velocity	Low velocity.
Outlets	Constricted outlet, or none.
Exposure	Protected from wind and waves.
Water Depth	Predominantly shallow.
Water Source	Surface water, either runoff or overbank.
Flooding Extent	Seasonal flooding of long duration.
Vegetation	Wide stands and high areal coverage of persistent emergent or multi-stemmed woody vegetation.
Size	High wetland-to-drainage basin ratio.
Drainage Basin Characteristics	Urban, agricultural, or disturbed, with erosive soils and slopes.
Substrate	High organic content to retain heavy metals.

Table 20
Wetland Functions and Design Criteria:
Shoreline Stabilization (adapted from Marble (1992))

Wetland Characteristic	Design Considerations
Theory	Must be sited where erosion protection is needed. Prime concern is to reduce energy of incoming water and to stabilize wetland substrate.
Wetland Types	Estuarine, riverine, lacustrine, palustrine.
Location	Streambanks, lakeshores; to control erosion.
Topography	Flat, to encourage sheet flow and energy dispersion.
Vegetation	Forested, scrub/shrub, persistent emergent in high-density, wide stands.
Fetch	Between 100 and 6000 ft, perpendicular to winds.

Table 21
Wetland Functions and Design Criteria:
Floodflow Alteration (adapted from Marble (1992))

Wetland Characteristic	Design Considerations
Theory	Flooding must be a problem in the drainage basin, and the wetland must reduce energy of the floodwaters and store them. If numerous wetlands already exist in the drainage basin, another will contribute little to flood flow alteration.
Wetland Types	Riverine, lacustrine, palustrine, nontidal.
Outlets	None, or constricted and controlled.
Drainage Basin Cover	Large, impermeable surfaces and soils.
Other Wetlands	Drainage basin should have few other wetlands.
Water Flow	Sheet flow rather than channel flow.
Vegetation	Dense stands of forested or scrub/shrub.

Table 22
Wetland Functions and Design Criteria:
Groundwater Recharge (adapted from Marble (1992))

Wetland Characteristic	Design Considerations
Theory	Few natural wetlands provide aquifer recharge. They must be located above an aquifer with sufficient gradient to the water table to allow significant downward water flow. On the other hand, the substrate permeability must be slow enough to retain wetland hydrology.
Wetland Types	Nontidal riverine, lacustrine, palustrine.
Drainage Basin Cover and Soils	Many impermeable surfaces and soils impeding groundwater recharge.
Wetland Soils	Permeable soils, artificial if necessary.
Underlying Strata	Thick, unstratified, permeable.
Water Source	Surface water.
Outlets	None, or controlled, to increase hydraulic gradient.
Topography	Convex slopes, to increase gradient to water table.
Water Chemistry	Recharge waters not contaminated.

Table 23
Wetland Functions and Design Criteria:
Production Export (adapted from Marble (1992))

Wetland Characteristic	Design Considerations
Theory	Requires high-productivity plants (aquatic bed species are most productive) and regular flushing into target fish habitat. Flushing requires circulation and/or flooding. Habitat must encourage plant growth.
Wetland Types	Estuarine, riverine, lacustrine, palustrine.
Vegetation	Predominantly aquatic bed and emergent, but also some scrub/shrub and forested.
Cover	Both vegetated and open water, to facilitate circulation.
Plant Productivity	Highly productive species; see local experts.
Growth Environment	Shallow, sheltered, soft-bottomed, unshaded.
Outlets	Open to allow flushing to fish/nursery waters.
Flooding	Seasonally flooded.
Bottom Topography	Flat, to facilitate sheet flow.
Water Velocity	Moderate velocity, to prevent stagnation.
Exposure	Exposed to moderate, but not high-velocity waves.
Upstream Water Structures	Minimal; wetland needs flooding.
Wetland Size	Wetland should occupy > 20% of its drainage area.
Drainage Basin Size	More than 1 square mile.
Substrate	Fertile; not sand.
Water pH	Between 6.0 and 8.5.
Target Area	Located to flush into spawning grounds.
Configuration	Island or fringe adjacent to open water encourages export.

Table 24
Wetland Functions and Design Criteria:
Aquatic Diversity/Abundance (adapted from Marble (1992))

Wetland Characteristic	Design Considerations
Theory	Need high diversity of habitat, including variable water depths, plant food sources, substrate types. Shallows with high water exchange are essential. Need paths of biological exchange with outside aquatic environments. Need high quality physical and chemical environment, including moderate wave and heat inputs, high oxygen content, and low sediment contamination.
Wetland Types	Estuarine, riverine, lacustrine, palustrine.
Hydroperiod	Permanently flooded, or exposed only intermittently.
Outlets	Organisms need both inlet and outlet to move in and out of the wetland.
Flooding	Seasonal, long-duration flooding needed.
Water Source	Some groundwater input needed to lower temperatures; wetland waters should meet water quality standards for pH, dissolved solids and oxygen, temperature, sediment load.
Water Level	Avoid frequent, abrupt changes.
Water Flow	Low velocity (< 1.5 ft/sec in 2-year flood).
Vegetation	Open areas and sparse vegetation necessary for fish habitat; trees, shrubs, herbaceous, and aquatic bed types necessary.
Shading	Part of wetland should be shaded at midday.
Biotic Habitat	Aquatic bed habitat for at least 10 percent of area; variety of water velocities and depths.
Setting	Locate in large drainage basin with high wetland diversity; connect to as many other wetlands as possible, with some upstream.
Substrate	Variety of substrate types, with minimal sand or rock.
Sediment	Avoid sites that receive heavy sediment loads.

Table 25
Wetland Functions and Design Criteria:
Wildlife Diversity/Abundance (adapted from Marble (1992))

Wetland Characteristic	Design Considerations
Theory	Wildlife habitat needs large acreage wetland and adjacent forest. Vegetative communities should be complex with emphasis on food and shelter for target fauna.
Wetland Types	Estuarine, riverine, lacustrine, and palustrine.
Size	Greater than 5 acres.
Setting	Either isolated wetland or part of cluster of wetlands. Uplands should supply food and habitat, preferably forest larger than 5 acres. Avoid areas with significant human disturbance.
Vegetation	Complex mosaic of open water and various vegetation classes, dominated by forested and scrub/shrub. Use vegetation preferred by target fauna.
Diversity	Should differ from nearby wetlands to supply habitat diversity.
Outlet	Outlet needed for regular flushing.
Islands	Create islands for refuge from predators.
Exposure	Need shelter from wind and waves.
Substrate	Organic soils help maintain vegetation diversity.
Ecotone	Make ecotone wide and sinuous to supply large habitat acreage.
Water Quality	Avoid acidic, polluted, or stagnant water.

Table 26
Compatibility of Wetland Functions (adapted from Marble (1992))

	Groundwater Recharge	Flood Alteration	Shore Stabilization	Sediment Retention	Nutrient Transformation	Production Export	Aquatic Habitat	Wildlife Habitat
Groundwater Recharge	0[1]	+	0	-	0	0	0	0
Flood Alteration	+	0	+	0	+	0	0	0
Shore Stabilization	0	+	0	+	+	-	-	-
Sediment Retention	0	+	+	0	+	0	-	-
Nutrient Transformation	+	+	+	+	0	-	0	0
Production Export	-	0	0	-	0	0	+	0
Aquatic Habitat	-	+	0	0	0	0	0	+
Wildlife Habitat	-	+	+	0	0	0	0	0

Note: Interactions are not necessarily symmetrical. For example, nutrient transformation may make a wetland less efficient at production export, whereas the level of production export does not necessarily make the wetland less effective at nutrient transformation.

[1] Code for cells: 0 = No significant interaction
+ = Compatible
- = Incompatible

References

Abbruzzese, B., and Leibowitz, S. G. (1997). "Environmental auditing: A synoptic approach for assessing cumulative impacts to wetlands," *Environmental Management* 21(3), 457-475.

Adamus, P. R. (1992). "Review of sources and methods." *Statewide wetlands strategies: A guide to protecting and managing the resource.* World Wildlife Fund, Island Press, Washington, DC.

Adamus, P. R. (1993). "User's manual: Avian richness evaluation method (AREM) for lowland wetlands of the Colorado Plateau," EPA/600/r-93/240. EPA Research Laboratory, Corvallis, OR.

Adamus, P. R., Stockwell, L. T., Clairain, E. J., Jr., Morrow, M. E., Rozas, L. P., and Smith, R. D. (1987). "Wetland evaluation technique (WET), Vol 2," Technical Report Y-87, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Adamus, P. R., Stockwell, L. T., Clairain, E. J., Jr., Morrow, M. E., Rozas, L. P., and Smith, R. D. (1991). "Wetland evaluation technique (WET) Vol. 1: Literature review and evaluation rationale," Technical Report WRP-DE-2, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Ainslie, W. B., Smith, R. D., Pruitt, B. A., Roberts, T. H., Sparks, E. J., West, L., Godshalk, G. L., and Miller, M. V. (1999). "A regional guidebook for assessing the functions of low gradient, riverine wetlands in Western Kentucky," Technical Report WRP-DE-17, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Allen, H. H., and Klimas, C. V. (1986). "Reservoir shoreline revegetation guidelines," Technical Report E-86-13, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Amman, A. P., Franzen, R. W., and Johnson, J. L. (1986). "Methods for the evaluation of inland wetlands in Connecticut." Bulletin No. 9, Connecticut Department of Environmental Services, Concord, NH.

Amman, A. P., and Stone, A. L. (1991). "Method for the comparative evaluation of nontidal wetlands in New Hampshire," NHDES-WRD-1991-3, New Hampshire Department of Environmental Services, Concord, NH.

Balbach, H. E. (1996). "Military land management research tools: An annotated bibliography," Special Report 96/65, U.S. Army Construction Engineering Research Lab, Champaign, IL.

Bartoldus, C. C. (1999). "A comprehensive review of wetland assessment procedures: A guide for wetland practitioners," Environmental Concern, Inc., St. Michaels, MD.

Bartoldus, C. C., Garbish, E. W., and Kraus, M. L. (1994). "Evaluation for Planned Wetlands (EPW)," Environmental Concern, Inc., St. Michaels, MD.

Brinson, M. M. (1993). "A hydrogeomorphic classification for wetlands," Technical Report WRP-DE-4, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Brinson, M. M., Hauer, F. R., Lee, L. C., Nutter, W. L., Rheinhardt, R. D., Smith R. D., and Whigham, D. (1995). "A guidebook for application of hydrogeomorphic assessments of riverine wetlands," Technical Report WRP-DE-11, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Cable, T. T., Brack, V., Jr., and Holmes, V. R. (1989). "Simplified method for wetland habitat assessment," *Environmental Management* 13, 207-213.

Conservation Foundation. (1988). *Protecting America's wetlands: An action agenda.* The Conservation Foundation, Washington, DC.

Cowardin, L. M., Carter, V., Golet, F. C., and LaRoe, E. T. (1979). "Classification of wetlands and deepwater habitats of the United States," FWS/OBS-79/31, U.S. Fish and Wildlife Service, Washington, DC.

Crabtree, A., Day, E., Garlo, A., and Stevens, G. (1992). "Evaluation of wetland mitigation measures: Vol 1, Final report," FHWA-RD-90-083, U.S. Department of Transportation, Federal Highway Administration, McLean, VA.

Davis, M. M. (1994). "Decision sequence for functional wetlands restoration," *Water, Air, and Soil Pollution* 77, 497-511.

Dunne, K. P., Rodrigo, A. M., and Samanns, E. (1998). "Engineering specifications for wetland plant establishment and subgrade preparation," Technical Report WRP-RE-19, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Environmental Laboratory. (1987). "Corps of Engineers wetlands delineation manual," Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Galatowitsch, S. M., and van der Valk, A. G. (1994). *Restoring prairie wetlands.* Iowa State University Press, Ames, IA.

Garbisch, E. W. (1986). *Highways and wetlands; compensating wetlands losses.* U.S. Department of Transportation, Federal Highway Administration.

Hammer, D. A. (1992). *Creating freshwater wetlands.* Lewis Publishers, Boca Raton, FL.

Hayes, D. F., Olin, T. J., Fischenich, J. C., and Palermo, M. R. (2000). "Wetlands Engineering Handbook," Technical Report ERDC/EL TR-WRP-RE-21, U.S. Army Research and Development Center, Vicksburg, MS.

Hollands, G. G., and Magee, D. W. (1985). "A method for assessing the functions of wetlands." *Proceedings of the National Wetland Assessment Symposium.* J. Kusler and P. Riexinger, ed., Association of Wetland Managers, Berne, NY.

Jain, R. K., Urban, L. V., and Stacey, G. S. (1974). "Handbook for environmental impact analysis," Technical Report E-59/ADA006241, U.S. Army Engineer Construction Engineering Research Laboratory, Champaign, IL.

Kentula, M. E., Brooks, R. P., Gwin, S. E., Holland, C. C., Sherman, A. D., and Sifneos, J. C. (1992). "An approach to improving decision making in wetland restoration and creation," A. J. Hairston, ed., EPA/600/R-92/150, Environmental Protection Agency, Environmental Research Laboratory, Corvallis, OR.

Kollmorgen Corporation. (1992). *Munsell soil color charts.* Macbeth Division of Kollmorgen Corporation, Baltimore, MD.

Kusler, J. A., and Kentula, M. E., ed. (1989). "Wetland creation and restoration: The status of the science, Vol. I: Regional reviews," EPA/600/3-89/038a, U.S. Environmental Protection Agency Environmental Research Laboratory, Corvallis, OR (available from Island Press, Washington, DC).

Landin, M. C. (1992). "Achieving success in wetland restoration, protection, and creation projects." *Fourth International Wetlands Conference, INTERCOL IV.* September, 1992, Columbus, OH.

Larson, J. S. (1976). "Models for assessment of freshwater wetlands," Publ. No. 32, Water Resources Research Center, University of Massachusetts, Amherst, MA.

Leibowitz, S. G., Abbruzzese, B., Adamus, P. R., Hughes, L. E., and Irish, J. T. (1992). "A synoptic approach to cumulative impact assessment: A proposed methodology," EPA/600/R-92/167, U.S. Environmental Protection Agency Environmental Research Laboratory, Corvallis, OR.

Leslie, M., Meffe, G. K., Hardesty, J. L., and Adams, D. L. (1996). *Conserving biodiversity on military lands: A handbook for natural resources managers.* The Nature Conservancy, Arlington, VA.

Marble, A. D. (1992). *A guide to wetland functional design.* U.S. Department of Transportation, Fed. Hwy. Ad. Rep. No. FHWA-IP-90-010 (available commercially from Lewis Publishers, Boca Raton, FL, 1992).

Meeks, G., Jr., and Runyon, L. C. (1990). "Wetlands protection and the states." *National Conference of State Legislatures*, Denver, CO.

Miller, R. E., Jr., and Gunsalus, B. E. (1997). "Wetland Rapid Assessment Procedure (WRAP)," Technical Publication REG-001, Natural Resource Management Division, Regulation Department, South Florida Water Management District, South Palm Beach, FL.

Minnesota Interagency Wetlands Group. (1997). *Minnesota routine assessment method for evaluating wetland functions (MnRAM), Version 2.0.* Draft dated 6 Oct 1997. Minnesota Board of Water and Soil Resources, St. Paul, MN.

Mitsch, W., and Gosselink, J. (1993). *Wetlands.* 2nd ed., Van Nostrand Reinhold Company, New York.

Palermo, M. W. (1992). "Wetlands restoration and establishment projects to benefit from systematic engineering approach," *The Wetlands Research Program Bulletin* 2(4), 5-7. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Pennsylvania Game Commission. (1985). "Pennsylvania modified 1980 habitat evaluation procedure," Pennsylvania Game Commission, Millville, PA.

Reed, P. B., Jr. (1988). "National list of plant species that occur in wetlands: National summary," *Biol. Rpt.* 88(24), U.S. Fish and Wildlife Service, Washington, DC.

Schnick, R. A., Morton, J. M., Mochalski, J. C., and Beall, J. T. (1982). "Mitigation and enhancement techniques for the upper Mississippi River system and other large river systems," Resource Publication 149, U.S. Fish and Wildlife Service, Washington, DC.

Schroeder, R. L., O'Neil, L. J., and Pullen, T. M., Jr. (1993). "A wildlife community habitat evaluation model for bottomland hardwood forest in the Southeastern United States." U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Shaw, S. P., and Fredine, C. G. (1956). "Wetlands of the United States," Circular 39, U.S. Fish and Wildlife Service, Washington, DC.

Smith, R. D., Ammann, A., Bartoldus, C., and Brinson, M. M. (1995). "An approach for assessing wetland functions using hydrogeomorphic classification, reference wetlands, and functional indices," Technical Report WRP-DE-9, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

Soil Science Society of America. (1987). *Glossary of soil science terms.* Madison, WI.

Teskey, R. O., and Hinkley, T. M. (1977a). "Impact of water level changes on woody riparian and wetland communities: Vol I, Plant and soil responses," FWS/OBS-77/58, U.S. Fish and Wildlife Service, Washington, DC.

Teskey, R. O., and Hinkley, T. M. (1977b). "Impact of water level changes on woody riparian and wetland communities: Vol II, The southern forest region," FWS/OBS-77/59, U.S. Fish and Wildlife Service, Washington, DC.

Teskey, R. O., and Hinkley, T. M. (1977c). "Impact of water level changes on woody riparian and wetland communities: Vol III, The central forest region," FWS/OBS-77/60, U.S. Fish and Wildlife Service, Washington, DC.

Teskey, R. O., and Hinkley, T. M. (1978a). "Impact of water level changes on woody riparian and wetland communities: Vol IV, The eastern deciduous forest region," FWS/OBS-78/87, U.S. Fish and Wildlife Service, Washington, DC.

Teskey, R. O., and Hinkley, T. M. (1978b). "Impact of water level changes on woody riparian and wetland communities: Vol V, The northern forest region," FWS/OBS-78/88, U.S. Fish and Wildlife Service, Washington, DC.

Teskey, R. O., and Hinkley, T. M. (1978c). "Impact of water level changes on woody riparian and wetland communities: Vol VI, Plains grassland region," FWS/OBS-78/89, U.S. Fish and Wildlife Service, Washington, DC.

U.S. Army Corps of Engineers. (1987). "Beneficial uses of dredged material," Engineer Manual 1110-2-5026, Washington, DC.

U.S. Army Corps of Engineers, Office of the Chief of Engineers. (February 1990). "Department of the Army regulatory program: An overview," Washington, DC.

U.S. Army Corps of Engineers, Office of the Chief of Engineers. (6 March 1992). "Memorandum: Clarification and interpretation of the 1987 Manual," Washington, DC.

U.S. Army Corps of Engineers, St. Paul District. (1988). *The Minnesota wetland evaluation methodology for the North Central United States.* Minnesota Wetland Evaluation Methodology Task Force and Corps of Engineers, St. Paul District.

U.S. Army Engineering and Housing Support Center. (1 March 1990). "Wetlands protection and management," Technical Note No. 420-74-5, Department of the Army, Ft. Belvoir, VA.

U.S. Army Environmental Center. (1997). "Guidelines for preparing integrated natural resources management plans," U.S. Army Environmental Center, Aberdeen Proving Grounds, MD.

U.S. Department of Agriculture Natural Resources Conservation Service. (1996). "Sealed indicators of hydric soils in the U.S., Version 3.2," Washington, DC.

U.S. Department of Agriculture Natural Resources Conservation Service. (1998). "Field indicators of hydric soils in the United States, A guide for identifying and delineating hydric soils, Version 4.0," Fort Worth, TX.

U.S. Department of Agriculture Soil Conservation Service. (1991). "Hydric soils of the United States," Misc. Pub. No. 1491, Washington, DC.

U.S. Department of Agriculture Soil Conservation Service. (1992). "Wetland restoration, enhancement, or creation," Chapter 13, *Engineering Field Handbook*, Washington, DC.

U.S. Fish and Wildlife Service. (1980). "Habitat evaluation procedures (HEP) manual," *Ecol. Services Manual 102*, U.S. Fish and Wildlife Service, Washington, DC.

Whitlow, T. H., and Harris, R. W. (1979). "Flood tolerance in plants: A state-of-the-art review," Technical Report E-79-2, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

World Wildlife Fund. (1992). *Statewide wetlands strategies.* Island Press, Washington, DC.

Appendix A
Glossary

Adjacent "Bordering, contiguous, or neighboring. Wetlands separated from other waters of the United States by man-made dikes or barriers, natural river berms, beach dunes, and the like are 'adjacent wetlands" (33 CFR 328.3(c)).

Aggrading Accumulating sediment or deposition; in reference to streambeds.

A horizon Surface-most mineral layers of soil characterized by the presence of enough organic matter to significantly darken the matrix; usually the same as topsoil.

A-teams Interdisciplinary teams of experts instrumental in developing regional models used in assessing wetland function and value in the "Hydrogeomorphic (HGM) Approach to Assessing Wetland Function."

Alternative site In the avoidance step of mitigation, a possible location for a project where less damage will be done to the environment than if the primary project location is used.

Anaerobic Pertaining to the absence of molecular oxygen in the environment.

Avoidance "Not discharging into the waters of the United States or discharging into an alternative aquatic site with potentially less damaging consequences" (40 CFR 230.5(c)).

Categorical exclusion Under Nationwide Permit 23, activities exempted by agreement between Federal agencies and the Corps. As of this writing, the Department of the Army has no categorical exclusions (61 FR 65916, December 13, 1996).

Circular 39 Wetland classification system used by the U.S. Fish and Wildlife Service from 1956 until 1979 (Shaw and Fredine 1956).

Coastal zone management consistency Determination of compliance with state coastal zone management programs; necessary to obtain before a Corps permit can be issued. [Section 307(c) of the Coastal Zone Management Act of 1972, as amended (16 U.S.C. 1456(c); 33 CFR 320.3(b), 33 CFR 320.4(h), and 325.2(b)(2)(ii))].

Chroma "The relative purity, strength, or saturation of a color;" one of the three parameters used to define colors in the Munsell color system, the other two being hue and value. (Soil Science Society of America 1987).

Compensatory mitigation Activities that compensate for loss of wetland functions at one location by replacing them at another location (Mitigation MOA §II.C.3).

1987 Corps Manual Wetland delineation manual used by the Corps as of this writing (Environmental Laboratory 1987).

Corps permit Permit issued by the U.S. Army Corps of Engineers for activities regulated under authority of Section 404 of the Clean Water Act (33 U.S.C. 1341 et seq.), Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 401 et seq.), and Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972, as amended (33 U.S.C. 1413).

Cowardin system System for classifying wetlands developed by Cowardin et al. (1979) for the U.S. Fish and Wildlife Service and used in National Wetlands Inventory maps.

Creation Compensatory mitigation that establishes a wetland in an area not previously a wetland.

De minimis Inconsequential discharge of dredged material occurring during normal dredging operations; exempted from Corps regulation if the discharge would *not* have the effect of destroying or degrading any area of waters of the United States (33 CFR 323.2(d)(5)).

Depressional wetland Wetland whose primary source of water is precipitation or runoff from the adjacent landscape (Brinson 1993).

Discharge of fill material "Any addition of fill material into, including any redeposit of dredged material within, the waters of the United States. The term includes but is not limited to, the following: the addition of dredged material to a specified discharge site located in waters of the U.S.; the runoff or overflow from a contained land or water disposal area; and any addition, including redeposit of dredged material, including excavated material, into waters of the U.S. which is incidental to any activity, including mechanized landclearing, ditching, channelization, or other excavation." (33 CFR 323.2(d))

Dominance measure A recognized measure of the relative contribution of individual plant species to the community (e.g., percent cover, stem density, basal area).

Dominant species For jurisdictional wetland delineation purposes, dominant species are those species in each stratum that, when ranked in descending order and cumulatively totaled, immediately exceed 50 percent of the total dominance measure, plus any additional species comprising 20 percent or more of the total dominance measure for the stratum.

Ecotone The zone where two or more different plant communities meet and intergrade; a transition zone between two or more communities.

Emergent vegetation Erect, rooted, herbaceous hydrophytes, excluding mosses and lichens (Cowardin et al. 1979).

Enhancement Compensatory mitigation that increases the value of an impacted wetland by manipulating its functions and processes.

Estuarine System Deepwater tidal habitats and adjacent tidal wetlands that are usually semienclosed by land but have open, partly obstructed, or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land (Cowardin et al. 1979).

Eutrophication Natural or artificial process of nutrient enrichment whereby a water body accumulates nutrients through natural inflow or indirectly through human action such as fertilization.

FAC-neutral test An option for deciding presence of hydrophytic vegetation in which FAC, FAC+, and FAC- species are ignored and therefore FACW- and OBL-dominant species exceed FACU and UPL dominants; not to be used to exclude areas from jurisdiction that would be included under the more usual test wherein FAC, FACW, and OBL dominants exceed FACU and UPL dominants.

Facultative plants (FAC) For purposes of jurisdictional wetland delineation, the 1987 Corps Manual identifies facultative (FAC) plants as those with a similar likelihood (estimated probability 33 to 67 percent) of occurring in both wetlands and nonwetlands.

Facultative upland plants (FACU) For purposes of jurisdictional delineation, the 1987 Corps Manual identifies facultative upland (FACU) plants as those that sometimes (estimated probability 1 to <33 percent) occur in wetlands, but occur more often (estimated probability >67 to 99 percent) in nonwetlands.

Facultative wetland plants (FACW) For purposes of jurisdictional delineation, the 1987 Corps Manual identifies facultative wetland plants (FACW) as plant species that usually (estimated probability >67 – 99 percent) occur in wetlands, but also occur (estimated probability 1 to 33 percent) in nonwetlands.

Fill material "Any material used for the primary purpose of replacing an aquatic area with dry land or of changing the bottom elevation of any waterbody. The term does not include any pollutant discharged into the water primarily to dispose of waste, as that activity is regulated under Section 402 of the Clean Water Act" (33 CFR 323.2(e)).

Findings of No Significant Impact (FONSI or FNSI) One possible outcome of an Environmental Assessment done by the Corps on each Section 404 individual permit application.

Flooded Referring to the condition in which the soil surface is temporarily covered with flowing water from any source, such as streams overflowing their banks, runoff from adjacent or surrounding slopes, inflow from high tides, or any combination of sources.

Forested vegetation Woody vegetation greater than 20 ft tall (Cowardin et al. 1979).

Fringe wetlands Wetlands located on the shores of lakes or the ocean (Brinson 1993).

General permit A Corps permit for activities that are substantially similar in nature and cause only minimal individual and cumulative environmental impacts, or are under regulatory control exercised by another Federal, state, or local agency provided it has been determined that the environmental consequences of the action are individually and cumulatively minimal (33 CFR 325.5(c)).

Growing season For purposes of jurisdictional delineation, the USDA Soil Conservation Service (1991) identifies the growing season as "the portion of the year when soil temperatures are above biologic zero in the upper part." Guidance from USACE Office of the Chief of Engineers (1992) has advised estimation of the growing season by reference to climatological tables in local county soil surveys; when so calculated, growing season starting and ending dates will generally be determined based on the "28 °F or lower" temperature threshold at a frequency of "5 years in 10."

Headwaters "Non-tidal rivers, streams, and their lakes and impoundments, including adjacent wetlands, that are part of a surface tributary system to an interstate or navigable water of the U.S. upstream of the point on the river or stream at which the average annual flow is less than five cubic feet per second" (33 CFR 330.2(d).

Herbaceous layer For purposes of jurisdictional delineation, the 1987 Corps Manual identifies the herbaceous layer as all nonwoody plants regardless of height and all woody plants less than 3.2 ft tall, excluding woody vines.

High tide line For purposes of jurisdictional delineation, "The term 'high tide line' means the line of intersection of the land with the water's surface at the maximum height reached by a rising tide. The high tide line may be determined, in the absence of actual data, by a line of oil or scum along shore objects, a more or less continuous deposit of fine shell or debris on the foreshore or berm, other physical markings or characteristics, vegetation lines, tidal gages, or other suitable means that delineate the general height reached by a rising tide. The line encompasses spring high tides and other high tides that occur with periodic frequency but does not include storm surges in which there is a departure from the normal or predicted reach of the tide due to the piling up of water against a coast by strong winds such as those accompanying a hurricane or other intense storm" (33 CFR 328.3(d).

Hue "One of the three variables of color" in the Munsell color system, the other two being value and chroma. Hue "is caused by light of certain wavelengths and changes with the wavelength." (Soil Science Society of America 1987).

Hydric soils "Soils that form under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (USDA-Natural Resources Conservation Service 1996).

Hydrodynamics In the hydrogeomorphic classification system (Brinson 1993) the direction and cyclicity of water flow in a wetland; water flow may be characterized by (1) vertical fluctuations of inundation and water tables, (2) unidirectional flows of surface water, and (3) bidirectional flows of surface water.

Hydrogeomorphic (HGM) approach to assessing wetland function A method of wetland classification and assessment based on the concept that different kinds of wetlands are produced by different (1) water sources, (2) water flow patterns, and (3) geomorphic settings (Smith et al. 1995).

Hydrophytic vegetation Plant life growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content; the 1987 Corps Manual gives rules for identifying hydrophytic vegetation for jurisdictional delineations.

Impact analysis (1) Procedures used to prepare environmental assessments and environmental impact statements across a broad range of environments and situations; (2) Within the narrow context of wetland mitigation, procedures used to determine the difference between wetland evaluations conducted before and after impact.

Incidental fallback Incidental soil movement from excavation, such as the soil that is disturbed when dirt is shoveled, or back-spill that comes off a bucket and falls into the same place from which it was removed. Does not include soil movements away from the original site.

Individual permits Corps permits issued following a case-by-case evaluation of a specific project in accordance with full project and public interest review procedures discussed in 33 CFR 320, 323, and 325.

In-kind mitigation Compensatory mitigation where the impacted wetland and the compensation tract are both of the same wetland classification.

Inundated Referring to the condition in which water temporarily or permanently covers a land surface.

Isolated wetland "Non-tidal waters of the United States, including adjacent wetlands, that are not part of a surface tributary system to interstate waters or navigable waters of the United States" and are not located above headwaters (33 CFR 330.5(a)(26)(ii)).

Jurisdictional wetland delineation Process by which one identifies the legal geographic boundaries of a wetland for purposes of regulatory jurisdiction, or the product of such a determination.

Jurisdictional wetland determination Process by which one identifies presence or absence of a jurisdictional wetland at a point on the ground; this differs from jurisdictional wetland delineation, which identifies the areal extent of all such contiguous points.

Lacustrine system Wetlands and deepwater habitats with all of the following characteristics: (1) situated in a topographic depression or a dammed river channel; (2) lacking trees, shrubs, persistent emergents, emergent mosses or lichens with greater than 30-percent areal coverage; and (3) total area exceeds 8 ha (Cowardin et al. 1979).

Letter of permission An individual permit "issued through an abbreviated processing procedure which includes coordination with Federal and state fish and wildlife agencies and a public interest evaluation, but without the publishing of an individual public notice" (33 CFR 325.2(e)(1)).

Limnetic In the Cowardin wetland classification system (Cowardin et al. 1979), lacustrine systems that are either (a) deeper than 2 m at low water, or (b) waters deeper than 2 m bounded by the extent of emergent vegetation.

Littoral In the Cowardin wetland classification system (Cowardin et al. 1979), aquatic areas in lakes, ponds, or reservoirs greater than 8 ha (20 acres) that are shallower than 2 m and that lack trees, shrubs, persistent emergents, emergent mosses, or lichens with greater than 30-percent areal coverage.

Marine System Open ocean overlying the continental shelf and its associated high-energy coastline (Cowardin et al. 1979).

Matrix In soil science, the majority mass of soil material characterized by the same color within a particular soil horizon.

Mean high-water line The available tidal datum, preferably averaged over a period of 18.6 years (33 CFR 329.12(a)(2)).

Memorandum of Agreement (MOA) Formal and legally binding agreement between two Federal agencies. Memoranda of agreement discussed in this work establish policies and procedures when the Corps and another Federal agency have joint permitting authority over activities in waters of the United States.

Metadata "Data on data." Information used to describe GIS data that indicates the content, quality, condition, and other characteristics of the data.

Minimization The requirement that "appropriate and practicable steps have been taken which will minimize potential adverse impacts of the discharge on the aquatic ecosystem" (40 CFR 230.10(d)); such steps are described in 40 CFR 230.70 et seq.

Mitigation "Avoiding, minimizing, rectifying, reducing, or compensating for resource losses" (33 CFR 320.4(r)).

Mitigation banking Compensatory mitigation practice that establishes a large mitigation project to replace smaller, anticipated disturbances elsewhere.

Mitigation MOA Memorandum of Agreement between the Environmental Protection Agency and the Department of the Army concerning the determination of mitigation under the Clean Water Act section 404(b)(1) guidelines, November 15, 1989.

Mitigation objectives For wetland mitigation projects, the functional performance standards targeted for the replacement or created wetland.

Mottle In soil science, a mass of soil material comprising less than 50 percent of the volume of a horizon and characterized by a color differing significantly from the matrix; for purposes of identifying hydric soils, the color differences should be attributable to oxidation or reduction of iron or manganese.

National Pollutant Discharge Elimination System (NPDES) Primary pollution control program under the Clean Water Act; overseen by the EPA and delegated to most states; NPDES permits are required for discharges of waste into waters of the United States whereas Section 404 permits are required for discharge of dredged or fill material. An NPDES permit will be denied if the Corps finds that "anchorage and navigation of any of the navigable waters would be substantially impaired" by the activity for which a permit was applied (Clean Water Act Section 402(b)(6)).

National Wetlands Inventory (NWI) maps Maps of wetlands compiled by the U.S. Fish and Wildlife Service from aerial photography as part of a nationwide inventory of wetland resources; compiled at a map scale of 1:24000; uses the Cowardin classification system (Cowardin et al. 1979).

Nationwide permits General permits that "have been issued by the regulation (33 CFR 330) for certain specified activities nationwide. If certain conditions are met, the specified activities can take place without the need for an individual or regional permit" (33 CFR 325.5(c)(2)).

Navigable waters "Those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce" (33 CFR 329(4)).

No net loss Goal that the nation's wetlands resource base be maintained, as provided for in the Water Resources Development Act and in numerous state laws. Individual actions may result in a loss of wetland functions when it is not practicable to replace them, but overall the stated goal is to maintain, and in the long run increase, the size and quantity of the resource base.

Nonpersistent vegetation Wetland vegetation that falls at the end of the growing season (Cowardin et al. 1979).

Obligate wetland plants (OBL) For purposes of jurisdictional delineation, the 1987 Corps Manual identifies obligate wetland plants (OBL) as plants that occur almost always (estimated probability >99 percent) in wetlands, but which may also occur rarely (estimated probability <1 percent) in nonwetlands.

Ocean Dumping Act Common name for the Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972, as amended (33 U.S.C. 1413), under which transportation and dumping of dredged material at sea is regulated.

Offsite mitigation Compensatory mitigation on a different parcel of land than that on which the impacted wetland was located.

Onsite mitigation Compensatory mitigation on the parcel of land where the impacted wetland is located.

Ordinary high-water mark "The line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank; shelving; changes in the character of soil; destruction of terrestrial vegetation; the presence of litter and debris; or other appropriate means that consider the characteristics of the surrounding area" (33 CFR 328.3(e)).

Out-of-kind mitigation Compensatory mitigation that replaces an impacted wetland by restoring, enhancing, or creating a wetland of a different kind.

Oxidation Chemical loss of an electron; often indicates presence of oxygen, as when ferrous iron (Fe^{2+}) is transformed to ferric iron (Fe^{3+}).

Oxidized root channel Channels and soil surrounding living roots and rhizomes of hydrophytic plants in which iron oxidation occurs due to oxygen transport via the root system to the otherwise reduced soil matrix.

Palustrine System All nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 ppt. It also includes wetlands lacking such vegetation, but with all of the following four characteristics: (1) area less than 8 ha (20 acres); (2) active wave-formed or bedrock shoreline features lacking; (3) water depth in the deepest part of basin less than 2 m at low water; and (4) salinity due to ocean-derived salts less than 0.5 ppt (Cowardin et al. 1979).

Persistent vegetation Vegetation that remains erect in a wetland until the next growing season (Cowardin et al. 1979).

Plant community A vegetative complex unique in its combinations of plants, usually determined by combinations of environmental influences.

Ponded Referring to the condition in which free water covers the soil surface and is removed only by percolation, evaporation, or transpiration. No surface outlet is available for ponded water.

Practicable (alternatives) For the purposes of Section 404 mitigation, "...available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes" (40 CFR 230.3(q)).

Prairie pothole A depressional wetland, often seasonally inundated, commonly found in the upper Midwest (North and South Dakota and western Minnesota) and similar wetlands found elsewhere; often associated with migratory waterfowl habitat.

Preapplication meeting An optional meeting with "the district staff element having responsibility for [a permit]....to advise potential applicants of studies or other information foreseeably required for later federal action" (33 CFR 325.1(b)).

Preconstruction notification (PCN) Supplied by a permit applicant to notify the Corps of a proposed activity. Also serves as a request for confirmation from the Corps that the proposed activity complies with the terms and conditions of a nationwide permit (61 FR 65873, December 13, 1996).

Preservation Compensatory mitigation that attempts to replace an impacted wetland by protecting a different existing wetland from future disturbance; widely considered to be an unsound mitigation practice.

Programmatic permits General permits "founded on an existing state, local or other federal agency program and designed to avoid duplication with that program" (33 CFR 325.5(c)(3)).

Public interest review "An evaluation of the probable impacts, including cumulative impacts, of the proposed activity and its intended use on the public interest" (33 CFR 320.4(a)).

"Red Flag" issues Characteristics of a water of the United States that would automatically preclude issuance of a permit, such as endangered species, archaeological sites, cemeteries, etc.

Reduction Chemical gain of an electron; often indicates absence of oxygen, as when ferric iron (Fe^{3+}) is transformed to ferrous iron (Fe^{2+}).

Regional permits General permits that are issued "after compliance with other procedures in [33 CFR 325]. If the public interest so requires, the [Corps] may condition the regional permit to require a case-by-case reporting and acknowledgment system. However, no separate applications or other authorization documents will be required" (33 CFR 325.5(c)(1)).

Restoration The planning, construction, and management activities necessary to return a former wetland to its pre-disturbance conditions.

Riverine System All wetlands and deepwater habitats contained within a channel, with two exceptions; (1) wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens, and (2) habitats with water containing ocean-derived salts in excess of 0.5 ppt (Cowardin et al. 1979).

Riverine wetland Wetland whose primary source of water is a river or stream (Brinson 1993).

Saplings/shrubs For purposes of jurisdictional delineation, the 1987 Corps Manual identifies saplings/shrubs as woody plants greater than 3.2 ft tall with a diameter at breast height of less than 3.0 in.

Saturation "A condition in which all easily drained voids (pores) between soil particles are filled with water" (USDA Soil Conservation Service 1991); in the field, saturated soil glistens with moisture, or exudes moisture when lightly shaken in the hand.

Scrub-shrub vegetation Woody vegetation less than 20 ft tall (Cowardin et al. 1979).

Section 404 permit Permit issued by the Corps authorizing activities regulated under authority of Section 404 of the Clean Water Act (33 U.S.C. 1341 et seq.). Most commonly thought of as a permit to place fill in wetlands but also issued for other waters of the United States where the jurisdictional boundary is otherwise defined, usually by the ordinary high-water mark or mean high-water line.

Section 404 wetland Special aquatic habitat whose boundaries are defined in the current Corps wetlands delineation manual and which is therefore subject to Corps jurisdiction under Section 404 of the Clean Water Act.

Section 404(b)(1) Guidelines Regulations of the EPA (40 CFR 230) defining the substantive criteria used in evaluating discharges of dredged or fill material under Section 404 of the Clean Water Act.

Significant (impact) (1) Finding resulting from an environmental assessment that an environmental impact statement is necessary; (2) finding within the Corps permitting process of public interest review that an action will degrade the waters of the United States sufficient to warrant avoidance by removal to a practicable alternative site.

Special aquatic sites "Those sites identified in Subpart E [40 CFR 230.40-.45]. They are geographic areas, large or small, possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values" (40 CFR 230.3(q-1)). Subpart E of 40 CFR 230 lists the following areas as special aquatic sites: sanctuaries and refuges, wetlands, mud flats, vegetated shallows, coral reefs, riffle and pool complexes (40 CFR 230.40-.45).

Standard permit An individual permit that has been processed through the public interest review procedures, including public notice and receipt of comments.

Stratum A layer of vegetation used to determine dominant species in a plant community; the 1987 Corps Manual uses four strata in identification of wetland vegetation: trees, shrubs, herbs, and woody vines.

Success criteria (for mitigation) Easily measurable external attributes that a mitigation wetland should exhibit to indicate that mitigation objectives have been met; often expressed in terms of vegetative cover and health, water depths and durations, sediment loads, water quality, etc.

Texture (of soil) Particle size distribution, such as sandy loam, silty clay, etc.

Tree For purposes of jurisdictional delineation, the 1987 Corps Manual identifies trees as plants that have a diameter at breast height of at least 3.0 in.

Upland plants (UPL) For purposes of jurisdictional delineation, the 1987 Corps Manual identifies upland plants (UPL) as plants that rarely occur (estimated probability <1 percent) in wetlands, but occur almost always (estimated probability >99 percent) in nonwetlands under natural conditions.

Value Within the Munsell color system, "the relative lightness or intensity of color and approximately a function of the square root of the total amount of light." (Soil Science Society of America 1987)

Water dependency A site is water-dependent "if the activity associated with a discharge which is proposed for a special aquatic site.... [requires] access or proximity to or siting within the special aquatic site in question to fulfill its basic purpose" (40 CFR 230.10(a)(3)).

Water quality certification Statement from the state water quality agency that the project complies with pertinent State and Federal water quality regulations. Required for Section 404 permits under Section 401 of the Clean Water Act and 33 CFR 320.4(d).

Water table For purposes of wetland delineation, "the zone of saturation at the highest average depth during the wettest season; it is at least six inches thick and persists in the soil for more than a few weeks" (USDA Soil Conservation Service 1991).

Waters of the United States "The term 'waters of the United States' means (1) all waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide; (2) all interstate waters including interstate wetlands; (3) all other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce...; (4) all impoundments of waters otherwise defined as waters of the United States under the definition; (5) tributaries of waters identified in [items] (1)-(4) [of this definition]; (6) the territorial seas; (7) wetlands adjacent to waters (other than waters that are themselves wetlands) identified in [items] (1)-(6) [of this definition]" (33 CFR 328.3(a)).

Wetland evaluation 1. Procedures specifically designed to determine extent and significance of impacts to wetland functions; the procedure entails two steps: characterizing functions, and defining impacts thereto. 2. Within definition 1, the step of characterizing functions of a wetland.

Wetland hydrology In general terms, permanent or periodic inundation or prolonged soil saturation sufficient to create anaerobic conditions in the soil.

Wetlands "Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (33 CFR 328.3(b) and 40 CFR 230.3(t)).

Woody vines For purposes of jurisdictional delineation, the 1987 Corps Manual identifies woody vines as climbing plants at least 3.2 ft tall.

Appendix B
Data Form, Routine Wetland Determination

(From the 1987 Corps of Engineers "Wetlands Delineation Manual," as revised by Memorandum dated 6 Mar 92 from CECW-OR to all Corps Districts.)

REVISED DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: _____ Applicant/Owner: _____ Investigator: _____	Date: _____ County: _____ State: _____
Do Normal Circumstances exist on the site? Yes No Is the site significantly disturbed (Atypical Situation)? Yes No Is the area a potential Problem Area? Yes No (If needed, explain on reverse.)	Community ID: _____ Transect ID: _____ Plot ID: _____

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1.			9.		
2.			10.		
3.			11.		
4.			12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FACU). _____

Remarks:

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: _____(in.)

Depth to Free Water in Pit: _____(in.)

Depth to Saturated Soil: _____(in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase): _____

Drainage Class: _____
Field Observations
Confirm Mapped Type? Yes No

Taxonomy (Subgroup): _____

Profile Description: Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Aquic Moisture Regime
___ Reducing Conditions
___ Gleyed or Low-Chroma Colors
___ Concretions
___ High Organic Content in Surface Layer in Sandy Soils
___ Organic Streaking in Sandy Soils
___ Listed on Local Hydric Soils List
___ Listed on National Hydric Soils List
___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes No (Circle)	(Circle)
Wetland Hydrology Present?	Yes No	Is this Sampling Point Within a Wetland? Yes No
Hydric Soils Present?	Yes No	

Remarks:

Approved by HQUSACE 2/92

Appendix C
Application and Instructions for a Department of the Army Permit

ENG FORM 4345, officially expired October 1996 but is still being used by the Corps. A new form and an instruction pamphlet (EP 1145-2-1) are being written but, as of this date, have not been released to the public.

This form and accompanying instructions are available electronically on the Corps Headquarters Regulatory Web page: http://www.usace.army.mil/lrc/reg/

Addresses and telephone numbers of Corps of Engineers Regulatory Offices are found in Appendix F.

Instructions for Preparing a Department of the Army Application

Blocks 1 through 4. To be completed by Corps of Engineers.

Block 5 - Applicant's Name. Enter the name of the responsible party or parties. If the responsible party is an agency, company, corporation or other organization, indicate the responsible officer and title. If more than one party is associated with the application, please attach a sheet with the necessary information marked ***Block 5***.

Block 6 - Address of Applicant. Please provide the full address of the party or parties responsible for the application. If more space is needed, attach an extra sheet of paper marked ***Block 6***.

Block 7 - Applicant Telephone Number(s). Please provide the number where you can usually be reached during normal business hours.

Blocks 8 through 11. To be completed if you choose to have an agent.

Block 8 - Authorized Agent's Name and Title. Indicate name of individual or agency, designated by you, to represent you in this process. An agent can be an attorney, builder, contractor, engineer, or any other person or organization. *Note: An agent is **not** required.*

Blocks 9 and 10 - Agent's Address and Telephone Number. Please provide the complete mailing address of the agent, along with the telephone number where he/she can be reached during normal business hours.

Block 11 - Statement of Authorization. To be completed by applicant if an agent is to be employed.

Block 12 - Proposed Project Name or Title. Please provide name identifying the proposed project (i.e., Landmark Plaza, Burned Hills Subdivision, or Edsall Commercial Center).

Block 13 - Name of Water Body. Please provide the name of any stream, lake, marsh, or other waterway to be directly impacted by the activity. If it is a minor (no name) stream, identify the water body the minor stream enters.

Block 14 - Proposed Project Street Address. If the proposed project is located at a site having a street address (not a box number), please enter here.

Block 15 - Location of Proposed Project. Enter the county and state where the proposed project is located. If more space is required, please attach a sheet with the necessary information marked ***Block 15.***

Block 16 - Other Location Descriptions. If available, provide the Section, Township, and Range of the site and/or the latitude and longitude. You may also provide description of the proposed project location, such as lot numbers, tract numbers, or you may choose to locate the proposed project site from a known point (such as the right descending bank of Smith Creek, one mile down from the Highway 14 bridge). If a large river or stream, include the river mile of the proposed project site, if known.

Block 17 - Directions to the Site. Provide directions to the site from a known location or landmark. Include highway and street numbers as well as names. Also provide distances from known locations and any other information that would assist in locating the site.

Block 18 - Nature of Activity. Describe the overall activity or project. Give appropriate dimensions of structures such as wingwalls, dikes (identify the materials to be used in construction, as well as the methods by which the work is to be done), or excavations (length, width, and height). Indicate whether discharge of dredged or fill material is involved. Also, identify any structure to be constructed on a fill, piles, or float-supported platforms. The written descriptions and illustrations are an important part of the application. Please describe, in detail, what you wish to do. If more space is needed, attach an extra sheet of paper marked ***Block 18***.

Block 19 - Proposed Project Purpose. Describe the purpose and need for the proposed project. What will it be used for and why? Also include a brief description of any related activities to be developed as the result of the proposed project. Give the approximate dates you plan to both begin and complete all work.

Blocks 20 through 22. To be completed if dredged and/or fill material is to be discharged.

Block 20 - Reason(s) for Discharge. If the activity involves the discharge of dredged and/or fill material into a wetland or other water body, including the temporary placement of material, explain the specific purpose of the placement of the material (such as erosion control).

Block 21 - Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards. Describe the material to be discharged and amount of each material to be discharged within Corps jurisdiction. Please be sure this description will agree with your illustrations. Discharge material includes: rock, sand, clay, concrete, etc.

Block 22 - Surface Area of Wetlands or Other Waters Filled. Describe the area to be filled at each location. Specifically identify the surface areas, or part thereof, to be filled. Also include the means by which the discharge is to be done (backhoe, dragline, etc.). If dredged material is to be discharged on an upland site, identify the site and the steps to be taken (if necessary) to prevent runoff from the dredged material back into a water body. If more space is needed, attach an extra sheet of paper marked *Block 22*.

Block 23 - Is Any Portion of the Work Already Complete? Provide any background on any part of the proposed project already completed. Describe the area already developed, structures completed, any dredged or fill material already discharged, the type of material, volume in cubic yards, acres filled, if a wetland or other water body (in acres or square feet). If the work was done under an existing Corps permit, identify the authorization if possible.

Block 24 - Names and Addresses of Adjoining Property Owners, Lessees, etc., Whose Property Adjoins the Project Site. List complete names and full mailing addresses of the adjacent property owners (public and private) lessees, etc., whose property adjoins the water body or aquatic site where the work is being proposed so that they may be notified of the proposed activity (usually by public notice). If more space is needed, attach an extra sheet of paper marked *Block 24*.

Information regarding adjacent landowners is usually available through the office of the tax assessor in the county or counties where the project is to be developed.

Block 25 - Information about Approvals or Denials by Other Agencies. You may need the approval of other Federal, state, or local agencies for your project. Identify any applications you have submitted and the status, if any (approved or denied) of each application. You need not have obtained all other permits before applying for a Corps permit.

Block 26 - Signature of Applicant or Agent. The application must be signed by the owner or other authorized party (agent). This signature shall be an affirmation that the party applying for the permit possesses the requisite property rights to undertake the activity applied for (including compliance with special conditions, mitigation, etc.).

APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT
(33 CFR 325)

OMB APPROVAL NO. 0710-003
Expires October 1996

Public reporting burden for this collection of information is estimated to average 5 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Service Directorate of Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302; and to the Office of Management and Budget, Paperwork Reduction Project (0710-0003), Washington, DC 20503. Please DO NOT RETURN your form to either of those addresses. Completed applications must be submitted to the District Engineer having jurisdiction over the location of the proposed activity.

PRIVACY ACT STATEMENT

Authority: 33 USC 401, Section 10: 1413, Section 404. Principal Purpose: These laws require authorizing activities in, or affecting, navigable waters of the United States, the discharge or fill material into waters of the United States, and the transportation of dredged material for the purpose of dumping it into ocean waters. Routine Uses: Information provided on this form will be used in evaluating the application for a permit. Disclosure: Disclosure of requested information is voluntary. If information is not provided, however, the permit application cannot be processed nor can a permit be issued.

One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (see sample drawings and instructions) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned.

(ITEMS 1 THRU 4 TO BE FILLED BY THE CORPS)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETED

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME	8. AUTHORIZED AGENT'S NAME AND TITLE (an agent is not required)
6. APPLICANT'S ADDRESS	9. AGENT'S ADDRESS
7. APPLICANT'S PHONE NOs. W/AREA CODE a. Residence b. Business	10. AGENT'S PHONE NOs. W/AREA CODE a. Residence b. Business

11. STATEMENT OF AUTHORIZATION

I hereby authorize, _____ to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

APPLICANT'S SIGNATURE _____ DATE _____

NAME, LOCATION, AND DESCRIPTION OR PROJECT OR ACTIVITY

12. PROJECT NAME OR TITLE (see instructions)

13. NAME OF WATERBODY, IF KNOWN (if applicable)	14. PROJECT STREET ADDRESS (if applicable)
15. LOCATION OF PROJECT COUNTY _____ STATE _____	

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (see instructions) **Section, Township, Range, Lat/Lon, and/or Accessors's Parcel Number, for example.**

17. DIRECTIONS TO THE SITE

ENG FORM 4345 EDITION OF SEP 91 IS OBSOLETE (Proponent: CECW-OR)

18. Nature of Activity (Description of project, include all features)

19. Project Purpose (Describe the reason or purpose of the project, see instructions)

USE BLOCKS 20-22 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

20. Reason(s) for Discharge

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards

22. Surface Area in Acres of Wetlands or Other Waters Filled (see instructions)

23. Is Any Portion of the Work Already Complete? Yes ___ No ___ IF YES, DESCRIBE THE COMPLETED WORK

24. Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins Waterbody (If more than can be entered here, please attach a supplemental list).

25. List of Other Certifications or Approvals/Denials Received from other Federal, State, or Local Agencies for Work Described in This Application.

AGENCY	TYPE APPROVAL*	IDENTIFICATION NUMBER	DATE APPLIED	DATE APPROVED	DATE DENIED

* Would include but is not restricted to zoning, building, and flood plain permits

26. Application is hereby made for a permit or permits to authorize the work described in this application. I certify that the information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

SIGNATURE OF APPLICANT _____ DATE _____ SIGNATURE OF AGENT _____ DATE _____

The application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

ENG FORM 4345 EDITION OF SEP 91 IS OBSOLETE (Proponent: CECW-OR)

Appendix D
Sample Scope of Work

The following Scope of Work was prepared by Dr. Jim Bailey for the development of a mitigation bank program on Aberdeen Proving Ground.

Wetlands Mitigation Bank Development

Scope of work

Objectives. The objective of this work is to characterize the area proposed as the wetlands mitigation bank for APG. Components of this description are; (1) a wetland delineation of the proposed area, (2) a compilation of the plant species in the proposed area, (3) an evaluation of the hydrology of the area with recommendations concerning site-specific wetlands creation/restoration strategies in relation to the hydrologic profile, and (4) an evaluation of wetland functions of the area. A product of the characterization should be an environmental assessment suitable for use as National Environmental Policy Act (NEPA) documentation for the mitigation bank. Development of the mitigation bank is required to facilitate wetland mitigation as a condition of permits issued under Sections 404 and 401 of the Clean Water Act.

a. Wetlands delineation is intended to provide a baseline map of existing wetlands in a proposed mitigation banking site.

b. The plant species list is needed to comply with requirements of the Endangered Species Act. No Federal activity can adversely affect an endangered species or its critical habitat.

c. Area hydrology must be evaluated to be able to develop site-specific wetland creation/restoration strategies. A portion of wetland mitigation will involve wetland construction, which is highly dependent on the local hydrology.

d. Evaluation of the wetlands functions of the area is intended to provide a baseline functional picture for comparison with future wetlands mitigation. Wetlands mitigation frequently involves functional replacement, which can be accomplished through enhancement of existing wetlands.

e. Development of a wetlands mitigation bank will require an environmental assessment to fulfill NEPA requirements.

Background.

Wetlands mitigation is required as a condition of permits issued under the Clean Water Act by the Corps of Engineers (Section 404) and/or the State of Maryland, Department of the Environment (Section 401). The Corps of Engineers (CE) promotes the concept of mitigation banking as a time-saving device and a mechanism to design and develop a planned mitigation area to provide maximum wetland functions. Total replacement of wetland functions lost through permitting can be accomplished, even for nationwide permits not normally requiring wetland mitigation. Mitigation banking area design can increase the wetland functions of existing wetlands and provide an integrated natural resource management program. Functional analysis of wetlands is provided through Wet II computer software and environmental parameter values. Mitigation compares function loss of permitted wetland fill with function gain by mitigation activities in the mitigation bank.

At present, six projects have outstanding mitigation requirements and development of the mitigation bank area is needed to provide sites for required mitigation. Baseline information on wetland parameters and hydrologic management information is required to develop the wetland mitigation bank area. NEPA documentation is required, by law, whenever human activities will change the environmental complexion of an area.

General specifications.

The contractor shall conduct the studies in a timely manner to comply with the specific requirements set forth in the section below titled "Specific Requirements." The work described will be conducted over a 1-year period from the effective date of the task order, with quarterly in-progress review. Specific segments may require additional reporting. Concurrent specific mitigation design will utilize information from the contractor as it is reported.

The contractor shall ensure that all personnel have the needed permits, passes, and access clearances to perform the required studies. To accomplish this the contractor shall coordinate with any and all APG activities involved to provide access to the study areas and with any outside agency to secure any appropriate permits to conduct the studies in consonance with current Federal, state, local, and APG laws and regulations. The contractor shall update and renew any required permits as the laws or regulations change. The contractor shall process and coordinate any documentation required to gain security badges for its staff needing access to controlled areas of APG.

The contractor shall provide all vehicles, equipment, and specialized limited-use equipment required to perform the studies and produce the required reports.

The contractor shall ensure that all study participants comply with applicable worker safety and health requirements as covered by statutes and APG regulations. The contractor shall work in a variety of potentially hazardous outdoor environments (the conditions include singular or combinations of climatic conditions which include but are not limited to cold, heat, humidity, rain, snow, sleet, storms, and other climatic conditions found in the APG area). All participants may be exposed to normal arthropod pests associated with outdoor work. These pests include but are not limited to, biting flies, mosquitoes, chiggers, and ticks. Some ticks may carry Lyme's Disease, Rocky Mountain Spotted Fever, Paralytic Tick Fever, and other naturally occurring tick-borne diseases. The contractor shall ensure all personnel working on the project take all needed reasonable precautions to protect themselves from these risks.

The contractor shall provide project oversight and review the work to ensure the resulting information will meet the task order requirements.

The contractor shall, as a minimum, conduct quarterly in-progress review meetings involving both the study personnel and APG staff to review and ascertain the progress toward task order requirements and what modifications, if any, are needed to improve the final results.

The contractor shall provide APG with a progress report no later than 15 days subsequent to all in-progress review meetings to provide a logical pattern of development of the project.

Reporting - The contractor shall provide reports to the government as deliverable products to the studies. Reports shall use Courier font at a 10 pitch and use the standards of the "Congress of Biological Editors Style Manual," 5th Edition, copyright 1983. All reports shall be provided with a 3.5-in., double-sided, high-density, floppy disk in DOS format with the report in WordPerfect software Version 5.1 along with the written text.

The Action Officer will produce minutes of all meetings between the contractor and APG personnel within 15 working days of the meeting. This provides for an administrative record of discussions and forms a basis of evaluation of implementation of findings at a later date.

The contractor shall produce an overall final report that analyzes all information generated over the study period. The contractor shall produce any specific reports identified in the study areas listed in the section below titled "Specific Requirements."

The contractor shall produce the Environmental Assessment (EA) for the development of the wetland mitigation bank. The format of the EA shall meet

the requirements of NEPA. The contractor shall prepare a draft EA within 9 months of the effective date of the task order. The draft EA will be reviewed in a joint meeting between the contractor, the action officer, and the appropriate personnel from the Directorate of Safety, Health, and Environment (DSHE) to correct problems discovered and identify potential areas requiring additional effort. The contractor shall prepare the final EA within 11 months of the effective date of the task order. The final EA will be reviewed by the action officer within 15 days of receipt. If necessary, a joint meeting will be held to resolve any discrepancies. The EA will be accepted after resolution of outstanding questions.

The action officer shall review and approve any report submitted to the government for form, completeness, and professionalism. APG will review and have final approval authority on any report generated as a result of these studies.

Specific requirements.

Wetlands delineation - All wetlands on the proposed site will be identified, delineated, and mapped.

Wetland identification and delineation shall be performed using the 1987 Corps of Engineers delineation manual (Environmental Laboratory 1987) and shall be verifiable to the CE regulatory office.

Delineated wetlands will be flagged in the field, where possible, and mapped using a computer-generated program compatible with DSHE's GIS hardware system. ARC-INFO is the preferred software package.

Wetlands Delineation Reporting Requirements - APG will create a form for reporting of wetlands delineation results including soils analysis results, vegetation survey results, and the evaluation of the hydrology of the area. This form will be completed for each discrete wetland area in the proposed wetland mitigation bank area. Upland areas will also be characterized using the reporting form. Forms will be submitted to the action officer monthly.

Soil Survey - Representative soil types will be identified for the mitigation bank area and soil colors as identified by the Munsell Soil Color Chart will be reported on the survey forms (see previous section).

Vegetation Survey - A plant species list will be compiled for the mitigation bank area. Reporting of vegetation on an area basis will be done on the survey forms.

Any plant species listed on the State or Federal threatened or endangered species lists will be reported no more than 48 hr after it has been identified. The site(s) where the species was found will be located on the GIS-generated map.

No action may be taken during the study that would harm any threatened or endangered species or alter the critical habitat for that species.

Hydrology Study - A study of the hydrology of the mitigation bank area will be conducted. Hydrologic evaluation should provide information relating to the existing wetlands, as well as recommendations for hydrologic alterations or modifications that will be required for wetland restoration or creation. Included in the recommendations will be an analysis of the source of hydrology for created/restored wetlands as well as any required earthwork activities or installation of water control structures.

Existing hydrological evaluations will be reported using the survey form. Recommendations for wetland creation/restoration actions will be included as part of the final report.

Wetland functions - Functions of the existing wetlands will be evaluated using the latest version of the WET software program.

Existing wetland functions will be reported using the survey form.

Environmental Assessment (EA) - An environmental assessment of the actions needed to create a wetlands mitigation bank must be written and submitted in accordance to National Environmental Policy Act requirements. A draft EA will be submitted to APG, DSHE no later than 9 months after the task order is issued in order to incorporate APG internal evaluation requirements. A final EA must incorporate APG internal evaluation requirements. A final EA must be submitted within 11 months of the task order date and a public comment period must be observed. Changes required by public comment must then be incorporated.

Literature Review - The contractor shall conduct a thorough review of relevant scientific literature to support decisions suggested by the EA. The contractor shall use the information generated in the other phases of the task order to the maximum extent possible.

Deliverable Products - The contractor shall produce a variety of deliverable reports to fulfill the task order. The deliverable reports are listed below.

Accident or Incident Report - In the event of an accident or incident, the contractor shall contact the action officer within 1 hr of the occurrence. The contractor shall prepare and submit to the action officer a written report of the occurrence within 24 hr. The action officer will notify the contractor if a special reporting form or procedure is required based on the nature of the event.

In-progress Reports - In-progress reports are to be submitted quarterly during the life of the task order outlining the status and progress of the task order.

Final Task Order Report - A final report analyzing all the data collected during the task order period will be prepared. The report shall synthesize all data and develop overall conclusions based on the following information.

Wetlands Delineation - A delineation of all wetlands in the mitigation bank area will be submitted by the end of the task order period. Included in the delineation will be the soils, vegetation, and hydrologic information listed on the survey forms. Wherever possible information will be generated on the GIS mapping system.

Plant Species List - An overall plant species list will be compiled from the wetlands delineation survey and presented as a separate deliverable with special note given to threatened and endangered species.

Hydrologic Information - Recommendations of wetlands creation/restoration development will be based on hydrologic information.

Wetlands Function - Information on wetlands function shall be supplied for all delineated wetland areas.

Draft EA - The draft EA shall be submitted within 9 months of the issuance of the task order.

Final EA - The final EA shall be submitted within 11 months of the issuance of the task order.

Photography in/over APG will be under the supervision of the action officer, or his designee, who will be responsible for verifying the contents of photographs before the film leaves APG. Camera permits will only be issued to the action officer or his alternate(s) to ensure this oversight.

Aerial or ground surveys will only be conducted when approved by the Range Operations and Control Branch and Security Office. Requests for approval to fly or enter range areas shall be made no later than noon the day prior to the desired date of the survey. Flights will normally be scheduled on Sundays to preclude interference with testing and to minimize denial of access by CSTA. CSTA has the authority to deny access to land, water, or air when safety or security concerns exist on the date(s) requested.

Appendix E
Elements of a Mitigation Proposal

Table E1
Elements of a Compensatory Mitigation Proposal[1]

PROJECT SUMMARY
One-page summary of report.

I. PROJECT DESCRIPTION

A. Location

1. Describe location.

2. Locate on maps (Highway and USGS topographic).

B. Brief Summary of Project

One or two paragraphs describing overall project purpose, and role of wetlands in project development.

C. Responsible Parties

Provide names, titles, addresses, and phone numbers of applicants, points of contact, and contractors.

D. Jurisdictional Areas to be Filled

Provide detailed topographic map identifying Corps jurisdiction and areas to be filled.

E. Types, Functions, and Values of Jurisdictional Areas

1. Wetland types.
2. List of wetland functions provided by project wetlands.

II. GOAL OF MITIGATION

A. Type(s) of Habitat or Wetland to be Restored or Created.

Explain if different from wetland to be filled.

B. Acreage of Each Type.

C. Wetland Functions to be Performed by Each Type.

Explain if different from wetland to be filled.

(Sheet 1 of 5)

[1] Adapted with little change from guidelines proposed by U.S. Army Engineer District, San Francisco.

Table E1 (Continued)

III. FINAL SUCCESS CRITERIA

These will be used to determine fulfillment of resource responsibilities and compliance with conditions of a wetlands permit. Success will depend on the wetland performing target functions. A minimum of 2 years should elapse *after* all human support (e.g., irrigation, replanting, fertilization and pesticide application, rodent control) has ceased.

A. Biotic Community

Depending on target function, for example:

1. Wildlife species (wildlife habitat).
2. Vegetative cover, species, health and vigor (habitat, erosion/flood control).
3. Root development and density (erosion control, habitat).

B. Hydrologic Regime

Depending on target function, for example:

1. Channel shapes and sizes (erosion/sediment control).
2. Outlets (production export, sedimentation, habitat).
3. Topography and volume (flood storage).
4. Dissolved oxygen (habitat, production export).

C. Target Jurisdictional Acreage

IV. PROPOSED MITIGATION SITE

A. Location and Size of Mitigation Area

1. Describe location and relation to project wetlands.
2. Provide 1"/100' topographic maps as well as USGS topographic map.

B. Existing Wetland Functions of Mitigation Area

C. Present and Proposed Uses of Mitigation Area

1. Known and anticipated uses.
2. Vegetation, soils, and hydrologic maps of site.
3. Disturbances to area, including power lines, roads, pipelines, structures, exotic plantings, etc.

D. Jurisdictional Delineation, If Applicable

E. Setting

1. Describe landforms and uses of adjacent lands.
2. Describe and locate nearby aquatic sites/wetlands.

V. IMPLEMENTATION PLAN

A. Responsible Parties

Names, titles, addresses, and phone numbers of parties responsible for implementing the project.

B. Site Preparation

1. Base maps with planned alteration.

2. Cross sections of planned alteration.

Table E1 (Continued)

3. Plans for

   (a) Grading.
   (b) Water control structures.
   (c) Hydrologic changes.
   (d) Erosion control.
   (e) Bank stabilization.
   (f) Soil amendments.
   (g) Equipment and procedures.
   (h) Vegetation control.
   (i) Access control.
   (j) Planting excavation methods.

C. Planting Plan

1. Brief description of planting plan.
2. Table of species, numbers, spacing, pot sizes, etc.
3. Source of seeds, cuttings, plant plugs, etc.
4. Map of planting and species locations.
5. Storage methods for any transplantings.
6. Expected volunteer vegetation.

D. Schedule

Provide timetable for site preparation and planting.

E. Irrigation Plan

1. Irrigation methods, frequency, quantity.
2. Water sources.

F. As-Built Progress Report (if major changes)

1. Specify that mitigation team submit description of project within 6 weeks of site preparation and planting, including:

   a. Deviations from original plans.
   b. Actual graded contours.
   c. Cross sections.
   d. Planting locations and types.
   e. Structures and roads.

VI. MAINTENANCE

A. Maintenance Activities

Describe planned maintenance activities, including

1. Irrigation system inspection.
2. Plant replacement.
3. Weeding.
4. Water structure inspection.

Table E1 (Continued)

5. Fertilization.

6. Erosion control.

7. Herbivore protection.

8. Trash removal.

B. Responsible Parties

Names, addresses, phone numbers.

C. Schedule

Table of maintenance activities and inspections

VII. MONITORING PLAN

A. Performance Criteria

Provide interim target criteria to be based on progress toward final success criteria.

B. Monitoring Methods

1. Describe quantitative methods, including statistical analyses. Examples: percent cover, seedling survival, erosion depths at critical points, pH, turbidity, etc.

2. Sample data sheets.

3. Photographs to be taken at regular intervals and from common locations of critical and representative targets identified from goals. Representative sampling quadrats should also be photographed. (May not be applicable or useful in every situation.)

C. Annual Reports

1. List of parties responsible for report and participating in monitoring program.

2. Analyses of quantitative monitoring data.

3. Prints of any monitoring photographs.

4. Maps identifying monitoring areas, transects, etc.

5. Copies of field data sheets should be retained.

6. Copy of Corps permit, including Letters of Modification.

VIII. COMPLETION OF MITIGATION

A. Notification of Completion

If appropriate, notify Corps when all success criteria have been met. Include jurisdictional delineation of mitigated wetland.

B. Corps Confirmation

Corps may require site visit to confirm completion.

Table E1 (Concluded)

IX. CONTINGENCY PLANS

A. Funding

Identify funds to be used to implement contingency mitigation if primary mitigation fails.

B. Initiating Procedures

If an annual performance criterion is not met, determine the cause. Report to the Corps if part of permit conditions are not met. Propose remedial action.

C. Alternative Locations for Contingency Mitigation

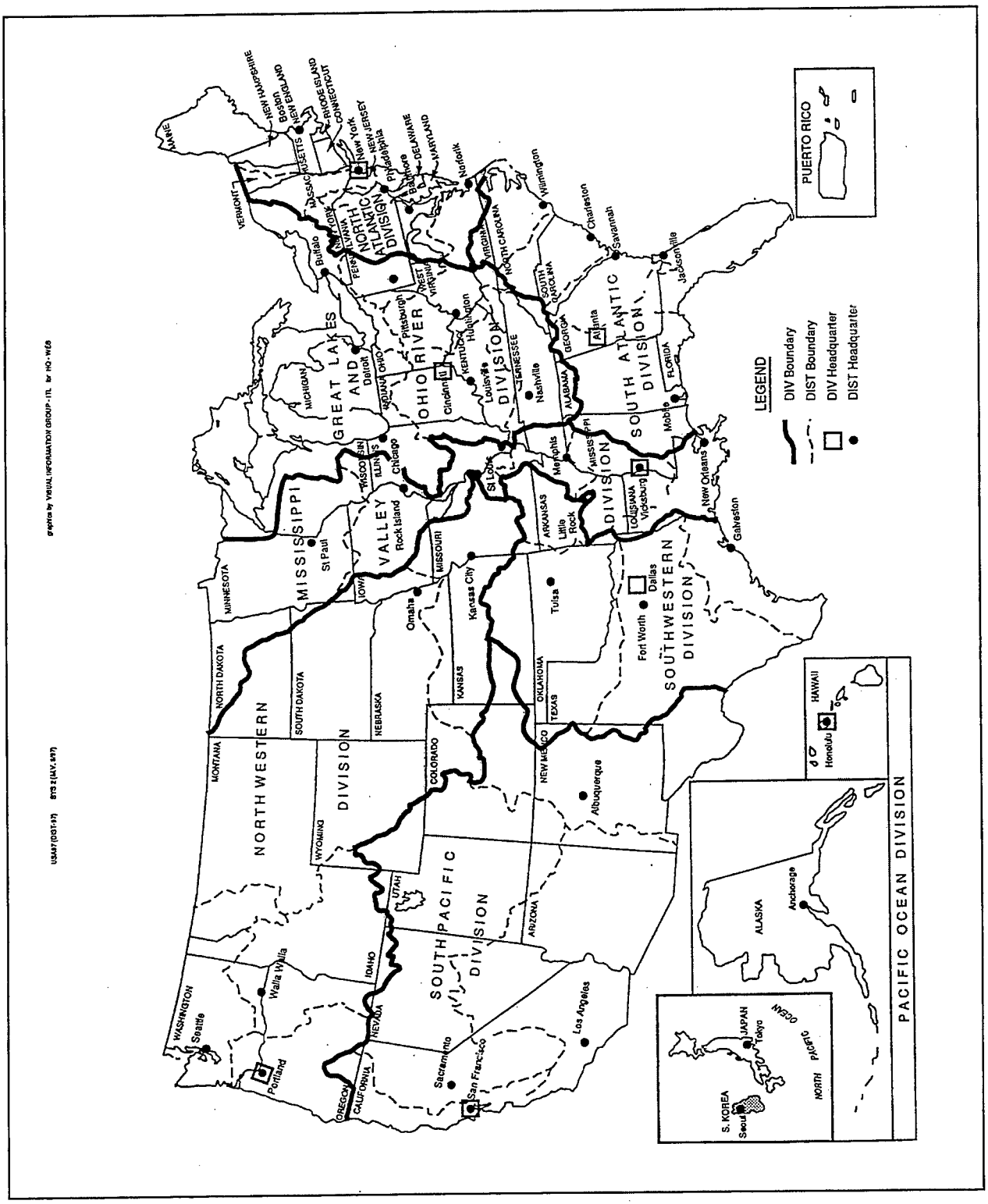
For certain projects it may be necessary to provide contingency mitigation sites. If so, identify a range of possible contingency measures that could be undertaken, should some or all of the mitigation project fail.

(Sheet 5 of 5)

Appendix F
Corps of Engineers Regulatory Offices Addresses and Telephone Numbers and District Boundary Map

Table F1
District Regulatory Offices

District	Address	Symbol	Phone
Alaska	PO 898, Anchorage, AK 99506-0898	POA-CO-R	907/753-2712
Albuquerque	PO 1580, Albuquerque, NM 87103-1580	SPA-CO-R	505/432-3283
Baltimore	PO 1715, Baltimore, MD 21203-1715	NAB-OP-R	410/962-3670
Buffalo	1776 Niagara St, Buffalo, NY 14207-3199	LRB-CO-R	716/879-4313
Charleston	PO 919, Charleston, SC 29402-0919	SAC-CO-P	803/727-4330
Chicago	111 N. Canal St, Chicago, IL 60606	LRC-CO-R	312/353-6400x4020
Detroit	PO 1027, Detroit, MI 48231-1027	LRE-CO-L	313/226-2432
Ft. Worth	PO 17300, Ft Worth, TX 76102-0300	SWF-OD-R	817/334-2681
Galveston	PO 1229, Galveston, TX 77553-1229	SWG-CO-R	409/766-3930
Honolulu	Bldg 230, Ft Shafter, Honolulu, HI 96858-5440	POH-ET-PO	808/438-0030
Huntington	502 8th St, Huntington, WV 25701-2070	LRH-OR-F	304/529-5487
Jacksonville	PO 4970, Jacksonville, FL 32232-0019	SAJ-CO-R	904/232-1666
Kansas City	601 E 12th St, Kansas City, MO 64106-2896	NWK-OD-P	816/983-3670
Little Rock	PO 867, Little Rock, AR 72203-0867	SWL-CO-P	501/324-5296
Los Angeles	PO 2711, Los Angeles, CA 90053-2325	SPL-CO-R	213/452-3406
Louisville	PO 59, Louisville, KY 40201-0059	LRL-OR-F	502/582-6461
Memphis	Fed Bldg, Rm B-202, Memphis, TN 38103-1894	MVM-CO-R	901/544-3471
Mobile	PO 2288, Mobile, AL 36628-0001	SAM-OP-S	334/690-2658
Nashville	PO 1070, Nashville, TN 37202-1070	LRN-CO-F	615/736-5181
New England	696 Virginia Rd, Concord, MA 01742-2751	NAE-CO-R	978/318-8338
New Orleans	PO 60267, New Orleans, LA 70160-0267	MVN-OD-S	504/862-2255
New York	26 Federal Plaza, New York, NY 10278-0090	NAN-OP-R	212/264-3996
Norfolk	803 Front St, Norfolk, VA 23510-1096	NAO-CO-R	804/441-7068
Omaha	PO 5, Omaha, NE 68101-0005	NWO-OP-R	402/221-4211
Philadelphia	100 Penn Square East, Philadelphia, PA 19107-3390	NAP-OP-R	215/656-6725
Pittsburgh	Fed Bldg, 1000 Liberty Ave, Pittsburgh, PA 15222-4186	LRP-OR-F	412/644-4204
Portland	PO 2946, Portland, OR 97208-2946	NWP-PE-G	503/808-4370x4380
Rock Island	PO 2004, Rock Island, IL 61204-2004	MVR-OD-R	309/794-5370
Sacramento	650 Capitol Mall, Sacramento, CA 95814-4794	SPK-CO-O	916/557-5252
St. Louis	210 Tucker Blvd N, St. Louis, MO 63101-1986	MVS-CO-F	314/331-8575
St. Paul	1135 USPO & Custom House, St. Paul, MN 55101-1479	MVP-CO-R	612/290-5376
San Francisco	211 Main St, San Francisco, CA 94105-1905	SPN-CO-R	415/977-8460
Savannah	100 W Oglethorpe, Savannah, GA 31402-0889	SAS-OP-P	912/652-5768
Seattle	PO C-3755, Seattle, WA 98124-2255	NWS-OP-R	206/764-6980
Tulsa	PO 61, Tulsa, OK 74121-0061	SWT-OD-R	918/669-7401
Vicksburg	4155 Clay St., Vicksburg, MS 39180-3435	MVK-OD-F	601/631-5276
Walla Walla	Bldg 602, City-County Airport, Walla Walla, WA 99362	NWW-OP-R	509/527-7151
Wilmington	69 Darlington Ave., PO 1890, Wilmington, NC 28403	SAW-RG-R	910/251-4630


LEGEND
DIV Boundary
DIST Boundary
DIV Headquarter
DIST Headquarter
PUERTO RICO
NORTHWESTERN DIVISION
MISSISSIPPI VALLEY DIVISION
GREAT LAKES AND OHIO RIVER DIVISION
NORTH ATLANTIC DIVISION
SOUTH ATLANTIC DIVISION
SOUTHWESTERN DIVISION
SOUTH PACIFIC DIVISION
PACIFIC OCEAN DIVISION
Seattle
Portland
Walla Walla
Sacramento
San Francisco
Los Angeles
Albuquerque
Fort Worth
Dallas
Tulsa
Omaha
Kansas City
St Paul
Rock Island
Chicago
St Louis
Memphis
Little Rock
Vicksburg
New Orleans
Galveston
Mobile
Jacksonville
Savannah
Charleston
Wilmington
Norfolk
Baltimore
Philadelphia
New York
Boston
Buffalo
Pittsburgh
Huntington
Louisville
Cincinnati
Detroit
Nashville
Atlanta
Anchorage
Honolulu
Tokyo
Seoul

Appendix G
Corps of Engineers Regional Permit for Fort Carson and Pinon Canyon Maneuver Site Erosion Control Activities

REGIONAL PERMIT

US Army Corps
of Engineers
Albuquerque District
4101 Jefferson Plaza, NE
Albuquerque, NM 87109-3435

Fax No. 505-342-3498

Regional Permit No: CO-97-30278

Issuance Date: December 11, 1997

Phone: (719) 543-6914

Expiration Date: December 11, 2002

In Reply Refer to: District Engineer, ATTN: CESPA-OD-R

REGIONAL PERMIT
UNDER SECTION 404 OF THE CLEAN WATER ACT (33 USC 1344)
for Fort Carson and the Pinon Canyon Maneuver Site
Erosion Control Activities

Purpose of this Regional Permit: The purpose of this regional permit is to authorize erosion control activities on Fort Carson and the Pinon Canyon Maneuver Site which are substantially similar in nature and cause only minimal individual and cumulative environmental impacts. Activities which do not comply with the provisions of this regional permit may require an individual permit Some of the activities authorized by this regional permit may be authorized by one or more nationwide permits. Such activities are included in this regional permit for ease of use and consistency of action.

Permittee: Department of the Army personnel under the command of Headquarters, Fort Carson, or their contractors or subcontractors.

Permit Area: This regional permit is applicable to all waters of the United States, including wetlands, on Federal lands on Fort Carson located near Colorado Springs in El Paso, Pueblo, and Fremont Counties, Colorado, and on the Pinon Canyon Maneuver Site located near Trinidad in Las Animas County, Colorado. Maps showing the permit area are attached.

Scope of Work and Authorized Materials: Activities authorized by this regional permit are limited to erosion control activities within the permit area. Types of activities which are authorized if they occur in waters of the United States are listed below. Drawings showing typical activities are attached.

a. **Erosion Control and Stock Watering Impoundments.** Small dams may be constructed across intermittent or ephemeral water courses to provide erosion control. Typical erosion control dams impound 1 acre-foot of water at spill level and stock watering dams can impound up to 5 acre-feet. Construction may include excavating the impoundment area. Excavated material may be placed into the water course immediately below the dam to restore eroded areas to pre-erosion condition. The total filled area within the ordinary high water mark of the water course will not exceed 1/2 acre for each structure. The net loss of wetlands will not exceed 1/10 acre for each structure.

b. **Banksloping of Erosion Courses.** Resloping the banks of deeply incised or heavily eroded channels is typically done to enhance the use of training lands for off-road vehicles. Project reaches may be treated by cutting the vertical banks to a 8H:1V slope (not to exceed 4H:1V) and filling the over-deepened channel. Trees will be avoided during operations. Topsoil will be stripped and stockpiled at the site, and replaced as surface finish. Banksloped areas will be seeded with a critical-area grass/forb seed mix; and erosion blankets and rock armoring may be used on over-steepened areas and nick-points. Filling or excavation of within the ordinary high water mark of the water course will not exceed 3 acres for each project. The net loss of wetlands will not exceed 1/10 acre for each project.

c. **Check Dams.** A series of check dams are typically used along roads and major access trails where larger erosion control structures cannot be built. Check dams will be constructed of rock, but may also be built of pole (discarded telephone poles), baled hay, or other similar clean material. The dams will be constructed by placing the material into an excavated trench with a weir formed along the crown. Rock riprap lining of the water course bed may be placed between the check dams for further erosion control. Heavy gage metal netting may be used to anchor the rock. Each check dam will not exceed 25 cubic yards of material and the total area of disturbance within the ordinary high water mark of a water course for each project will be less than 1/3 acre. The net loss of wetlands will not exceed 1/10 acre for each project.

d. **Rock Armor.** Armor of water courses along transportation routes may be necessary when no effective alternative can be used. Materials will be large (12-inch diameter or greater) granite rock or other suitable, clean material. Smaller, clean backfill or bedding material may be used. Total armoring within a water course for each project will not exceed 1/3 acre and the net loss of wetlands will not exceed 1/10 acre.

e. **Hardened Crossings.** Hardened low-water crossings for wheeled and tracked military vehicles that maneuver off-road are established to avoid erosion of the stream bed and banks. Concrete crossings are used in areas of high use such as Main Supply Routes. Rock hardened crossings are used for secondary or other crossings. Each crossing will be excavated approximately 4 feet deep and rock fill of several aggregates and sizes placed and compacted within the excavation. Excavated material will be spoiled at suitable adjacent areas or backfilled on the crossings as surface finish. The crossing will be designed to prevent the restriction of, and to withstand, expected high flows. The total filled area within the ordinary high water mark of the water course will not exceed 1/3 acre for each crossing. The net loss of wetlands will not exceed 1/10 acre for each crossing.

f. **Culverts and Bridges.** Culverted crossings and bridges are established to avoid erosion of the stream bed and banks on perennial streams or where there is perennial or intermittent flooding of Main Service Routes and other roads. Armoring may be associated with culvert shoulders. Large scale crossings typically require construction of a bridge. The filled or excavated area within the ordinary high water mark of the water course will not exceed 1/3 acre for each crossing. The net loss of wetlands will not exceed 1/10 acre for each crossing. The crossings must be designed to prevent the restriction of, and to withstand, expected high flows.

g. **Erosion Control Terraces and Water Diversions.** Erosion control terraces and water diversions are usually constructed on uplands. However, they may occasionally be built across intermittent or ephemeral water courses. Compacted earth fill may be placed as terraces or diversions. The filled or excavated area within the ordinary high water mark of the water course will not exceed 1/3 acre for each structure or fill. The net loss of wetlands will not exceed 1/10 acre for each project.

h. **Water Turnouts.** Water turnouts, diversions, or a variety of devices designed to site specific needs may be employed. These devices usually occur on upland but may occasionally outfall into or cross water courses. For these action, the filled or excavated area within the ordinary high water mark of the water course will not exceed 1/3 acre for each structure or fill. The net loss of wetlands will not exceed 1/10 acre for each structure or fill.

i. **Other Activities or Activities which Exceed Work Limitations.** Other erosion control activities not described above or activities which exceed any of the above acreage limitations may be authorized under this regional permit if the permittee first notifies the Corps of Engineers in accordance with Notification Procedures. Such work cannot proceed until the Corps of Engineers has provided written approval.

Duration of the Regional Permit: This regional permit authorizes activities begun within 5 years and completed within 6 years after the date of issuance, unless the permit is revoked in the interim. Activities completed under authorization of the regional permit which was in effect at the time the activity was completed continue to be authorzied by that regional permit.

Notification Procedures: No notification is required for activities which fall within the above Activities "a" - "h". Other erosion control activities or activities which exceed any of work acreage limitations may be authorized under this regional permit if the permittee first provides the Corps of Engineers with the below information prior to beginning work:

a. A complete description of the work including composition, source, and volume in cubic yards of all material to be discharged; area of water course to be excavated or filled; and a description of the waters of the United States including wetlands to be affected.

b. Project location including name of water course, Section, Township, Range and UTM coordinates (or military grid coordinates).

c. Drawings or sketches on 8-1/2" x 11" paper showing the project location, the plan or top view of all work subject to Section 404, and cross-sectional or side views of the work.

The information should reference Regional Permit No. CO-97-30278 and be sent to:

Southern Colorado Project Office
Albuquerque District, US Army Corps of Engineers
720 North Main Street, Suite 205
Pueblo, CO 81003-3046
Telephone: (719) 543-9459

The Corps of Engineers will coordinate the notification with other Federal and state agencies to solicit their views on the environmental effects of the proposed work. After considering agency comments, the Corps of Engineers may add special conditions to ensure that adverse environmental impacts are minimal, or may decide that an individual permit application is required. Within 30 days of receiving a completed notification, the Corps of Engineers will review the proposal and inform the permittee if the work may proceed under the authorization of this regional permit. The work cannot proceed until the Corps of Engineers has provided written approval.

Conditions of the Regional Permit: All activities authorized under this regional permit are subject to the following conditions.

a. Only clean, non-polluting material will be used. No discharge of dredged or fill material will consist of unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.) and the discharge must be free from toxic pollutants in toxic amounts.

b. Measures will be taken to prevent spilled fuels, lubricants, wet concrete (other than that placed in forms), or other toxic materials from entering the water course.

c. All disturbed areas above the ordinary high water mark will be seeded.

d. Wetlands will be avoided where possible and measures will be taken to protect wetlands from damage during construction. Projects may include on site wetland replacement or creation to avoid exceeding the net loss of wetlands allowed for a type of activity.

e. A quarterly report will be provided to the Corps of Engineers (due 12/1, 3/1, 6/1, and 9/1). For the reporting period, the report will include a list of the actions authorized under the regional permit for each type of activity, water course name, and the location including the Installation; S, T, R; and UTM or military grid coordinates.

f. The activities authorized by this permit will be properly maintained.

g. No activity is authorized under this regional permit which is likely to jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act, or which is likely to destroy or adversely modify the critical habitat of such species.

h. No activity which may affect historic properties listed, or eligible for listing, in the National Register of Historic Places is authorized under this regional permit until the permittee has complied with the requirements of the National Historic Preservation Act.

i. Representatives from the Corps of Engineers must be allowed to inspect the authorized activities to ensure that they are being, or have been accomplished, in accordance with the terms and conditions of the permit.

Further Information:

a. State Water Quality Certification: In accordance with Section 401 of the Clean Water Act, regional general permits in the State of Colorado have been certified by statute pursuant to Colorado Revised Statutes 25-8-202 and 25-8-308.

b. Colorado Law: The permittee is responsible for obtaining necessary authorizations under state water law or dam safety regulations.

c. Congressional Authorities: This regional permit is authorized pursuant to Section 404 of the Clean Water Act (33 U.S.C. 1344).

d. Limits of this Authorization: This regional permit does not obviate the need to obtain other Federal, state, or local authorizations required by law; does not grant any property rights or exclusive privileges; does not authorize any injury to the property or rights of others; and does not authorize interference with any existing or proposed Federal project.

e. Limits of Federal Liability: In issuing this permit, the Federal Government does not assume any liability for the following: damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes; damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest; damages to persons, property, or to other permitted or unpermitted activities or

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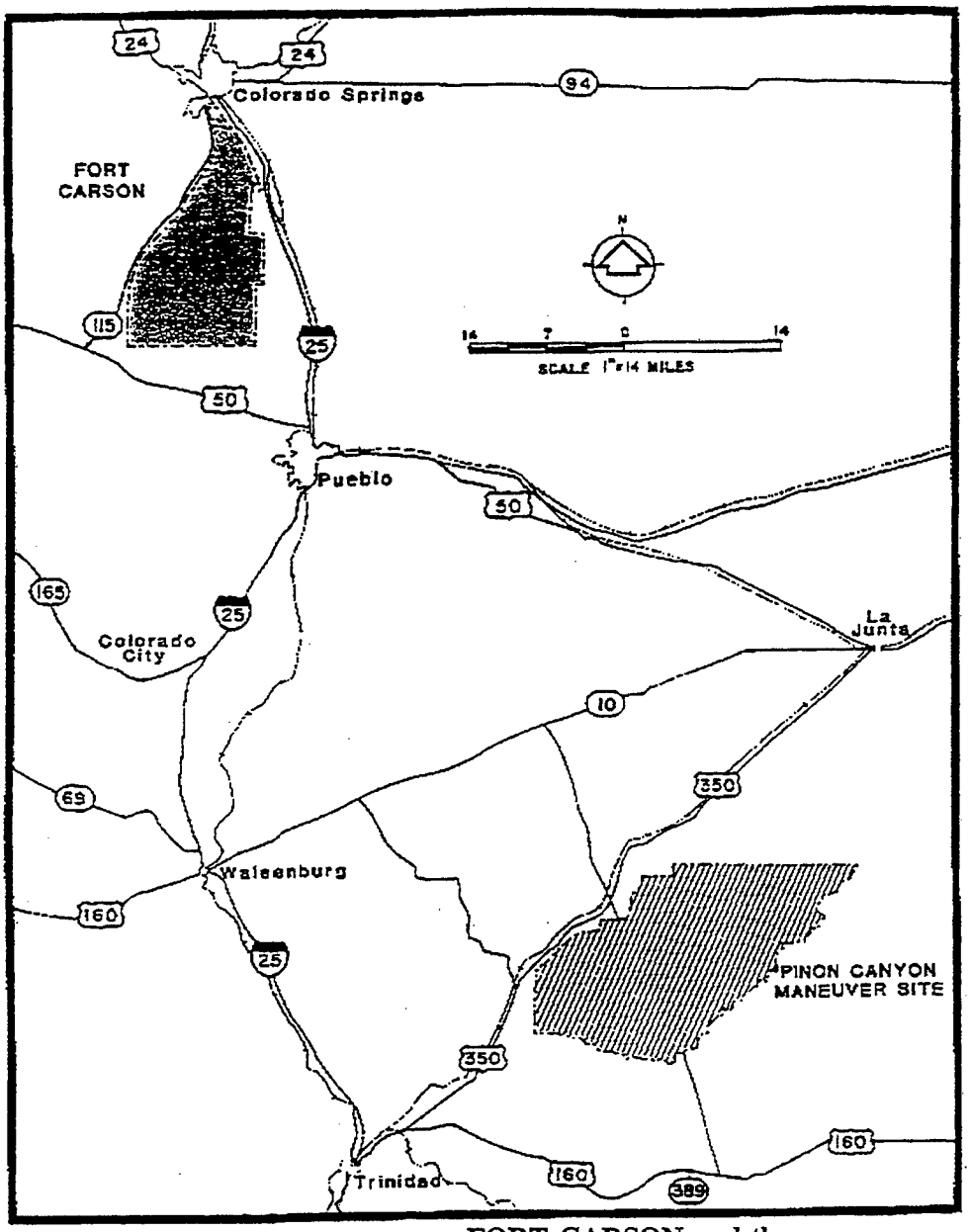
structures caused by the activities authorized by this permit; design or construction deficiencies associated with the permitted work; or damage claims associated with any future modification, suspension, or revocation of this permit.

f. Reevaluation of Permit Decision: The Corps of Engineers may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following: the permittee fails to comply with the terms and conditions of this permit; the information provided by the permittee in support of the permit application proves to have been false, incomplete, or inaccurate; significant new information surfaces which this office did not consider in reaching the original public interest decision. Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring the permittee to comply with the terms and conditions of the permit and for the initiation of legal action where appropriate. The permittee will be required to pay for any corrective measures ordered by this office, and if fails to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill the permittee for the cost.

Lloyd S. Wagner
Colonel, EN
District Engineer

Enclosures



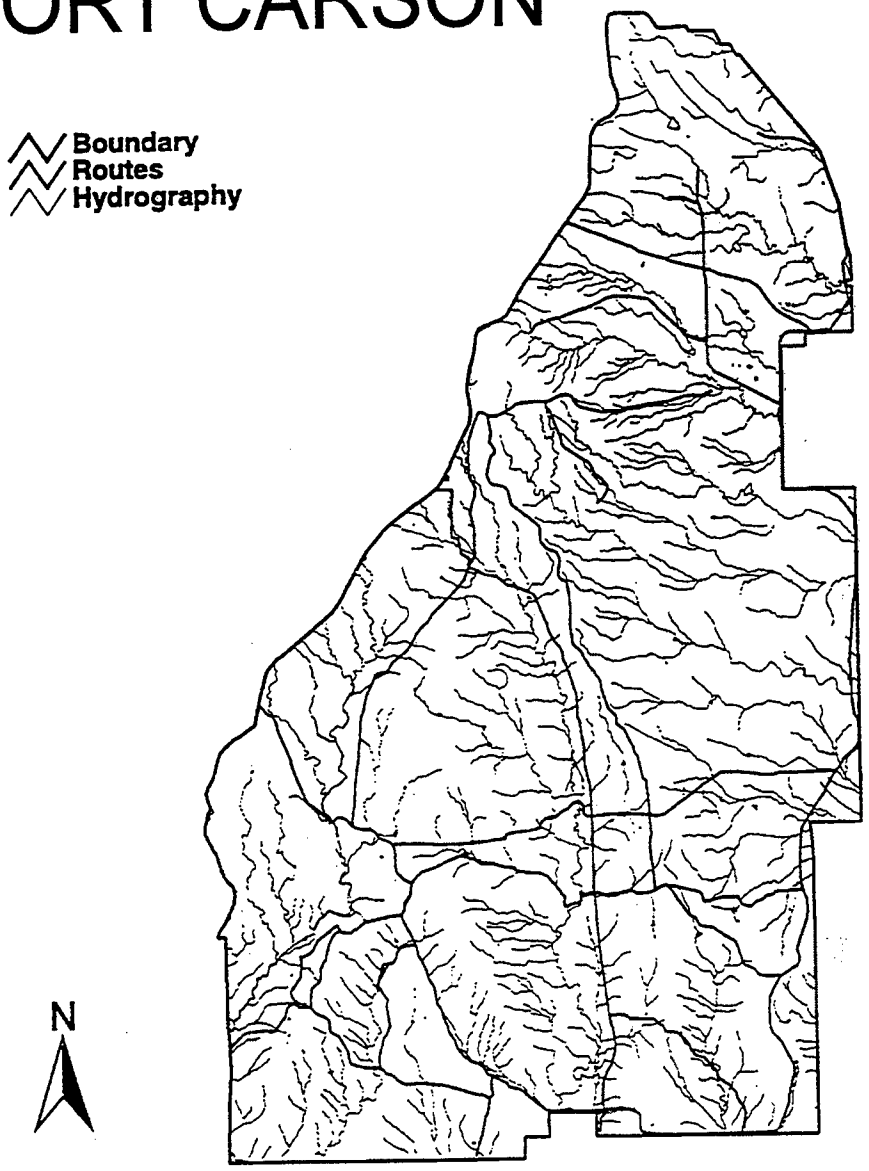
REGIONAL LOCATION MAP **FORT CARSON and the PINON CANYON MANEUVER SITE**

Regional Permit for Fort Carson and the Pinon Canyon Maneuver Site Erosion Control Activities

El Paso, Fremont, Pueblo, and Las Animas Counties, Colo
Regional Permit No. CO-97-30278

Sheet 1 of 7 October 1997

FORT CARSON



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the DECAM 10/97

Regional Permit for Fort Carson and the Pinon Canyon
Maneuver Site Erosion Control Activities

El Paso, Fremont, Pueblo, and Las Animas Counties, Colo
Regional Permit No. CO-97-30278

Sheet 2 of 7

October 1997

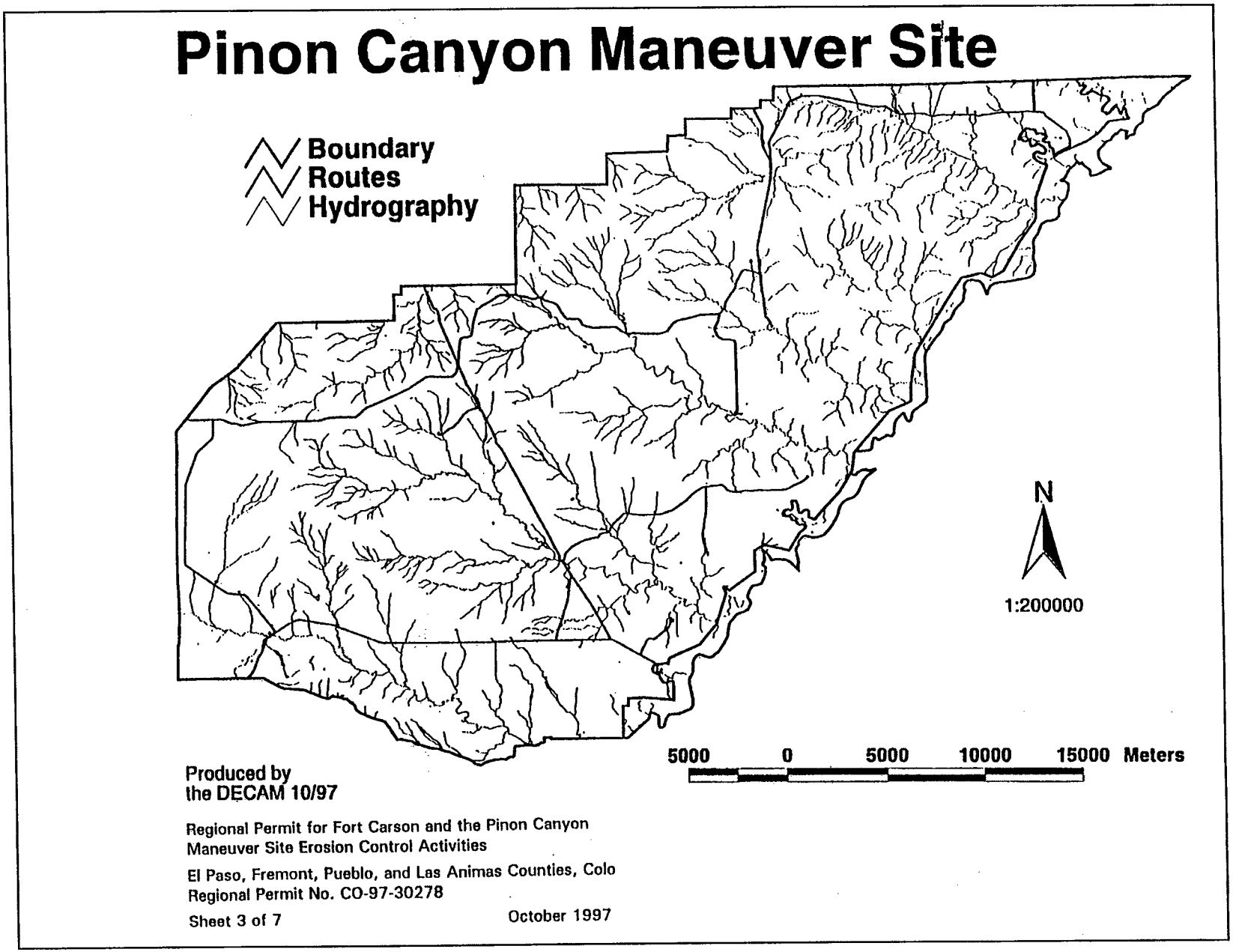

Pinon Canyon Maneuver Site
Boundary
Routes
Hydrography
N
1:200000
5000 0 5000 10000 15000 Meters
Produced by
the DECAM 10/97
Regional Permit for Fort Carson and the Pinon Canyon
Maneuver Site Erosion Control Activities
El Paso, Fremont, Pueblo, and Las Animas Counties, Colo
Regional Permit No. CO-97-30278
Sheet 3 of 7
October 1997

FIGURE 1 - Erosion Control Dam Cross Section

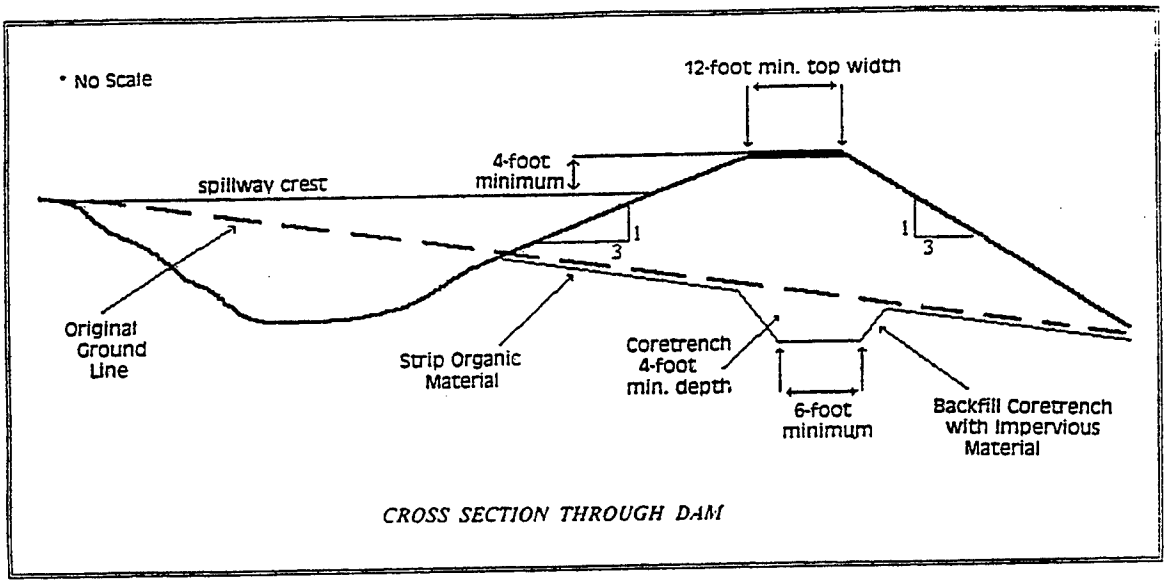
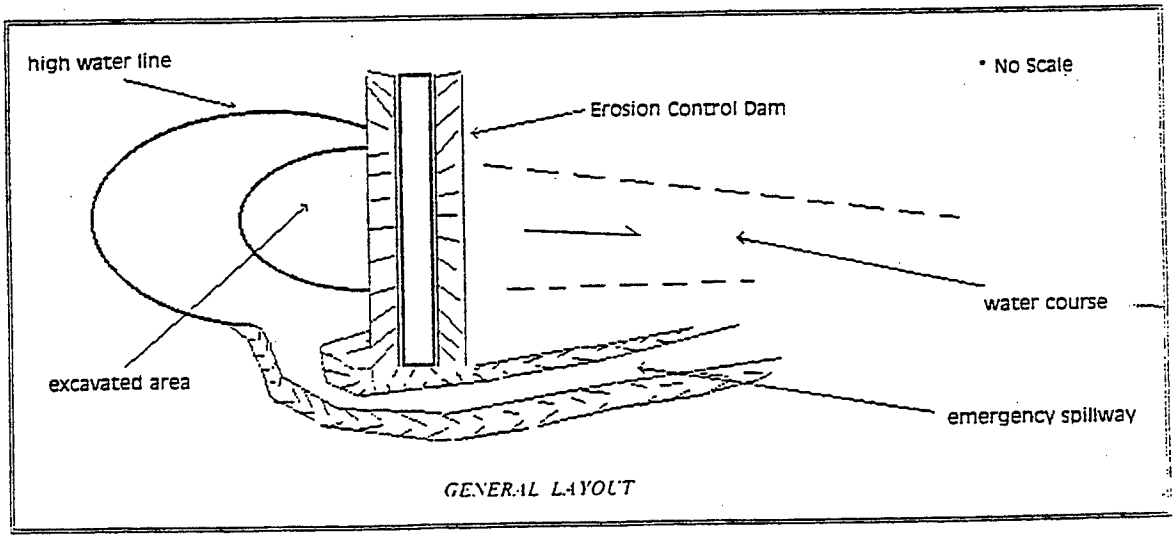


FIGURE 2 - Erosion Control Dam & Impoundment Area



Regional Permit for Fort Carson and the Pinon Canyon Maneuver Site Erosion Control Activities

El Paso, Fremont, Pueblo, and Las Animas Counties, Colo
Regional Permit No. CO-97-30278

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FIGURE 3 - Typical Ban..ope Construction - *Cut & Fill Method*

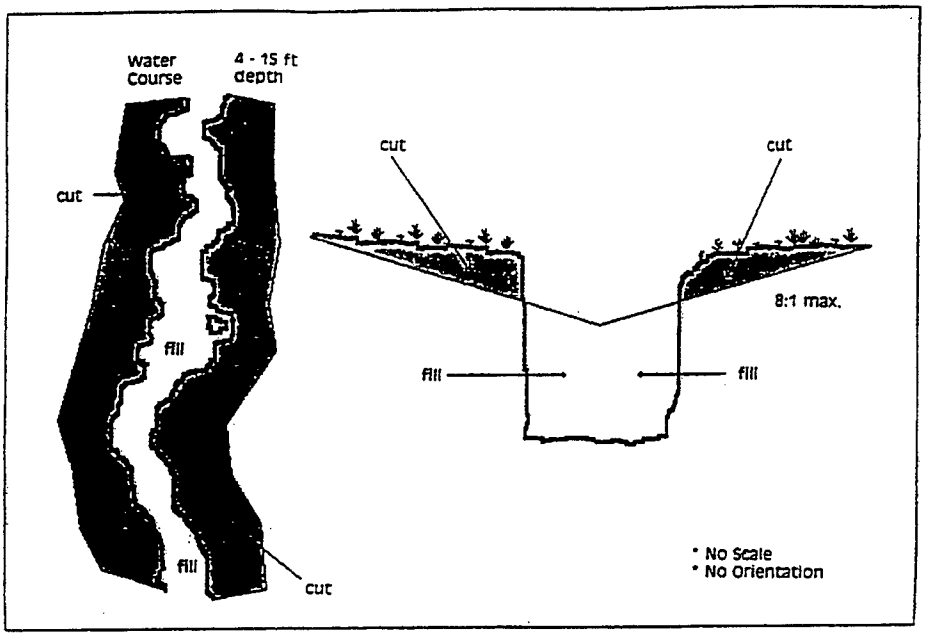
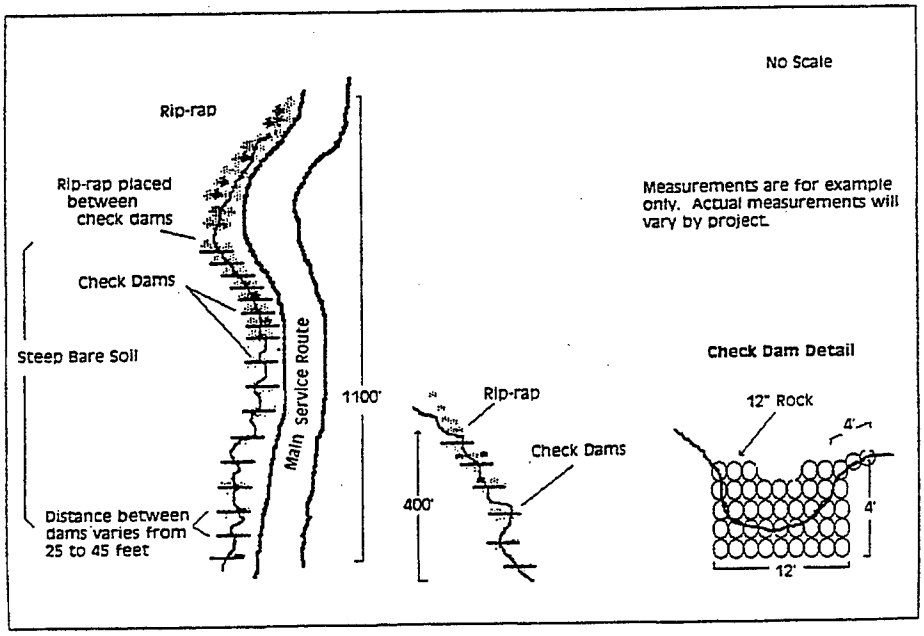


FIGURE 4 - Typical Erosion Control Check Dam Series



Regional Permit for Fort Carson and the Pinon Canyon Maneuver Site Erosion Control Activities

El Paso, Fremont, Pueblo, and Las Animas Counties, Colo
Regional Permit No. CO-97-30278

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FIGURE 5 - Typical Ro Hardened Crossing

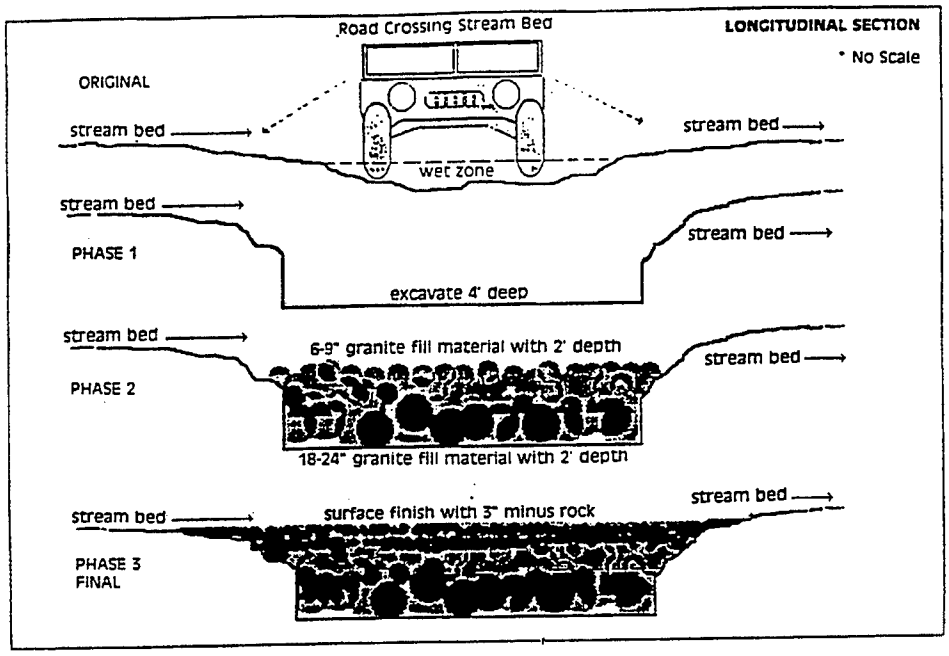
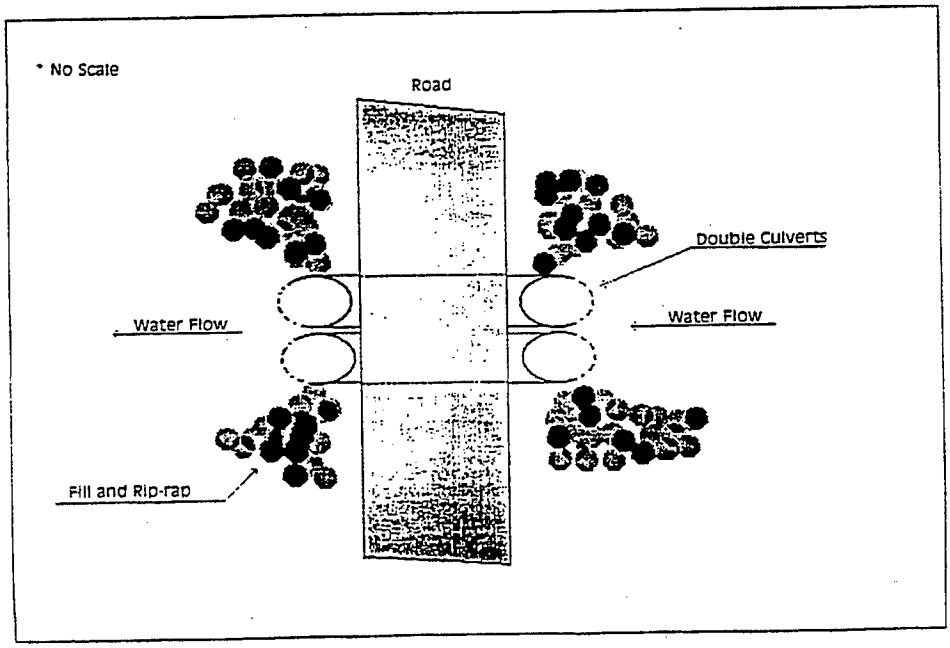


FIGURE 6 - Typical Culvert



Regional Permit for Fort Carson and the Pinon Canyon Maneuver Site Erosion Control Activities

El Paso, Fremont, Pueblo, and Las Animas Counties, Colo
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FIGURE 7 - Typical Erosion Control Terrace

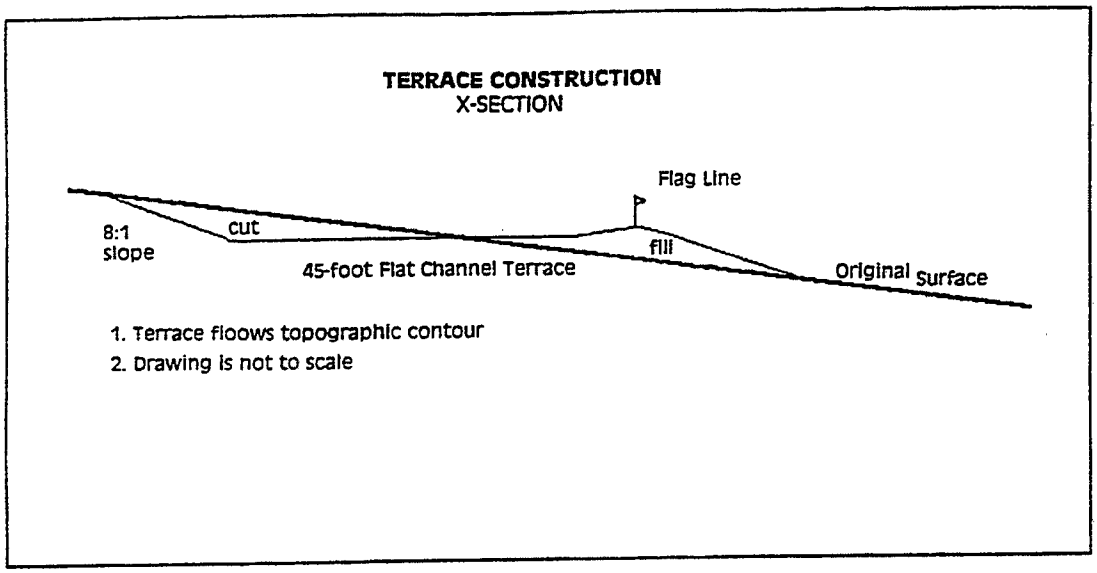
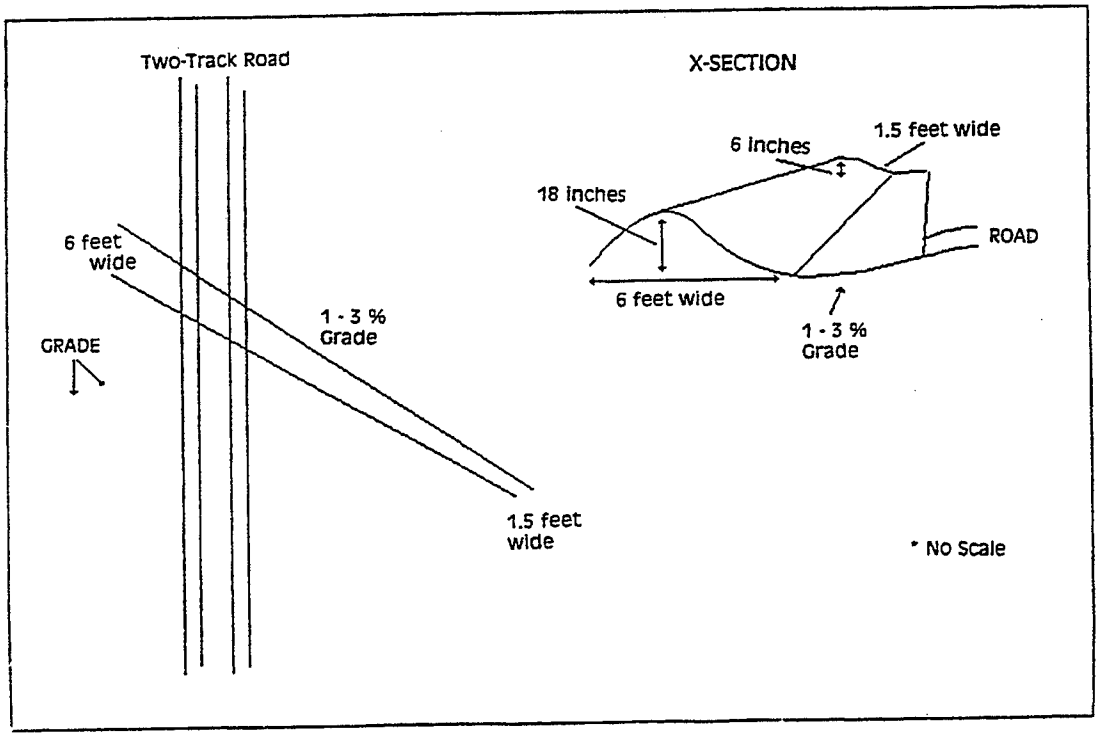


FIGURE 8 - Typical Water Turnout



Regional Permit for Fort Carson and the Pinon Canyon Maneuver Site Erosion Control Activities

El Paso, Fremont, Pueblo, and Las Animas Counties, Colo
Regional Permit No. CO-97-30278

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Appendix H
Guidelines to Prepare Integrated Natural Resources Management Plans for Army Installations and Activities

Guidelines to Prepare Integrated Natural Resources Management Plans for Army Installations and Activities

April 1997

Prepared by

U.S. Army Environmental Center
Aberdeen Proving Ground, Maryland 21010

With support from

Horne Engineering Services, Inc.
2750 Prosperity Avenue
Suite 450
Fairfax, Virginia 22031

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	April 1997	Final

4. TITLE AND SUBTITLE
Guidelines to Prepare Integrated Natural Resources Management Plans for Army Installations and Activities

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Army installations are required by Army regulation to prepare and implement an Integrated Natural Resources Management Plan. This document has been provided to aid installations in meeting this requirement.

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TABLE OF CONTENTS

PREPARATION GUIDELINES FOR INTEGRATED NATURAL RESOURCES MANAGEMENT PLANS

INTRODUCTION

The purpose of these guidelines is to provide natural resources managers at Army installations with guidance on preparing integrated natural resources management plans (INRMPs) that are consistent with federal laws, Army policy, and natural resources management philosophies.

The INRMP is the installation commander's adaptive plan for managing natural resources to support and be consistent with the military mission while protecting and enhancing those resources for multiple use, sustainable yield, and biological integrity. The purpose of the INRMP is to ensure that natural resource conservation measures and Army activities on mission land are integrated and are consistent with federal stewardship requirements. INRMPs should be written to reflect the scope of the Army's stewardship requirements to sustain native ecological resources on a landscape and watershed scale and to comply with current legal mandates.

These guidelines are intended to support the Army policy of preparing and implementing INRMPs as directed by Army Memorandum (21 March 1997), *Army Goals and Implementing Guidance for Natural Resources Planning Level Surveys (PLS) and Integrated Natural Resources Management Plan (INRMP)*, and to assure that Army stewardship requirements are being addressed and executed on Army installations.

These guidelines consist of four parts. Part I includes a discussion of the compliance requirements, goals, stewardship, National Environmental Policy Act (NEPA) requirements, INRMP preparation process, INRMP preparation principles, and INRMP standardization. Part II contains an annotated outline for each of the major chapters of the INRMP. Part III is a checklist of possible elements that could be included in the INRMP or documents that could be consulted or referenced. Part IV is a list of laws that evoke certain conservation actions.

PART I - PREPARATION GUIDANCE

1.0 OBJECTIVE

The objective of this document is to provide guidelines for the preparation of integrated natural resources management plans (INRMP) for U.S. Army installations and other lands used for the Army military mission, including those lands used by the State Army National Guards and U.S. Army Reserves. The management of natural resources is a series of processes over a long period and the INRMP provides incremental steps to achieve those long-term goals.

2.0 COMPLIANCE REQUIREMENTS

2.1 Federal Laws and Executive Orders

The preparation of an INRMP will normally encompass compliance with certain laws or executive orders. The following list, although not inclusive, includes most of the legal requirements that an installations would be concerned with. A more comprehensive list is found in Part IV of these guidelines:

- Sikes Act of 1962 (as amended through 1988)
- National Environmental Policy Act of 1969
- Endangered Species Act of 1973
- National Historic Preservation Act of 1966 (as amended through 1992)
- Archeological Resources Protection Act of 1979
- American Indian Religious Freedom Act of 1978
- Native American Graves Protection and Repatriation Act of 1990
- Federal Noxious Weed Act of 1974
- Clean Water Act of 1987
- Clean Air Act (as amended through 1990)
- Federal Insecticide, Fungicide, and Rodenticide Act
- Protection of Wetlands, 1977, Executive Order 11990
- Migratory Bird Treaty Act

2.2 Regulatory Requirements

In order for an INRMP to be valid, it must not only comply with applicable natural resource laws, but with Department of Defense Directives and Instructions, and Army Policies, as well.

Department of Defense Instruction 4715.3, *Environmental Conservation Program*, and Army Regulation 200-3, *Natural Resources - Land, Forest and Wildlife Management* both require military installations to prepare INRMPs. Army Memorandum (21 March 1997), *Army Goals and Implementing Guidance for Natural Resources Planning Level Surveys (PLS) and Integrated Natural Resources Management Plan (INRMP)* requires that all CONUS and certain OCONUS installations having more than 500 acres of mission lands shall have and execute a valid INRMP. Via official memorandum, the MACOM may request that a particular installation be exempted from these requirements. Adequate supporting evidence and reason must be provided with this

request. This request will be made to HQDA (DAIM-ED-N), which will appropriately concur or non-concur with the request and respond via memorandum to the MACOM.

3.0 GOALS OF INTEGRATED NATURAL RESOURCES PLANNING

- Support the installations operational mission
- Meet stewardship requirements
- Enhance quality of life

4.0 STEWARDSHIP THROUGH ECOSYSTEM MANAGEMENT

Stewardship of natural resources on an ecosystem scale addresses requirements of water quality, soil productivity, biological diversity of native flora and fauna, and compliance concerns. The INRMP must emphasize protection and management of soil and water resources, which will, in turn, support the sustainability of biological resources and of mission activities.

As a minimum, the scope of INRMP implementation should span the entire installation, but the consideration of the effects of that management should extend beyond installation boundaries. For example, downstream water quality must be considered when planning on-post activities.

Ecosystem management provides a means for the Army to both protect biodiversity and to provide high quality military readiness. The INRMP is a mechanism through which Army installations can maintain sustainable land use through ecosystem management.

Ecosystem management must be based on clearly stated goals and objectives, and the INRMP must identify those goals and objectives, means to accomplish them, and methodologies to monitor results against objectives. An INRMP is the mechanism through which both ecosystem management and biodiversity protection will be accomplished on Army installations in the context of accomplishment of the installation's operational mission.

5.0 NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)

Informed decision-making using the NEPA process must be an integral part of natural resources management on installations. By following the NEPA process, damages to natural resources on Army lands can be minimized or mitigated.

The adoption of a formal INRMP may be considered a major federal action as defined by Section 1508.18 in the Council for Environmental Quality's (CEQ) regulations. Planning documentation should satisfy NEPA requirements. Installations are encouraged to subject draft INRMPs to the scoping process defined within NEPA and AR 200-2. At a minimum, environmental analysis and solicitation of public comments will be completed in accordance with AR 200-2 prior to implementation of an INRMP. The INRMP must be finalized only after considering the alternatives, some of which may have been identified during a public participation process.

5.1 Management Alternatives

To assure that the best management strategies are selected for managing the natural resources, several possible management scenarios may need to be considered for each resource area. These alternatives could include different intensities of management, alternative best management practices to accomplish the goal, or even land use changes to accomplish the resource objectives. The NEPA process will allow full consideration of viable alternatives and will assure that critical issues are not overlooked during the decision making process.

5.2 Administrative Record

Maintaining an administrative record of INRMP preparation actions is an essential step required by NEPA. Public participation, coordination and consultation with other agencies, documents consulted, alternatives considered, and decisions made must all be a part of the administrative record. The level of public involvement and the amount of documentation required must be determined by the installation. If it is determined during the environmental review that the impacts of management decisions should be documented in an environmental assessment (EA), the record must document the decision making process that was used in selecting the preferred alternative. The EA should address proposed management actions together with the impacts of those actions on natural resources. Where specific proposed management actions cannot be described, the EA must establish some significance criteria that will guide future prescribed activities. With good NEPA documentation to support natural resources management decisions, the INRMP should serve as an excellent reference for tiering future NEPA documents.

6.0 INRMP PREPARATION PROCESS

The INRMP development process may not be exactly the same at all installations, but the guidance offered here could be considered a reasonable approach to assure that important issues are addressed. The chart in Figure 6-1 provides a suggested schedule for the development of the INRMP and associated NEPA documents. The flow chart in Figure 6-2 describes pictorially how the process should work.

6.1 Funding

The INRMP development, including associated NEPA documentation, should not exceed one year. However, it is important to program funding at least two years in advance. Revisions or updates must be anticipated and programmed into the Environmental Program Requirements (EPR) report no later than Year-4 of the life of the existing plan. Since the EPR report process encourages long term budget planning, it is easy to budget for INRMPs and accompanying NEPA documents at least five years out.

6.2 Decision Making

It is important that the INRMP preparation process be directly linked with the NEPA documentation. This does not mean that the general public or a environmental organization will dictate the contents of the INRMP. Once the military mission and natural resources objectives have been well identified, outside participation could be very helpful in identifying different alternatives to reach those objectives. The selection of the final preferred alternative is a decision

to be made by the Installation Commander and comes at the discretion of the Installation Commander. Appropriate documentation of these efforts becomes the NEPA documentation. An INRMP that is developed following the NEPA process will result in a well informed management program that is realistic and defensible, and will provide the greatest level of assurance of the sustainability of the future military mission. However, since this NEPA process usually requires a higher level of effort, additional costs must be included in the budget.

6.3 Installation Responsibility

It is imperative that installation staff take full responsibility for the INRMP preparation and implementation processes wherever possible. Using external sources to develop the INRMP is discouraged except where the necessary level of expertise does not exist at the installation. If some aspects of INRMP development should be accomplished using outside resources, entities responsible for implementation should maintain a sufficient level of quality control to assure that the plan appropriately address issues and that it is implementable.

Figure 6-1

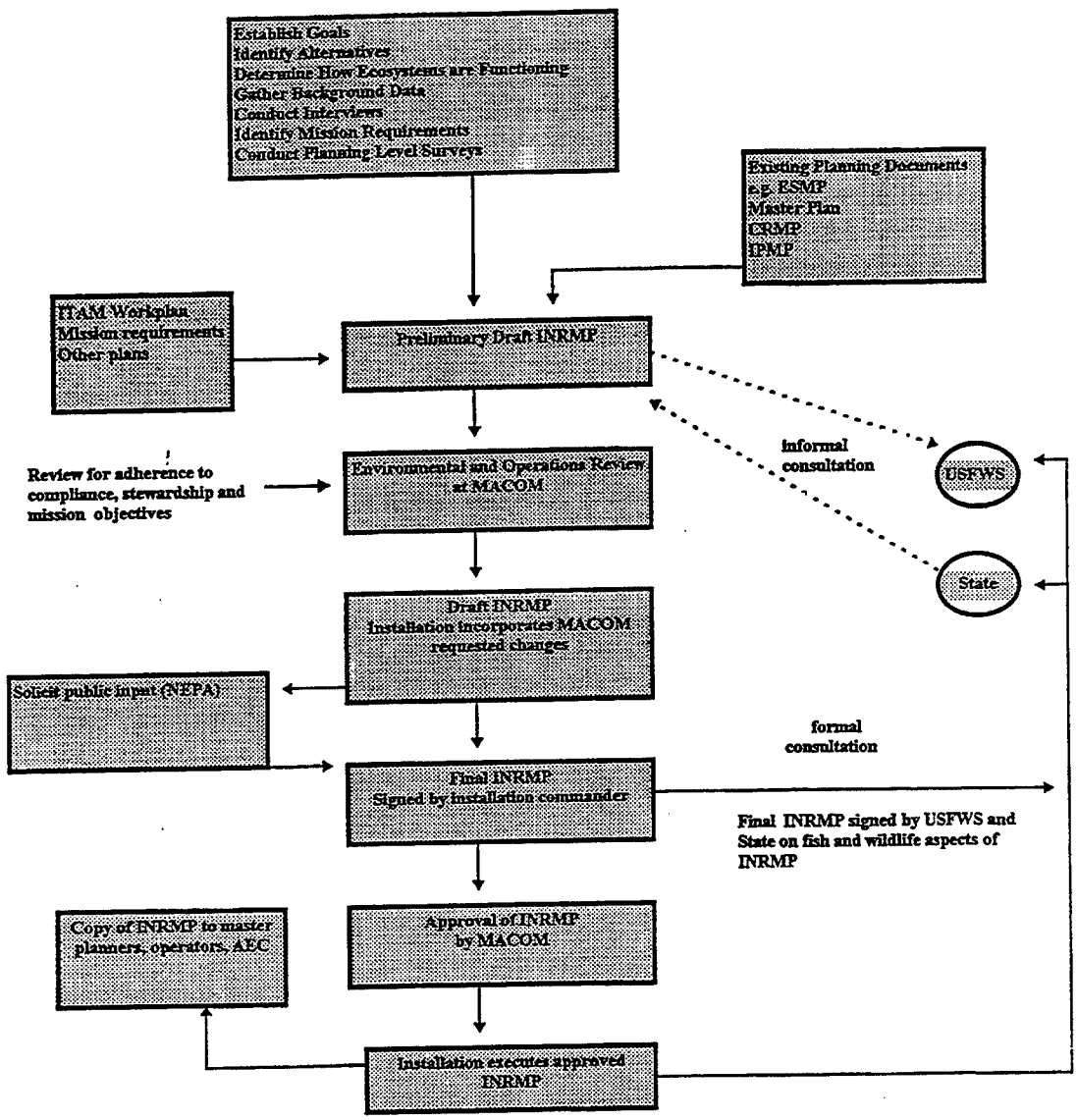
Suggested INRMP Development Schedule

ACTION	DAY
Start (Notice to Proceed)	0
Draft Project Management Plan	10
Final Project Management Plan	30
Draft INRMP & Draft DOPAA	90
Draft EA & Final DOPAA	150
Draft Final INRMP	240
Final EA & Draft FNSI	290
Army Signs FNSI	300
30-Day Notice of Availability	300
Army Approves Final INRMP	360

EA - Environmental Assessment
DOPAA - Description of Proposed Actions and Alternatives
FNSI - Finding of No Significant Impact

NOTE: This schedule assumes that an Environmental Impact Statement(EIS) will not be required. If an EIS is required, this schedule will need to be modified and extended accordingly.

INRMP Preparation Process
Figure 6-2



6.4 Installation Interviews

The INRMP preparation process typically starts with interviewing installation personnel within the following offices or directorates:

- Environmental Directorate or equivalent - Fish and wildlife management; forest management; threatened and endangered species management; agricultural and grazing outlease management; pest management; water quality monitoring; cultural resources management; environmental awareness; land management; other.
- Provost Marshal's Office - Natural resources law enforcement; land management security requirements.
- Outdoor Recreation - Natural resources related outdoor recreation activities; check in/check out procedures; hunter safety requirements; harvest data; number and location of hunting areas; other.
- Directorate of Engineering and Housing - Master Planning; future development plans; total installation size; acreage of training areas, impact areas, cantonment areas.
- Directorate of Plans, Training, and Mobilization or mission operations equivalent - Range and Training Land Program (RTLP); type of missions; troop and civilian strength; mission activity schedules; number and type of vehicles and equipment; number, use, and location of ranges, training areas, and impact areas; improvements in natural resources that would benefit or support the military mission, etc.
- Fire Department - Prescribed burn schedules, firebreak maintenance, wildfire response, etc.
- Public Affairs Office - Background information on installation history and military mission.
- Directorate of Safety or equivalent - Land management for ammunition quantity distances; noise buffer requirements.

6.5 Planning Level Surveys

Planning level surveys are those surveys that could make significant contribution to the understanding and management of existing resources. Existing information from surveys of installation resources must be utilized to the extent that they contribute to the preparation of the INRMP. If adequate surveys are missing or incomplete, those deficiencies must be identified within the content of the INRMP and their completion should be scheduled in the INRMP.

As a minimum, the following planning level surveys, and associated maps, should be included:

- Topography
- Wetlands
- Surface waters
- Soils
- Flora
- Vegetative communities
- Threatened and endangered species
- Fauna

Other surveys could include:

- Migratory bird surveys
- Geologic surveys
- Sensitive area surveys
- Cultural resources surveys
- Erosion surveys
- Others important to the installation

6.6 Other Background Materials

During the interviews, other relevant background materials should also be collected or reviewed. These background materials include the following documents:

- Relevant Environmental Assessments/Impact Statements
- Biological opinions
- Previous Natural Resources Management Plan
- Integrated Cultural Resources Management Plan
- Historic Preservation Plan
- Forest Management Plan
- Endangered Species Management Plans
- Agricultural/Grazing Leases and Plans
- Watershed Management Plans/Studies
- Wetlands Management Plan
- Integrated Pest Management Plan
- Installation Master Plan
- Installation Property Utilization Plan
- Installation Training Regulations
- Implementation Plan of the RTLP
- Installation Environmental and Noise Regulations
- Hunting Regulations
- Cooperative Fish and Wildlife Management Plan
- Erosion Management Plan

6.7 Resources Reconnaissance

Following the interviews and the collection of background materials, an installation reconnaissance is conducted to document the following features:

- Special interest areas
- Critical habitat
- General habitat
- Wetlands
- Streams and open water areas
- Commercial and urban forestry resources
- Riparian areas
- Firebreaks

- Agricultural and/or grazing areas
- Hunting and fishing areas
- Training and impact areas
- Firing ranges
- Other mission areas

Natural resources opportunities such as watchable wildlife areas, outdoor recreation opportunities, and public access potential should also be noted. In addition, grounds maintenance, forest management, and agricultural/grazing lease management practices should be documented.

The findings of the interviews and installation reconnaissance, as well as information obtained from the background research are synthesized and incorporated into the INRMP. The INRMP should describe the existing environment, the military mission, training activities, current research/surveys that are being conducted, current installation programs relating to natural resources management, data gaps and future studies necessary to fill those data gaps, consistencies and inconsistencies between the INRMP and other installation plans, measures to overcome any inconsistencies, land use restrictions, suggested management practices, priorities of proposed projects, responsibilities, and resource requirements, including staffing, equipment, and training. A checklist of potential components of an INRMP or information sources can be found in Part III of these guidelines.

6.8 Coordination and Review

The installation is encouraged to work with other organizations, agencies, and individuals both off and on the installation throughout the process of preparing the INRMP. Building partnerships is essential for ecosystem management to function. Informal reviews are encouraged, and formal reviews should be done as needed. These reviews should be consistent with the NEPA process.

It is especially critical that INRMP preparation be coordinated with those individuals responsible for the military mission. Military land planners and users should be part of the preparation team and not just reviewers of drafts. Their involvement should begin early in the planning process and continue throughout the execution phases. It is important that the INRMP be beneficial to the military mission.

Coordination and consultation with the State Historic Preservation Officer, the appropriate State agency, and the U.S. Fish and Wildlife Service (USFWS) is specifically required during preparation of the INRMP. Since these latter two agencies will be signatory to the fish and wildlife aspects of the INRMP, it is important to get their "buy-in" early in the process. They are also essential for determining the needs of local ecosystems balanced against the requirements of the installation's military mission.

Meeting with installation neighbors (e.g., National Park Service, U.S. Forest Service, and Native American Tribes) is also necessary in order to determine how installation activities may affect their lands, as well as to discuss management opportunities for shared ecosystems.

Neighboring communities could also contribute to the success of the planning effort. Once the mission and natural resource objectives have been drafted, concerned citizens and groups should be given opportunity to express their interests. This can be done through public notices or meetings, as necessary, during the NEPA process. One-on-one contact with groups with strong interests in installation natural resources is the best way to get productive input. The tactic of waiting until the installation has the plan completely coordinated prior to informal outside review is specifically not recommended.

Some agencies and outside individuals or groups may appropriately review the entire document, while others may only need (or desire) to review portions of the INRMP. These decisions should be made by the installation.

6.9 Approval Process

MACOMs must review the final draft before it is made available for public comment. After changes (if any) that are recommended by the MACOM have been reconciled, and the supporting NEPA documentation supports a finding of no significant impact (FNSI), the Installation Commander signs the FNSI. A Notice of Availability is then published and the INRMP, Environmental Assessment, and FNSI are made available for a thirty-day public comment period.

The Installation Commander then signs the INRMP and it is submitted to the appropriate State agency and the USFWS for concurrence on the fish and wildlife aspects of the INRMP. The concurrence of these agencies can be in the form of affixing signatures of appropriate officials on the "signature" page near the front of the document, or in the form of a signed letter of concurrence from the agency. Any substantive changes requested at this stage must be discussed with the MACOM prior to the agreement with such proposed changes. The signed INRMP is then provided to the MACOM for final approval. Unless MACOMs or HQDA specifically request an extension, approval is automatic after 60 days of receipt by the MACOM.

7.0 INRMP PREPARATION PRINCIPLES

The INRMP must be implementable and should conform to the principles discussed below.

- **Purpose.** The INRMP must meet legal mandates as well as Department of Army policies pertaining to INRMPs. The most important role of the INRMP is to serve as an effective installation tool for managing natural resources consistent with mission requirements. The INRMP could be viewed as a "snapshot" of the current situation with a management implementation strategy for at least the next five years.

- **Uniformity.** The INRMPs should maintain enough structural similarity so that reassigned natural resources managers and staff can be familiar with the components and organization of the documents.

- **Coordination.** The process of preparing the INRMP must include coordination with relevant agencies, organizations, and public interest groups, as well as appropriate coordination within installation and Army chains of command. The INRMP should address relationships between other existing environmental programs on the installation, and the appropriate portions of those plans should be incorporated by reference.

- **Automated Data Processing (ADP).** In addition to a hard copy of the INRMP with associated maps and support data, installations are encouraged to build their INRMP within ADP (including Geographic Information Systems) systems if they are organized and equipped to do so.

- **Applicability.** An INRMP is required for all Army lands having significant natural resources management opportunities as identified in current regulation. Included are those lands withdrawn from other federal agencies for military use by Congressional action or otherwise under the long term use of the Army. It also includes lands used by the Army National Guard and Army Reserve components. Some lands, such as impact areas, may not have the level of natural resources management potential as more accessible lands, but these lands should be addressed to whatever level of management is possible.

- **Ecosystem Management.** The INRMP should use an ecosystem management approach to natural resources management. The concept of single species management is no longer an appropriate approach to managing natural resources on Army lands. Each element of the ecosystem must be managed in perspective of its relationship to other parts of the ecosystem so that natural biological integrity is maintained to the extent feasible.

- **Data Collection.** The INRMP can be prepared at any stage of development of the installation's natural resources program. The INRMP should include summaries of data collected, but delaying the preparation of the INRMP to collect more data is usually not recommended.

Data collection systems should be a part of the INRMP, building upon existing data. The INRMP will become more accurate and more valuable as databases are developed. The INRMP should also identify data deficiencies and provide a remedy for such deficiencies through plan implementation.

- **Detail of Plan.** The INRMP should be in enough detail, including referenced material, to provide managers with information necessary to implement all phases of the natural resources management program, even if the manager is new to the installation.

- **Military Mission.** The needs and effects of the installation's military mission in terms of natural resources is a critical component of the INRMP. The INRMP must support military use requirements as well as natural resources needs to ensure the mission can be sustained. To the extent possible, mission activities should be described in enough detail to predict specific impacts on natural resources, as well as to describe appropriate management and remediation measures to be included in the INRMP. Information on the types of military mission activities, troop and

civilian strengths, numbers and types of vehicles and equipment that may impact natural resources, and range use should be presented. Information on the natural resources necessary to support the military mission should also be discussed, as well as the impacts that natural resources management may have on the military mission (e.g., certain areas may require special precaution due to the presence of endangered species). At installations where the Integrated Training Area Management (ITAM) program has been implemented, that program must be an integral part of the INRMP to assure direct support to the military mission. However, the INRMP is not a military mission operations document. The action proposed within an INRMP is the management of natural resources, not the fielding of the military mission. Where one exists, the Range and Training Land Program (RTLP) Range Development Plan (RDP) will be used as the source document for identifying the military mission.

- **Compatibility.** Natural resource programs described within the INRMP must be fully compatible with one another. Incompatibilities with other installation programs must be identified, and strategies must be presented to resolve these incompatibilities. This will assure complete integration with the installations master plan, the facilities maintenance plan, integrated pest management plan, cultural resources management plan, endangered species management plan, training and range area management plan, mobilization and deployment plans, and information management systems.

- **Enforcement.** Enforcement of natural resources laws must be included within INRMPs. The emphasis should be toward professional enforcement of these laws.

- **Issues.** Biopolitical issues affecting implementation of INRMP should be identified, and strategies should be outlined for their resolution. Parties involved in these issues may be either internal or external to the installation.

- **Priorities.** Priorities for individual programs within INRMP must be identified.

- **Implementation.** INRMPs must include an implementation strategy that addresses, at a minimum, funding and manpower. Implementation should also identify programs and projects within INRMPs that are required by law and those that are not. The INRMP should identify as many specific projects as possible, as opposed to generic discussions of programs. Implementation should be specific for the intended life span of the INRMP with the understanding that projects may change through adaptive management and may be affected by funding availability.

- **NEPA.** The NEPA process will be used to make informed decisions with regard to management and protection of installation natural resources. Information obtained during the environmental review process and other sources will be integrated into these plans as appropriate.

- **Public Access.** INRMPs must discuss public access policies, including access for hunting and fishing and other types of outdoor recreation, access for Native Americans to religious sacred sites, and access provisions for handicapped individuals.

8.0 INRMP STANDARDIZATION

INRMPs are organized by standardized chapters to allow users to quickly find items of interest. However, these chapters should not be written as stand-alone entities but should link and interrelate with one another to appropriately address overlapping ecosystem concerns.

8.1 Main Chapters

Main chapters will be numbered consecutively (1, 2, 3 etc.) and use the standard chapter headings within these Guidelines. Installations may not need each chapter heading, but the chapter should be included with a brief statement as to the reason for no content. Installations may determine a need to add a chapter, but additions should be kept to a minimum for consistency. Any additional chapter should be inserted at the most appropriate location. Chapters may have as many unnumbered paragraphs as needed to describe the programs and projects.

8.2 First Echelon Subchapters

First echelon subchapters will be numbered using a period followed by consecutive numbering (1.2, 3.4, etc.). Standard subchapter headings are provided in the Guidelines, but these may be modified if needed. These subchapters may have as many unnumbered paragraphs as needed for descriptions.

8.3 Additional Subchapters

Additional subchapter breakdowns will be identified using standard format (e.g. 3.2.1) with no restrictions on the number or nature of such further divisions of chapter content. Each subchapter will have a heading to be included in the Table of Contents. Subchapters may have as many unnumbered paragraphs as needed.

8.4 Page Numbering

Pages will be consecutively numbered starting with the first page following the Table of Contents. Decimals will not be used unless changes are made which require additional pages.

8.5 References and Appendices

In general, appendices will be used for short, but important, documents and items that are often needed for reference. References should be used for long documents or items seldom needed beyond the descriptions within the INRMP. For example, it might be appropriate to put descriptions of soil types found on an installation in an appendix while the document from which these descriptions were taken would be referenced. An important memorandum might be in an appendix, while an Army policy would be referenced. Local regulations might be included in an appendix, while an AR would more appropriately be referenced.

8.6 Glossary and Index

Neither a glossary nor an index is included within the Guidelines. A glossary may be included if installations believe it useful for persons who will use the INRMP. An index may be included if installations believe it important to locate specific words or terms. It is suggested that this decision be made based on the completeness and detail within the Table of Contents and the

clarity of chapter headings to determine chapter contents. Neither of these items should be included unless it is felt that they would be used by persons responsible for implementing the INRMP.

8.7 Number of Copies

A minimum of three copies will be sent to the appropriate MACOM with one of these to be forwarded to the U.S. Army Environmental Center. It is assumed that cosigners (normally the USFWS and the appropriate State agency) will each want at least one copy. Thus, the installation should assume that it will need a minimum of five copies beyond its internal use. The total number of copies will largely be determined by the number of ecosystem partners both off and on the installation. When possible and practicable, a digital copy of the INRMP should also be made available.

PART II - MAJOR CHAPTER OUTLINE

COVER PAGE

The Cover Page should include, as a minimum, the name of the document (Integrated Natural Resources Management Plan), the name of the installation, and the effective dates (a five year period).

SIGNATURE PAGE

This page will include those who approve the INRMP by signature. Normally this will be the installation commander, and the MACOM representative. The director of the appropriate State agency, and the regional director of the USFWS will approve the fish and wildlife aspects of the INRMP. In lieu of signatures from the state agency and the USFWS, concurrence letters from those agencies may be inserted immediately following the signature page.

PREPARER - REVIEWER PAGE

This page identifies those who prepared the INRMP and those who reviewed it. Reviewers should include installation and major command personnel. If the installation believes that agencies external to the installation were instrumental to review (and approval) of the entire plan, they may also be included. Those who only provided incidental technical advice or preparation assistance should be identified in the "Persons Contacted" chapter and not on the "Preparer-Reviewer Page."

PREFACE (Optional)

This would normally be a brief statement regarding the importance of natural resources management to the installation.

TABLE OF CONTENTS

Depending on the desires of the installation, the table of contents (TC) may be extremely detailed to second and third level subchapters, or it may be abbreviated to major chapters and subchapters. If the second option is chosen, it is recommended that a detailed TC be included at the beginning of each major chapter.

EXECUTIVE SUMMARY

The Executive Summary should include those items that executive personnel (installation, MACOM, and outside agencies/organizations) need to know in order to appreciate the importance of the document. This section should rarely exceed three pages in length.

Purpose. Include the statement from the Army Memorandum (21 March 1997), *Army Goals and Implementing Guidance for Natural Resources Planning Level Surveys (PLS) and Integrated Natural Resources Management Plan (INRMP)*, that the purpose of the INRMP is to ensure that natural resource conservation measures and Army activities on mission land are integrated and are consistent with federal stewardship requirements.

Environmental Compliance. Briefly describe the major legal requirements pertinent for natural resources management. The list of laws and Executive Orders in Part I, Chapter 2.0, although not all inclusive, may be used as a guide.

Scope. Describe the geographic and programmatic scope of the Plan. Briefly identify ecosystems toward which the Plan will be targeted.

Relationship to the Military Mission. Describe how the Plan will affect the military mission. This should be a very positive statement and should briefly identify:

- what the military activities are
- what natural resources are required to support mission activities
- how mission activities impact natural resources, either directly or indirectly
- the impacts of natural resources, or their management, on the mission

Partnerships. Indicate those who will be significant partners with the installation in implementing the Plan.

Planned Major Initiatives. Indicate, in priority order, the major programs which the Plan identifies as critical during the next five years.

Costs and Benefits. Identify costs in terms of total funds, personnel, installation support, and command support. Identify benefits in terms of the goals identified in Chapter 1-1.

Summary. Provide a concise summary of the effects of the Plan on the installation and its mission.

1.0 GOALS AND POLICIES

This chapter should have an introductory statement regarding the Army's commitment to natural resources management.

1.1 Goals

List general goals of the Plan. These should be specific to the needs of the installation, but should also be a reflection of the objectives addressed in the Army Environmental Strategic Action Plan. These objectives include the sustainability of lands for mission use, protection of natural resource assets, protection of cultural resource assets, provision of recreational opportunities, and multiple use accommodation.

1.2 Policies

These should be policies established by the installation that will be used to attain each goal identified in Section 1.1. These policies can also serve as a broad checklist to monitor the success of the plan.

1.3 Monitoring Progress

Include an annual monitoring procedure to determine the effectiveness of the INRMP.

2.0 LOCATION AND ACREAGE

2.1 Location

Describe the location of the installation in relation to the part of the state and the proximity to such things as major cities, rivers, and landmarks.

2.2 Acreage and Acquisition

Describe land acquisition, including property ownership, water rights, and the size of parcels obtained to create an historic progression of the total installation size. Note previous land uses. Acquisition information (e.g., how much land, from whom, when) is important to determine the overall effects of Army actions on the land and its natural resources over time.

2.3 Installation History

Briefly describe the history of the installation in terms of mission and major historic events.

2.4 Neighbors

Identify those who border the installation or are regionally significant. Installation activities which may affect these neighbors' lands should be indicated.

2.5 Satellite Installations

Identify other installations or lands directly affected by the INRMP.

3.0 MILITARY MISSION

3.1 Overview

Provide an overview of the military mission, including the types of training, troop data and civilian strengths, numbers and types of equipment which might impact natural resources, range use days, and weapon and munitions production or storage..

3.2 Natural Resources Needed to Support the Military Mission

Describe the natural resources that are necessary to support the military mission. (e.g. vegetation for concealment islands, open areas for testing, and stable soil for maneuvers). At RTLP-participating installations, use the information available as a product of the RTLP planning process described in AR 210-21.

3.3 Effects of the Military Mission on Natural Resources

Describe the nature of the impacts or potential impacts of the current military mission on soil, vegetation, water, and wildlife.

3.4 Effects of Natural Resources or Their Management on the Mission

Discuss the various laws, policies, and regulations regarding protection of various environment elements that affect the mission. Examples of these laws include wetland protection, cultural resources protection, and endangered species protection. In addition, describe natural resources conditions that currently affect the accomplishment of the military mission, or that could potentially impact the mission if they were not adequately addressed (e.g., steep slopes, wet soils, and severe soil erosion).

3.5 Future Military Mission Impacts on Natural Resources

Project changes in the military mission over the next five to ten years and describe the predicted effects of these changes on natural resources. Coordinate with the RTLP process where applicable.

4.0 FACILITIES

4.1 Overview

Describe the overall nature of the installation. Is it a small city, an industrial complex, or a relatively small community? What is the size of the cantonment area? Mention facilities such as airfields and training ranges. This chapter need not be lengthy. Additional discussion could be included in the accompanying NEPA document.

4.2 Transportation System

Describe the road, railroad, air, and waterway system for transportation on the installation. Include roads, trails, and airfields on the range which will be important to the implementation of, or affected by, the INRMP.

4.3 Water Supply

Describe the installation's water quantity needs to support domestic use, irrigation, or wildlife watering. Describe water quality as it affects domestic use, wildlife, or aquatic species. Describe the sources of water for the various uses, and the effects of water withdrawal on aquifers, streams, or other natural resources.

4.4 Projected Changes in Facilities

Describe projected changes of facilities or additional facilities that are planned for construction during the next five to ten years. Indicate any significant impacts or implications these projected changes or additions could have on management of natural resources or on the implementation of the INRMP. The installation's Real Property Master Plan should be consulted to retrieve this information.

5.0 RESPONSIBLE AND INTERESTED PARTIES

5.1 Installation Organizations

Note that the installation, as a whole, is responsible for implementation of the INRMP. Identify those positions and organizations on the installation important to the success of the INRMP along with their role in implementing the plan. This normally starts with the installation commander.

5.2 Other Defense Organizations

Identify other Defense organizations that will assist with the implementation of the INRMP. These organizations normally include the MACOM, and they may include such organizations as the Army Environmental Center, Corps of Engineers laboratories, Corps of Engineers Districts, or even non-Army agencies within Defense.

5.3 Other Federal Agencies

Identify other federal agencies that contribute to implementation of the INRMP. This will include the USFWS as a signatory partner. It may also include such agencies as the Natural Resources Conservation Service, the U.S. Forest Service, the National Park Service, the Bureau of Land Management, and others.

5.4 State Agencies

Identify state agencies that will have a role in implementing the INRMP. This will include the appropriate State natural resources agency as a signatory partner. It could also include the state soil and water conservation agency.

5.5 Universities

Identify universities involved in the implementation of the INRMP.

5.6 Contractors

Identify the role of contractors in the implementation of the INRMP. If any are already selected or are working on contracts, they may be identified by name.

5.7 Other Interested Parties

Identify conservation groups, clubs, or individuals interested in the development and implementation of the INRMP. This can include national groups such as The Nature Conservancy, Ducks Unlimited, and the Sierra Club. It, more likely, will include state or local groups such as the state affiliate of the National Wildlife Federation or the local rod and gun club. It should include neighboring landowners who have a role in the plan.

5.8 Signatory Agencies

The specific responsibilities of the signatory agencies (generally the USFWS, the appropriate State natural resources agency, and the installation) should be delineated. These responsibilities should include such items as access, funding transfers, services provided, research, enforcement, means to update the INRMP, and other items of mutual interest. If a formal agreement exists

between parties, this information may be included as an appendices to the plan as a convenient way to specifically identify the special relationships among the three signatory agencies.

6.0 NATURAL RESOURCES AND CLIMATE

This chapter describes the natural resources of the installation as well as the condition and trend of each resource. Existing or needed planning level survey can also be identified for each resource. This chapter will not address the planned management of resources. If desired, this chapter may be abbreviated in the INRMP and discussed more extensively in the supporting NEPA document.

6.1 Setting

Describe the major ecoregion(s) together with component ecosystems, and land uses bordering the installation.

6.2 Topography

Describe the general topographic features of the land, including elevation changes, steepness of slope, watersheds, and any others that may be important to managing natural resources.

6.3 Geology

Describe the geologic makeup of the installation. Items which might be included include structure, stratigraphy, and seismicity.

6.4 Climate

Describe the general weather patterns. Provide information on temperature, precipitation, and wind as well as other variables which might be locally important.

6.5 Petroleum and Minerals

Identify mineral and petroleum resources on the installation and whether or not they have commercial value. Especially note any characteristics of these resources, such as strip mined areas, that could influence the management of natural resources on the installation.

6.6 Soils

Generally describe installation soils and their properties, including erodibility characteristics. Identify prime farmland soils. Detailed characteristics, capabilities, and limitations can be included in an Appendix or referenced. Reference any published soil surveys that may exist. Summarize the status of soil productivity and identify trends in that productivity in recent years. Emphasize the effects of wind and water erosion.

6.7 Water Resources

Describe both surface and ground water resources. Include lakes, ponds, perennial and intermittent streams, wetlands, and floodplains. Summarize the status of water quality and identify the trend of that quality in recent years. Pay particular attention to nonpoint source pollution, especially sedimentation and other pollutants most affected by the INRMP.

6.8 Flora

Describe results of inventories of installation flora which could include Land Condition Trend Analysis (LCTA) surveys, floristic collections, forest inventories, endangered plant surveys, or habitat analyses. Summarize species accounts. Use appendices if needed for specific lists. Indicate succession trends. Refer to vegetation (or habitat) map if one is available. Identify wetlands, critical habitat, globally ranked communities, unique and sensitive habitats, and other areas of special concern. Identify ecosystems to be managed.

6.9 Fauna

Describe results of inventories of installation fauna which could include game census, endangered species surveys, LCTA bird or small mammal surveys, neotropical bird surveys, fish census, or other similar studies or surveys. Summarize species accounts. Use appendices if needed for specific lists. Identify livestock and exotic species on the installation.

6.10 Threatened and Endangered Species

Identify Federally listed endangered, threatened, and candidate floral and faunal species. Identify state endangered and special concern species, as well as species off-site which could potentially be affected. Summarize species accounts. Include the status of consultations with the USFWS.

7.0 LAND USE AND MANAGEMENT UNITS

7.1 Land Uses

Describe the various ways installation lands will be used. If non-Army lands within the confines of the installation boundary will be covered by the INRMP, uses of those lands should also be described. Land uses could include vehicle maneuvers, bivouacking, drop zones, munitions production or storage, buffers, impact areas, timber production, hunting and fishing, grazing, agricultural leasing, and cantonment, to name a few. Several land uses may overlap one another. Describe what each land use means in terms of natural resources management impacts or concerns. Describe the amount of acreage involved with each type of land use. Each of these units should be addressed in a separate sub-chapter (7.1.1, 7.1.2, etc.)

7.2 Management Units

Management units are land or water areas that can be physically identified on the ground and on maps or photography, and can be managed apart from other units. Management units could realistically be divided by fencelines, roads, streams, vegetation changes, soil changes, topographic changes, or by differences in mission related activities. The boundary would define where one type of management would end and another would begin. Examples of land management units would include training areas, munitions storage areas, forest management compartments, hunting areas, watersheds, grazing units; agricultural fields, ranges and impact areas, golf courses, and landscaped or other improved grounds. Include any constraints to natural resources management in areas such as training lands, firing ranges, and impact areas. Constraints to natural resources management may include the inaccessibility to areas due to the presence of unexploded ordnance or the occurrence of training. Provide acreage for each individual land

management unit, if available. It might be desirable to address management unit information in table format. It is suggested that management unit be graphically displayed on photography or maps and be stored in the GIS database where they could be rapidly and effectively used in future management decisions.

The last sub-chapter should describe a comprehensive land management unit system (e.g., forest compartments, watersheds, or training areas) to be used to implement an ecosystem approach to natural resources management. Identify the means used to denote each type of land management unit (name, number, alpha character), ensure these identifiers are on any maps used, and use the same identifier when referring to them in the narrative.

8.0 NATURAL RESOURCES MANAGEMENT

8.1 Objectives

Explain that this chapter includes all decisions that will be used to manage the installation's natural resources during the next few years. This chapter is the heart of the INRMP and should be specific and detailed to the extent necessary that program and projects can be effectively implemented. If there are data gaps or unresolved concerns, they should be identified in their appropriate location and remediation action planned. Management programs identified in each subchapter must be appropriately integrated with management programs in other subchapters. If past natural resources management history is important to the implementation of the INRMP, identify and explain in the appropriate subchapter anything of managerial significance.

8.2 Forest Management

Include forest management measures that will be implemented to manage the forest ecosystem, with special emphasis on the protection of biodiversity. Recognize the need for forest planning on forests that are not capable of commercial production. Describe forest and forest management relations to the mission. Include requirements for forest inventories and methods for monitoring/regulating harvests and health to maintain sustainability. For installations with a timber management program, include such aspects as harvest, regeneration, disease prevention, and timber stand improvement in terms of forest sustainability. Include, harvest/planting schedules, species, volumes, and other parts of the management program. Describe the effects of pesticides or prescribed fires on other natural resources.

8.3 Agricultural/Grazing Outleases

Describe the agricultural and grazing outleasing program. The effects of farm management practices associated with these outleases, in terms of the total natural resources program and installation ecosystems, should be described. In addition, implementation of best management practices (e.g., crop rotation, no till agriculture, integrated pest management) should also be discussed. Summarize any conservation plan associated with a particular agricultural outlease.

Describe the installation's grazing management program. If controlled grazing exists on the installation, a grazing management plan must be included or attached. Discuss the type of grazing that occurs (e.g., cattle, sheep), the grazing system employed, the fencing arrangement, the length of the grazing season, the number of animal unit months, emergency drought plans, and special

provisions that are outlined in the grazing lease. Discuss how stocking rates, densities, and seasons are determined, and who is responsible for those determinations. Discuss how the grazing program affects other elements of the ecosystem and the military mission. Discuss prescribed fires or other management practices that may be used to manage rangeland resources.

8.4 Habitat Management

Describe habitat improvement projects which might include items such as food, nesting, and cover plantings, prescribed fire, nesting boxes, disking, aquatic weed control, fish structures, pond construction, and so forth. Indicate the locations, scope, and schedule of practice implementation to allow managers the opportunity to allocate personnel and resources for implementation. Specifically include measures taken for endangered species and neotropical migrants. Ensure that other habitat management programs do not conflict with habitat management provisions required within endangered species management plans.

8.5 Game Harvest Management

Describe game population management programs. Include such items as population trends, hunting and fishing regulations, and important considerations for the management of each species or group of species on a sustained use basis with consideration for ecosystem integrity.

8.6 Rare, Threatened, or Endangered Species Management

If the installation has an Endangered Species Management Plan (ESMP), that plan should either be made a component of the INRMP, or the related natural resources management actions described in the ESMP must be fully integrated into the INRMP. In addition to integration of endangered species management into the content of the INRMP, all or parts of the ESMP can be attached or referenced in the INRMP. Any conflicts identified between the INRMP and the ESMP must be resolved prior to INRMP signature.

8.7 Furbearer Management

Describe programs to manage furbearer populations.

8.8 Other Nongame Species Management

Describe population management efforts for nongame species which are not included in the above sections. Programs might include neotropical migrants, amphibians/reptiles, bats, or other species which are emphasized.

8.9 Transplants and Stocks

Describe projects to reintroduce species to the installation. Describe stocking programs, including both fish and wildlife. Identify the species involved, numbers, sizes, locations, and purposes of stocking and transplanting. Discuss biodiversity aspects of these programs, especially the degree of competition between indigenous and non-indigenous species. The introduction of non-indigenous species must comply with Executive Order 11987.

8.10 Wetlands Management

Describe programs that improve the quality of wetlands or efforts to develop, protect, or enhance wetlands. Include specific areas to be managed, management techniques, and species and habitat types that will benefit from such management. Floodplain and riparian area management should be included in this section.

8.11 Water Quality Management

Describe programs specifically designed to improve the quality of water. Discuss how these programs affect water quality off the installation. Describe the use of Stormwater Pollution Prevention Plans within the natural resources program. Discuss the effects of off-installation activities on installation water quality. Relate to the Water Quality monitoring section in Chapter 9.

8.12 Land Rehabilitation and Maintenance

For both ITAM and non-ITAM participants, describe programs designed to restore and maintain damaged or intensely used lands, including damage by wind and/or water. Include efforts for dust control.

8.13 Soil Resources Management

Describe existing or potential soil erosion concerns and their probable causes. Identify if a soil erosion inventory has been made or should be made. Establish a priority for dealing with soil erosion problems. Be site specific if possible. Discuss proposed treatment measures, including mechanical shaping, vegetating, fertilizing, livestock exclusion or other protection, and re-establishment period. Include recommendations for future uses of the sites. Re-vegetation practices should consist of native species to the extent that those species can adequately address the soil stability objectives.

8.14 Cantonment Area Management

Describe programs to manage cantonment area lands. Include general grounds maintenance, but only to the degree that it is part of natural resources management. Include reduced grounds maintenance programs. Discuss golf course management and its relationship to natural resources and water quality. Specifically discuss implementation of the 26 April 1994 Presidential memorandum on Environmentally and Economically Beneficial Practices on Federal Landscaped Grounds.

8.15 Pest Management

This chapter should incorporate appropriate methodologies and strategies identified in the installation's Integrated Pest Management Plan (IPMP). Portions of the IPMP can be referenced or attached to the INRMP, but relevant pest management issues must also be fully integrated in the discussion within the appropriate subchapters of the INRMP. DoD Instruction 4150.7 (DoD Pest Management Program) 22 April 1996, and AR 420-76 (Pest Management) are the relevant pest management policy regulations.

Describe programs to control noxious or undesirable plants, animals, or forest diseases. Discuss the role of herbicides and their effects on ecosystem health in general. Specifically

discuss compliance with the 26 April 1994 Presidential Memorandum which requires pollution prevention by reducing fertilizer and herbicide use, recycling green waste, and minimizing runoff. Include pesticide reporting requirements as well as applicator training/certification requirements. Cross reference to other sections of the INRMP where the overall Integrated Pest Management Plan may be discussed.

8.16 Fire Management

Describe programs to reduce the incidence of, or to suppress, wildfires. Include the different degrees of protection for specific areas, identify responsibilities (reporting, suppression, firebreak maintenance, etc.), and discuss the effects of wildfires on natural resources.

Describe the installations prescribed fire management program. Discuss the use of this program to reduce fuel loading and potential wildfires. Also discuss the use of prescribed fire for habitat improvement, grazing management, and open space creation for military training scenarios. Identify the areas to be burned, the objectives of the burn, the rotation schedule, and the season of burns. There must be a detailed management plan for each prescribed burn. These plans should be a part of the INRMP or adequately referenced.

8.17 Special Interest Area Protection

Describe provisions to protect special areas such as critical habitat, wetlands, highly erodible lands, important wildlife habitat, rare or unusual plant communities, prime farmland, stream corridors, and buffers around sensitive physical features and habitat types. Be specific as to restrictions, treatments, and timing of treatments. Ensure that requirements to protect endangered species are here, and that other features within the INRMP do not contradict these compliance requirements.

8.18 Training Requirements Integration (TRI)

At ITAM participating installations, describe the TRI program and its role in minimizing damage to natural resources from military mission activities. Include trainer agreed upon regulations and restrictions, training area rotations, and provisions for environmental considerations during mission siting.

9.0 INVENTORYING AND MONITORING

9.1 Objectives

Indicate objectives of this chapter specific to the installation.

9.2 General

Inventorying is done for the purpose of ascertaining the relative abundance and distribution of various natural resources for the purpose of structuring a management program that will affect these resources.

Monitoring of natural resources is done at established intervals to detect trends or responses to management activities.

Unless the inventorying or monitoring methodology is experimentally controlled, the results will only provide general information and cannot necessarily be used to determine causality.

Explain the purposes/goals of inventory and monitoring in terms of their use for adaptive management. Within each of these sections, explain what inventory or monitoring data are available, and what more may be needed for Plan implementation.

9.3 Flora Inventory and Monitoring

Describe the collection of baseline data and the means used to monitor significant changes in flora. Databases involved might include forest inventory, LCTA, vegetation mapping, satellite imagery and aerial photographs, endangered plant surveys, habitat surveys, range quality determination, and other indicators of ecosystem integrity. Specifically include measures to monitor changes in the capability of the land to support the military mission.

9.4 Fauna Inventory and Monitoring

Describe the collection of baseline data and the means used to monitor significant changes in fauna on the installation. Databases involved might include game and non-game surveys, endangered species surveys and monitoring, livestock monitoring, LCTA animal surveys, and other indicators of ecosystem integrity.

9.5 Water Quality Monitoring

Describe systems used to monitor water quality as it relates to land use and management.

9.6 Soil Resources Inventory and Monitoring

Describe whether existing soil inventories are current, complete, and provide utility in making management decisions. Identify if existing inventories need to be upgraded or if other new inventories are needed. Current published soil surveys and soil erosion surveys are essential for implementation of an INRMP. Soil erosion should be monitored on a regular basis, and especially following damaging events such as high winds, heavy rains, or excess trafficking.

9.7 Data Storage, Retrieval, and Analysis

Describe the means to store, analyze, and use the data collected. This might include GIS or standard database management computer software and hardware.

9.8 Five Year Plans

Summarize and schedule the inventory and monitoring projects to be accomplished in the next five years.

10.0 RESEARCH AND SPECIAL PROJECTS

10.1 Objectives

Identify chapter objectives specific to the installation.

10.2 Research Mechanisms

Describe means used to accomplish any projects that are planned or needed to help the installation implement the INRMP. These might include research done in-house, through

universities, by Corps of Engineers laboratories, by non-governmental organizations such as The Nature Conservancy, or by Intergovernmental Personnel Act (IPA) employees.

10.3 Planned Research/Special Projects

Describe research/special projects needed and planned during the next five to ten years. Prioritize them and indicate the planned mechanism for accomplishment.

11.0 ENFORCEMENT

11.1 Objectives

Identify chapter objectives specific to the installation.

11.2 History and Authority

Describe the organizational history of the natural resources law enforcement program. Include sources of authority. Describe current organization and manpower. Describe efforts to attain or maintain professional natural resources law enforcement status.

11.3 Jurisdiction

Describe the jurisdiction (exclusive, concurrent, and/or proprietary) of each part of the installation with regard to enforcement of natural resources laws.

11.4 Enforcement Activities

Describe the emphasis and activities of the enforcement program and its relationship to the installation natural resources program.

11.5 Training

Identify training to ensure enforcement officers maintain levels of competency normally required by professional natural resources enforcement agencies.

12.0 ENVIRONMENTAL AWARENESS

12.1 Objectives

Identify chapter objectives specific to the installation.

12.2 Military Personnel Awareness

Describe the Environmental Awareness program in terms of educational materials that are used to instill a conservation ethic in military personnel. Materials used on various Army installations include posters, videotapes, stickers, maps, field handbooks, reference or soldiers' field cards, and similar items. Identify those involved and the process for awareness transfer.

12.3 Public Awareness

Use individual subchapters to describe conservation education, environmental awareness, public relations, and other programs designed to inform the public or military users of the value of natural resources conservation and ways they can help with the program. Include such methods

as personal communications, public forums, newspapers, television, radio, prepared talks, special events, conservation education centers, nature trails, and professional talks.

13.0 OUTDOOR RECREATION

13.1 Objectives

Identify chapter objectives specific to the installation.

13.2 Military Mission Considerations

Describe the relationship between opportunities for outdoor recreation and military mission activities. Describe use of impact areas for recreation.

13.3 Public Access

Describe installation policies regarding public access, including access for the handicapped, for natural resources based recreation. Also address access required by the American Indian Religious Freedom Act of 1978.

13.4 Hunting, Fishing, and Trapping Programs

Describe hunting, fishing, and trapping programs and the associated fee assessment and collection methods. Include description of systems used to allow access to range areas, current and potential use of the programs, and specific projects used to improve these programs. Discuss the relationship between these programs and the wildlife population management programs discussed in Chapter 8.

13.5 Other Natural Resources Oriented Outdoor Recreation

Describe outdoor recreation programs that specifically relate to natural resources, exclusive of hunting, fishing, or trapping. These programs might include float trips, gold panning, nature study, hiking, skiing, or camping. Note relationships between these programs and natural resources management to ensure sustainability and protection of ecosystems.

13.6 Recreation and Ecosystem Management

Discuss the relationships between recreation activities and the maintenance of functional ecosystems.

13.7 Safety and Security

Discuss both safety and security issues that could affect accessibility of the installation for natural resources-related outdoor recreation.

14.0 CULTURAL RESOURCES PROTECTION

14.1 Objectives

Identify chapter objectives specific to the installation.

14.2 Cultural and Historic Resources

Briefly describe the cultural and historic resources on the installation in sufficient detail so that major concerns and potential conflicts between military mission, natural resources management, and cultural/historic resources are addressed.

14.3 Natural Resources Management Implications

Describe the relationship between natural resources management and the development and/or implementation of the Integrated Cultural Resources Management Plan and similar documents. Include the role of natural resources enforcement personnel. Include specific steps to ensure that implementation of the INRMP is consistent with cultural resources management.

Ensure that installation procedures to accomplish consultation requirements under Section 106 of the National Historic Preservation Act are accomplished with any pertinent action (specifically identified) within the INRMP. Do the same for compliance with the Archeological Resources Protection Act, the Native American Graves Protection and Repatriation Act, the American Indian Religious Freedom Act, and EO 13007 (Indian Sacred Sites).

Data recovered from archeological and historic sites investigations may be useful for determining the effects of native activities on natural resources or as a basis for determining trends in biodiversity. If sacred sites are identified on the installation, it is critical that any proposed modifications of terrain or plant species composition be considered in light of consultation with affected tribes.

15.0 NATIONAL ENVIRONMENTAL POLICY ACT

15.1 Objectives

Identify chapter objectives specific to the installation. NEPA documentation will be done in accordance with guidance in AR 200-2.

15.2 NEPA Responsibilities and Implementation

Identify the office responsible for implementation of NEPA at the installation. Briefly discuss NEPA specific to the installation, including process details, references to procedures and regulations, and the role of the proponent in NEPA preparation.

15.3 NEPA and Natural Resources Management

Describe the use of NEPA in the evaluation of environmental impacts and alternative actions for the management of natural resources. Describe the NEPA documentation that accompanies the INRMP. Briefly note the steps taken to achieve this documentation, such as scoping and coordination. Include the role of natural resources personnel, especially with regard to individual site development plans that affect natural resources. Include plans for mitigation and enforcement of mitigation. Note that specific natural resource projects done in the future may require additional NEPA review if they do not fall within the scope of significance criteria established in the NEPA document for the INRMP.

16.0 BIOPOLITICAL ISSUE RESOLUTION

Use subchapters to describe each significant biopolitical issue (both internal and external) that directly impacts the implementation of the INRMP. Include issues that are significant even if they are not based on fact. Be as specific as possible with regard to which programs are affected and the extent affected. Include strategies to resolve these issues. Such discussions of strategy do not have to include discussions of tactics which would reduce their effectiveness if made public.

17.0 IMPLEMENTATION

17.1 Organization, Roles, and Responsibilities

Describe the organization necessary to implement the INRMP. Include any relationships among organizations (internal and external) that must be built. Identify the roles and responsibilities of individuals, directorates, etc. within the organization to fully implement the INRMP.

17.2 Manpower

Identify the manpower required to implement the INRMP. Describe the sources of that manpower (internal and external). Include personnel training required.

17.3 Project/Programs Priorities

List each project/program identified within the INRMP which is proposed for accomplishment during the next five years. Prioritize these projects by categories such as High Priority, Important, and Less Important. Include projects/programs required for compliance as High Priority. Other projects/programs that are very meaningful to the installation might also be in the High Priority category. This category might include programs designed to directly benefit the military mission and those which significantly improve the installation quality of life. Generally, lesser important projects are those which would be the first cut or included on an "if funding available" basis. Timelines for implementation of each project or program should be specified.

This information could effectively be presented in a table. Each project or program could be referenced back to the appropriate sub-chapter where it was discussed.

17.4 Implementation Funding Options

Describe sources of funding for INRMP implementation. Explain how high priority items will be put into funding channels. Specifically include INRMP implementation funding requirements in the EPR Report. Estimate the total cost of implementing the INRMP by project, by environmental category, and by year.

17.5 Command Support

Describe the role of command support to the implementation of the INRMP. Specifically identify actions needed to implement the Plan.

REFERENCES

List documents cited in the INRMP using conventional scientific methodology.

PERSONS CONTACTED

List persons who provided information used in the preparation of the INRMP. Such listing does not imply endorsement of the INRMP.

APPENDICES

Liberal use should be made of figures and tables throughout the text if they provide useful guidance for INRMP implementation. If they are not appropriate to be included within the text, they should be included as appendices.

Appendix A: Figures

Appendix B: Lists

PART III - INRMP PREPARATION CHECKLIST

This checklist is intended as a reminder of resource materials that could be used as references during the development of the INRMP or of elements that could be incorporated into the INRMP. This list is not inclusive, nor may every element listed here be applicable for every installation.

1.0 GENERAL

- ☐ Installation's organizational structure
- ☐ Satellite installations
- ☐ Responsibilities of each branch within the environmental directorate
- ☐ Number and type of staff within the environmental directorate
- ☐ Environmental directorate staff training needs
- ☐ Current partners (e.g., universities, other federal/state agencies) working with the installation
- ☐ Neighbors surrounding the installation
- ☐ Surveys or assessments currently being conducted
- ☐ Surveys or assessments needed
- ☐ Geographic Information System (GIS) capabilities
- ☐ Software and data management
- ☐ Microcomputer systems
- ☐ History of natural resources management at the installation
  - Forest management
  - Fish and wildlife management
  - Land management
- ☐ Structure of Integrated Training Area Management (ITAM) program
- ☐ Installation's ITAM workplan
- ☐ Copies of related Environmental Assessments/Environmental Impact Statements
- ☐ Copies of relevant maps (e.g., soil surveys, wetlands, training areas, watersheds)

2.0 MILITARY MISSION

- ☐ Overview of military mission
- ☐ Number, type, and location of training, testing, storage, and impact areas
- ☐ Number, type, and location of firing ranges
- ☐ Type of military activities within each area
- ☐ Copies of maps depicting training, testing, storage, and impact areas
- ☐ Copies of maps depicting firing ranges
- ☐ Copies of current and future training schedules (if available)
- ☐ Number of units and troops that train on the installation
- ☐ Number and type of vehicles and equipment
- ☐ Type of munitions or ordnance used
- ☐ Projected changes in the military mission
- ☐ Copy of Range Development Plan (RDP)
- ☐ Copies of guidance for petroleum, oil, lubricants (POL) and antifreeze disposal

3.0 LAND MANAGEMENT

- ☐ Published soil survey
- ☐ Soil erodibility
- ☐ Locations most susceptible to soil erosion
- ☐ Copies of erosion control plan
- ☐ Possible Land Rehabilitation and Maintenance (LRAM) projects (e.g., training area rehabilitation, road drainage correction, establishing dedicated river crossings, hardened sites)
- ☐ Training Requirements Integration (TRI)
  - Training area rotation
  - Mission siting
  - Training restrictions
- ☐ Number and location of agricultural/grazing leases
- ☐ Provisions of lease agreements
- ☐ Copies of agricultural/grazing leases
- ☐ Water quality monitoring (surface water and groundwater)
- ☐ Stormwater management requirements
- ☐ Copies of Stormwater Management Plans
- ☐ Special Area Protection
  - Special status plant species
  - Waters of the United States (including wetlands)
  - Riparian communities
  - Other communities
- ☐ Land use restrictions (e.g., streamside forested buffers)
- ☐ Copies of Installation Master Plan/Property Utilization Plan

4.0 VEGETATION MANAGEMENT

- ☐ Land Condition Trend Analysis (LCTA)
- ☐ Range condition surveys
- ☐ Floral surveys
- ☐ Wetlands surveys
- ☐ Use/need for aerial photographs/satellite imagery
- ☐ Photo points
- ☐ Vegetative mapping efforts
- ☐ Fire Management
  - Firebreaks (location and maintenance)
  - Prescribed fire (location of burn sites, burn schedules)
  - Wildfire suppression
  - Wildfire impacts on natural resources

5.0 FISH AND WILDLIFE MANAGEMENT

- ☐ Faunal inventory and monitoring
  - Game species
  - Nongame species
  - Threatened and endangered species
  - Fish species
  - Neotropical birds
  - Livestock (if applicable)

6.0 RARE, THREATENED, AND ENDANGERED SPECIES

- ☐ Copy of Endangered Species Management Plan
- ☐ Endangered species act consultation
- ☐ Effects of installation activities on endangered species
- ☐ Endangered species activities
  - Preactivity surveys
  - Abundance and distribution studies
  - Predator and prey population studies
  - Incidental take record keeping
- ☐ Inventorying and monitoring
- ☐ Copies of biological assessments
- ☐ Copies of biological opinions
  - Permitted number of "takes"
  - Conditions for "harassment" (e.g., harassment from training is inadvertent)
  - Necessary reasonable and prudent measures

7.0 PEST MANAGEMENT

- ☐ Responsibility of noxious animal control
- ☐ Noxious Plant Control
  - Noxious plants present on the installation
  - Noxious plant control methods
  - Responsibility for noxious plant control
- ☐ Animal Control
  - Domestic pets
  - Insects and rodents
  - Predators and related pests
  - Feral animals
  - Stray cattle

8.0 ENVIRONMENTAL AWARENESS

- ☐ Copies of installation environmental regulations
- ☐ Copies of installation training regulations
- ☐ Handbooks
- ☐ Posters

- ☐ Field Cards
- ☐ Earth Day activities
- ☐ Installation newspaper
- ☐ Other

9.0 OUTDOOR RECREATION

- ☐ Hunting
  - Game harvest strategies
  - Population trends of game species
  - Maintenance of harvest data
  - Hunting seasons (bow, rifle, shotgun, blackpowder)
  - Bag limits
  - Check in/check out procedures
  - Hunter safety requirements
  - Number and location of hunting areas (map of hunting areas)
  - Restrictions in various hunting areas
  - Hunting permit fees
  - Other fees (e.g., access fee)
  - Enforcement
- ☐ Fishing
  - Type of fish species present on the installation
  - Type of fish species stocked/provided by the state, USFWS , or commercial hatcheries
  - Location/map of fishing areas
  - Water release schedules (if applicable)
  - Fishing permit fees
  - Other fees (e.g., access fee)
  - Check in/check out procedures
- ☐ Other Natural Resources Related Activities
  - Hiking
  - Camping
  - Biking
  - Boating
  - Other

10.0 CULTURAL RESOURCES MANAGEMENT

- ☐ Cultural resources surveys completed
- ☐ Future cultural resources surveys scheduled
- ☐ Historic building surveys completed
- ☐ Future historic building surveys scheduled
- ☐ Number of historic/cultural sites on the National Register of Historic Places
- ☐ Number of sites eligible for the National Register of Historic Places
- ☐ Copies of historic preservation plans (HPPs)
- ☐ Copies of cultural resources management plans (CRMPs)

PART IV - LAWS WHICH EVOKE CONSERVATION ACTIONS

	Influence	
	High	Medium
Abandoned Shipwreck Act of 1987 [43 USC 2101]		X
American Indian Religious Freedom Act of 1978, as amended [42 USC 1996] [PL 95-341]		X
Anadromous Fish Conservation Act (1965) [16 USC 757]		X
Antiquities Act of 1906 [16 USC 431] [PL 59-209]		X
Archaeological and Historic Resources Management [DoDD 4710-1]	X	
Archaeological and Historic Data Preservation Act of 1974 [16 USC 469]		X
Archaeological Resources Protection Act of 1979 [16 USC 470] [PL 96-095]	X	
Bald Eagle Protection Act of 1940 [16 USC 668]		X
Clean Air Act (CAA) (1955) [42 USC 7401]		X
Clean Water Act (CWA) (1972) [33 USC 1251] [PL 92-500]	X	
Coastal Zone Management Act of 1972 [16 USC 1451] [PL 92-583]		X
Conservation and Rehabilitation Program on Military and Public Lands (PL 93-452)		X
Conservation Programs on Military Reservations (Sikes Act) [16 USC 670] [PL 86-797]	X	
Curation of Federally Owned and Administered Archaeological Collections [36 CFR § 79]	X	
Determination of Eligibility for Inclusion in the National Register of Historic Places [36 CFR § 63]	X	
Emergency Wetlands Resources Act of 1986 [16 USC 3901]		X
Endangered Species Act (ESA) [PL 93-205]	X	
Environmental Protection and Enhancement: Subpart H Historic Preservation [32 CFR § 650]		X
Erosion Protection Act [33 USC 426]		X
Estuary Protection Act of 1968 [16 USC 1221]		X
Farmland Protection Policy Act of 1981 [7 USC 4201] [PL 97-098]		X
Federal Cave Resources Protection Act of 1988		X
Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), as amended [7 USC 136]	X	
Federal Land Policy and Management Act of 1976 [43 USC 1701]		X
Federal Noxious Weed Act of 1974, as amended [7 USC 2801]	X	
Fish and Wildlife Conservation Act of 1980 [16 USC 2901] [PL 96-366]		X
Fish and Wildlife Coordination Act of 1934 [16 USC 661]		X
Food, Agricultural, Conservation and Trade Act of 1990 (Pesticide Reporting) [7 USC 136l]		X
Historic Preservation Certificates [36 CFR § 67]		X
Historic Sites Act of 1935 [16 USC 461] [PL 74-292]		X
Historic Preservation [AR 420-40]	X	
Hunting, Fishing and Trapping on Military Lands		X
Indian Sacred Sites [EO 13007]	X	
Lacey Act of 1900		X
Marine Mammal Protection Act of 1972 [16 USC 1361] [PL 92-522]		X
Migratory Bird Treaty Act (1918) [16 USC 703] [PL 65-186]	X	
Multiple-Use Sustained Yield Act of 1960 [16 USC 528]		X
National Environmental Policy Act of 1969 (NEPA) [42 USC 4321] [PL 91-190]	X	
National Historic Landmarks Program [36 CFR § 65]		X
National Historic Preservation Act of 1966, as amended [16 USC 470] [PL 89-665]	X	
National Register of Historic Places [36 CFR § 60]	X	
Native American Graves Protection and Repatriation Act of 1990 [25 USC 3001] [PL 101-601]	X	
Native American Graves Protection and Repatriation Act Regulations	X	
North American Wetlands Conservation Act [16 USC 4401]	X	
Outdoor Recreation on Federal Lands		X
Outleasing for Grazing and Agriculture on Military Lands [10 USC 2667]	X	
Preservation of American Antiquities [43 CFR § 3]		X
Protection and Enhancement of the Cultural Environment [EO 11593]	X	
Protection and Enhancement of Environmental Quality [EO 11514]		X
Protection of Archaeological Resources: Uniform Regulations [32 CFR § 229]	X	
Protection of Historic and Cultural Properties [36 CFR § 800]	X	
Protection of Wetlands [EO 11990]	X	
Recreational Fisheries [EO 12962]	X	

Religious Freedom Restoration Act		X
Rivers and Harbors Act of 1899 [33 USC 401]		X
Safe Drinking Water Act of 1974, as amended [42 USC 300] [PL 93-523]		X
Salmon and Steelhead Conservation and Enhancement Act of 1980		X
The Secretary of Interior's Standards for Historic Preservation Projects[36 CFR § 68]	X	
Soil and Water Resources Conservation Act of 1977 [16 USC 2001]		X
Taylor Grazing Act (1934) [43 USC 315] [PL 73-482]		X
Timber Sales on Military Lands [10 USC 2665]	X	
Waiver of Federal Agency Responsibility under Section 110 of the National Historic Preservation Act [36 CFR § 78]		X
Water Resources Planning Act [42 USC 1962]		X
Watershed Protection and Flood Prevention Act [16 USC 1001] [33 USC 701]		X
Wild and Scenic Rivers Act of 1968 [16 USC 1271] [PL 90-542]		X
Environmental Effects Abroad of Major Federal Actions		X
Exotic Organisms [EO 11987]	X	
Floodplain Management [EO 11988]		X
Intergovernmental Coordination Act (1968) [42 USC 4231] [PL 90-577]		X
Protection of Wetlands [EO 11990]	X	
Use of Off-Road Vehicles on Public Lands		X

Appendix I
Abbreviations and Acronyms

Admin.	Administration
AR	Army Regulation
CFR	Code of Federal Regulations
Corps	U.S. Army Corps of Engineers
COE	U.S. Army Corps of Engineers
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
DA	Department of the Army
dbh	diameter at breast height
DoD	Department of Defense
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
EPW	Evaluation for Planned Wetlands (Bartoldus, Garbish, and Kraus 1994)
FAC	Facultative (plant species)
FACU	Facultative upland (plant species)

FACW	Facultative wetland (plant species)
FGDC	Federal Geographic Data Committee
FONSI (FNSI)	Finding of No Significant Impact
FR	Federal Register
FY	Fiscal Year
ha	hectare
HAT	Habitat Assessment Technique (Cable, Brack, and Holmes 1989)
HEP	Habitat Evaluation Procedures (U.S. Fish and Wildlife Service 1980)
HGM	Hydrogeomorphic Approach to Assessing Wetland Function (Smith et al. 1995)
INRMP	Integrated Natural Resources Management Plan
ITAM	Integrated Training Area Management
m	meter
MACOM	Major Army Command
MnRAM	Minnesota Routine Assessment Method for Evaluating Wetland Function, Version 2.0
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
NA	not applicable
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service (formerly the Soil Conservation Service (SCS))

NTIS	National Technical Information Service
NWI	National Wetlands Inventory
NWP	Nationwide Permit
OBL	Obligate wetland (plant species)
OTEC	Ocean Thermal Energy Conversion
PAMHEP	Pennsylvania Modified Habitat Evaluation Procedure (Pennsylvania Game Commission 1985)
PCN	Preconstruction Notification
ppt	parts per thousand
R & D	Research and Development
REC	Record of Environmental Consideration
SHPO	State Historic Preservation Officer
UPL	Upland (plant species)
U.S.C.	United States Code
USDA/SCS	U.S. Department of Agriculture Soil Conservation Service (now the Natural Resources Conservation Service (NRCS))
USDA/NRCS	U.S. Department of Agriculture Natural Resources Conservation Service (formerly the Soil Conservation Service (SCS))
vs.	versus
WET	Wetland Evaluation Technique (Adamus et al. 1987)
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WDCP	Wetland Delineator Certification Program
WRAP	Wetland Rapid Assessment Procedure (Miller and Gunsalus 1997)

Appendix J
Web Sites and Phone Numbers

DENIX - Defense Environmental Network and Information eXchange:
http://www.denix.osd.mil

Integrated Area Training Management (ITAM):
http://www.army-itam.com/

U.S. Army Corps of Engineers, Headquarters Regulatory Web site:
http://www.usace.army.mil/lcr/reg/

U.S. Army Corps of Engineers Sacramento District Regulatory Web site:
http://wetlands.usace.mil/

U.S. Army Corps of Engineers Waterways Experiment Station for HGM info:
http://www.wes.army.mil/el/wetlands/hgmph.html

U.S. Army Corps of Engineers Waterways Experiment Station for WES Wetlands Research Program publications and the 1987 Corps Wetlands Delineation Manual:
http://www.wes.army.mil/el/wetlands/wlpubs.html

U.S. Fish and Wildlife Service, National Wetlands Inventory (NWI)
http://www.nwi.fws.gov/

Federal Geographic Data Committee Web site:
http://www.fgdc.gov/

Army Environmental Hotline: 1-800-USA-EVHL

Office of the Director of Environmental Programs-Conservation:
703-693-0677

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14. ABSTRACT

This document provides Army Natural Resource Managers with general guidance on wetlands ecological principles and regulatory requirements that must be considered in the implementation of their installation's Integrated Natural Resources Management Plan (INRMP). Among other things, this document attempts to provide an overview of the regulatory program of the U.S. Army Corps of Engineers regarding wetlands. The objective of the handbook is to help land managers better fulfill their obligations for development and implementation of their installation's INRMP, and to help installations comply with applicable wetlands laws and regulations. Although this overview includes numerous quotations and citations of Federal regulations, the regulatory guidance is general in nature and should not be regarded as legal advice applicable to site-specific situations.

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